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Johan Sebastian Pöll

# The anaesthetist

1890-1960



A historical comparative study between  
Britain and Germany

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THE ANAESTHETIST 1890 - 1960

A historical comparative study between Britain and Germany

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# Preface

The first amazement that led to this book was in 1981. I began my training in anaesthesia and was indoctrinated by my teachers with the idea that anaesthetists had first emerged in Britain, that doctors like Snow, Magill and Macintosh had founded the specialty I had chosen. They had been the inventors of the science of anaesthesia and had designed essential tools and trademarks, such as the endotracheal tube and the laryngoscope. Especially the admirable Sir Ivan Whiteside Magill, who first used endotracheal intubation with a single tube to enable the plastic surgeon Harold Gillies to repair the broken faces of British servicemen from the First World War appealed to my imagination. These British anaesthetists were placed in sharp contrast with German surgeons, like Ferdinand Sauerbruch, who would not tolerate a separate doctor for anaesthesia in their operating theatres, who employed nurses to administer anaesthetics and who preferred to operate under local or spinal anaesthesia. To crown it all, spinal anaesthesia had been invented by August Bier, a German surgeon also responsible for the design of the German 'Stahlhelm', the steel helmet, the symbol of the German army. With all this in mind I took my place behind an anaesthetic apparatus for the first time and found out it was manufactured by Dräger, a German company that had been designing and manufacturing anaesthetic machines since 1902. The endotracheal tube I learned to use was manufactured by Rüsch, also a German company. The needle I was to use was manufactured by B. Braun from Melsungen, Germany. How was this all possible?

The second amazement was the staffing of the specialty I aspired to. In my country, the Netherlands, a so-called flexible one-table system is currently used, with one anaesthetist working on two tables assisted by non-medical assistants to watch over the anaesthetized patient. I was taught that this was a compromise with our surgeons who, strongly influenced by the German disciples of Bier and Sauerbruch, would not tolerate more anaesthetists and preferred to work with nurse assistants. How amazed I was when I found out that at the end of the 20<sup>th</sup> century Germany had the highest number of anaesthetists per inhabitant, and that the United Kingdom and the Netherlands had the lowest number. There had to be something wrong with the prevailing idea of British versus German anaesthesia.



# 1. Introduction

## 1.1. The framework

This thesis is about the different circumstances under which the administration of anaesthetics evolved into a medical specialty in two western European countries: Britain and Germany. This introductory chapter will show that in the existing historiography the British initiative of anaesthetic specialization is depicted as due to visionary British doctors, while narrow-minded surgeons obstructed this development in Germany. This supposed contrast appears to be based on a few often-cited but nevertheless anecdotal personal statements by postwar anaesthetists and surgeons. Basically, however, no systematic research into anaesthetic specialization linked to the existing theories about medical specialization in general, scarce on its own, has been performed. To study this problem a conceptualization of the different phases of medical specialization will be applied to anaesthesia.

## 1.2. The history of Britain's remarkable lead and Germany's lag

'It was in England that physicians, inspired by John Snow, first specialised in anaesthesia'<sup>1</sup> This was concluded by O.P. Dinnick, member of the Council of the Association of Anaesthetists of Great Britain and Ireland, during the Fourth World Congress of Anaesthesiologists in 1968 in London. He was neither the first nor the last historian of anaesthetics to describe the evolution of the administration of anaesthetics into a medical specialty in Britain as the shining example of an evolving process that appeared to be almost natural. A sequence of successes by the first anaesthetist, John Snow (1813-1858), in London around 1850; the founding of the first society of anaesthetists in 1893; the first published modern endotracheal intubation in 1926; the first recognition of a Diploma in Anaesthetics in 1935 and the first academic chair in 1937 led to the establishment of an independent scientific medical specialty. A well-known British handbook

<sup>1</sup> Dinnick, 'The first anaesthetic society' (1970) 181.

of anaesthesia explains this success as follows: ‘In Britain the administration of anaesthetics has always been in the hand of doctors and gradually there has been an increase in the number of specialists in the subject.’<sup>2</sup> This statement implies that in other countries anaesthetics were administered by non-medical personnel, hampering anaesthetic specialization.

While Britain seems to have been the first country where specialists in anaesthesia organized themselves, in 1893, Germany lacked a similar organization until 1953, making it appear to have been one of the last (Table 1). This has always been noted as remarkable because in medical respects Germany was usually on a par with the rest of the Western world. The foreword to an important collection of essays on the history of anaesthesia notes: ‘While most medical developments rapidly spread from the English-speaking countries to Continental Europe, this was not the case with anaesthesia. Advanced continental cities had not acknowledged the value of specialized doctors for the administration of anaesthesia. Germany, a country of most remarkable achievements in surgery, did not feel the need for highly specialised anaesthesiologists and as late as the fifties vegetated on the need for better trained anaesthesia-administering nurses, considering that there was no need to train doctors for this job.’<sup>3</sup> About this cross-Channel contrast the German historian W. Schwarz stated that ‘this comparative delay [of the establishment of a German Society of Anaesthesia] seems surprising; especially if one considers that German investigators had provided a vital stimulus to the development of anaesthesia at the end of the 19<sup>th</sup> and the early years of the 20<sup>th</sup> century.’<sup>4</sup> This picture of anaesthesia in Germany still exists in the 21<sup>st</sup> century and has been adopted by British as well as German writers on the history of anaesthesia.<sup>5</sup> Obviously somewhere in a cascade of developments something made the difference. This difference is historically interesting for the understanding of anaesthesia as a medical specialty and the understanding of medical specialization in general. Its interest only increases when considering the fact that only unstable explanations for it are given in the existing historiography.

### 1.2.1. The ether versus chloroform explanation

The most simple explanation for the lead of Britain in anaesthetic specialization, in contrast to the rest of the world and in particular to Germany and the United States, has long been the controversy regarding the use of ether or chloroform that dominated the anaesthetic debate at the close of the 19<sup>th</sup> century. Ether was easy to use and had a wide margin of safety. No separate medical specialist, not even a doctor, was required for its use. The alternative anaesthetic chloroform had a faster action, a nicer smell and was not explosive. Its administration however was more complicated and the margin

2 Atkinson, *Synopsis of Anaesthesia* (1977) 1.

3 Ruprecht, ‘Foreword’ (1985) 191.

4 Schwarz, ‘Attempts to establish anaesthesiology’ (1989) 170.

5 Snow, *Operations Without Pain* (2006) 152. Petermann, ‘Development of anaesthesiology’ (2005) 133. Goerig, ‘Die Anästhesie’ (2003) 57.



Table 1. Anaesthetic Societies in Europe

Founded	Land	Name
1893	Britain	Society of Anaesthetists
1932	Britain	Association of Anaesthetists of Great Britain and Ireland
1934	France	Société Française d'étude de l'Anesthésie et l'Analgésie
1934	Italy	Società Italiana di Anestesia ed Analgesia
1946	Sweden	Svenska Narkosläkarklubben
1948	Netherlands	Nederlandse Anaesthesisten Vereniging
1949	Denmark	Dansk Anæstesiologisk Selskab
1949	Norway	Norsk Anestesiologisk Forening
1950	Greece	Hellenic Society of Anaesthesiology
1951	Austria	Österreichische Gesellschaft für Anaesthesiologie
1952	Finland	Suomen Anestesiologi yhdistys
1952	Switzerland	Schweizerische Gesellschaft für Anästhesiologie
1953	Germany	Deutsche Gesellschaft für Anaesthesie
1953	Spain	Asociación Española de Anestesiología
1955	Belgium	Société Belge d'Anesthésie et de Réanimation*
1955	Portugal	Sociedade Portuguesa de Anestesia

## Sources:

Britain: this book; France: <http://www.sfar.org> 2008; Italy: <http://www.www.siaarti.it> 2008; Sweden: email correspondence Bror.Gardelov@lio.se 2008; Netherlands: *Van Aether naar Beter* (1988); Denmark: email correspondence sekretariat@dasaim.dk 2008; Norway: email correspondence elin.storjord@gmail.com 2008; Greece: <http://www.nda.ox.ac.uk/wfsa/html> 2011; Austria: email correspondence office@oegari.at 2008; Finland: email correspondence Riku.Aantaa@tyks.fi 2008; Switzerland: [www.sgar-ssar.ch](http://www.sgar-ssar.ch) 2008; Germany: this book; Spain: email correspondence secretario@sedar.es 2008; Belgium: <http://www.bvar.be/nl/algemeen/bvar/geschiedenis.htm> 2008; Portugal: email correspondence lpco@netcabo.pt 2008.

Note: This table shows the first national organizations of anaesthetists in Europe, sorted by their founding date. The Society of Anaesthetists in Britain was a purely scientific organization. The Association of Anaesthetists of Great Britain and Ireland, founded in 1932, was the first interest organization for anaesthetists. The French and Italian organizations had a principally scientific goal.

of safety was too narrow to risk use by an inexperienced person. In 1947 at the hundredth anniversary of chloroform Barbara Duncum, a staff member of the Nuffield Department of Anaesthetics in Oxford, described the influence of chloroform as follows '... at the time of Snow's death, in 1858, in many London hospitals and some larger provincial hospitals ... the custom of appointing a general practitioner interested in anaesthetics ... in the capacity of honorary 'chloroformist' was steadily growing. Thus the administration

of anaesthetics came increasingly into the hands of qualified and experienced men, some of whom were anxious and able to develop the theoretical as well as the practical side of their specialty.<sup>6</sup> Half a century later historians, in a paper explaining the development of anaesthesia in the US, took the same line: ‘... anaesthesia developed as a physician specialty in Great Britain because of the complexity of administering chloroform and the historical precedent of physicians administering anesthesia in Great Britain.’<sup>7</sup>

This ether-chloroform explanation however comes across as a chicken-and-egg discussion: in Britain chloroform could be used because anaesthetists were there and anaesthetists were there because chloroform was used. After the umpteenth time this explanation was published, Vincent J. Kopp, Professor of Anesthesiology at the University of North Carolina, remarked that ‘consideration of multiple historical, social, and ethical factors best explains how physicians came to dominate anesthesia care early on in Great Britain but not the United States. To simply imply physician dominance was rooted in more skilful use of the preferred drug obscures the role other more important factors played in our specialty’s professional history.’<sup>8</sup> Kopp was probably right, not least because it might not even be true that chloroform was used more often in Britain than in other countries. An analysis of the *Narkotisierungs-Statistik*, anaesthetizing statistics, presented in the 1890s by Ernst Julius Gurlt (1825 – 1899), professor of surgery in Berlin, has shown that in Germany as in Britain chloroform was the most frequently used anaesthetic. In the last decade of the 19<sup>th</sup> century around 95% of general anaesthesia was performed with chloroform.<sup>9</sup> The present study will confirm this similarity.

### 1.2.2. The cultural explanation

The socio-cultural explanations of the difference between Britain and Germany Kopp was aiming at had also been addressed in 1947 by Duncum. She stated that anaesthesia had been able to develop peacefully and undisturbed in Victorian England. The Continent, on the contrary, was suffering from revolution and war. There had been no enabling climate for scientific growth.<sup>10</sup> This was the main difference with Germany, where ‘until the eighteen-nineties ... the general attitude towards anaesthesia was one of apathy, so that administration was entrusted to students and junior house officers, many of whom came to the task without having been prepared by even the most rudimentary instruction.’<sup>11</sup> German historians described the same lack of interest in anaesthesia on the part of doctors in the first decades of the 20<sup>th</sup> century passing the buck to non-medical workers. ‘Obwohl die Durchführung von Narkosen zunächst eine ärztliche Aufgabe war, übernahmen bald nicht-ärztliche Mitarbeiter diese Tätigkeit.’<sup>12</sup>

6 Duncum, *The Development of Inhalation Anaesthesia* (1947) 21.

7 Waisel, ‘Development of Anesthesiology’ (2001) 907.

8 Kopp, ‘Physician Specialization’ (2002) 776.

9 Vlot, ‘The ether-chloroform controversy’ (2006) 80.

10 Duncum, *The Development of Inhalation Anaesthesia* (1947) 17, 19.

11 Ibid 544.

12 ‘Although at first the administration of anaesthetics was a medical task, non-medical assistants

In Germany, the administration of anaesthetics by inexperienced persons was to last until after the Second World War. 'Bis weit in die vierziger Jahre unseres Jahrhunderts hinein lag dann die Ausführung der Narkose in den Händen der nicht-ärztlichen Helfer oder aber der jüngsten und mithin unerfahrensten Assistenten.'<sup>13</sup> Overall these explanations of the difference are rather emotional and are aimed at old-fashioned, narrow-minded German surgeons. They are blamed as the conservative demons who counteracted the development of anaesthesia as a medical specialty. In 1972 Helmut C.D. Schmidt (1895-1979), a German surgeon who was interested in anaesthetics and had played a key role in the establishment of anaesthesia as a separate specialty in Germany in the 1950s, remembered the surgical attitude before the Second World War as follows: 'Es waren eigentlich nur irrationale Gründe, die die ältere Chirurgengeneration zu dieser einhellig ablehnenden Haltung veranlassten. Die alten 'Rauschebärte' waren zorn 'gerötet', dass man ihnen einen zweiten mitverantwortlichen Mann an die Seite stellen wollte.'<sup>14</sup>

### 1.2.3. Sauerbruch, the evil demon

Ferdinand Sauerbruch (1875-1951), an influential German surgeon in the interwar years, is depicted as the main counterforce to anaesthetic novelties in Germany. In 1955 Karl Heinrich Bauer (1890-1978), an influential postwar surgeon and by then an advocate of anaesthetic specialization, described the attitude of Sauerbruch towards Arthur Läwen (1876-1958), a progressive German surgeon who experimented as early as 1910 with curare and endotracheal intubation, as follows: 'Zugleich empfahl Läwen (1910!) für alle Eingriffe im Brustinneren zu intubieren und die Atmungsmuskulatur mit gut dosierbarem Curarin zu lähmen und dann den Beatmungsapparat in Anwendung zu bringen. Kein Zweifel: der junge Läwen hatte mit der Curarisierung, Intubation und künstlichen Beatmung alle Schlüssel der heutigen Anaesthetie bereits in der Hand. Man fragt sich: Warum haben er und andere nicht durchgesetzt? Nun, Läwen sagt selbst resigniert: Es war die Ablehnung durch Sauerbruch. Unbeschadet dessen sonstigen grossen Verdienste, hier hat sein Dämon den Fortschritt gehemmt.'<sup>15</sup>

soon took over this activity? Goerig, 'Anästhesie in der ersten Hälfte des 20. Jahrhunderts' (2003) 56.

13 'Until long in the forties of our century the administration of anaesthetics was in the hands of non-medical assistants or really the youngest and by that most inexperienced residents.' Klimpel von, 'Zur ärztlich ausgeführten Narkose' (1986) 241.

14 'Actually just irrational reasons brought the older generation of surgeons to this renunciatory attitude. The old beardies went scarlet with anger that a second jointly responsible person would be placed at their side.' Schmidt, 'Gruss an Hans Killian' (1972) 24.

15 'At the same time Läwen (1910) recommended to intubate and paralyse the respiratory musculature with curarin that could be well dosed and then to employ a respiratory ventilator. There can be no doubt that with curarization, intubation and artificial respiration the young Läwen had all keys to today's anaesthesia in hand. One wonders: why did he and others not enforce this development? Well, Läwen himself says resignedly: It was the disaffirmation by Sauerbruch. Irrespective of his other large merits, here his demon has hampered progress.' Bauer, 'Wandlungen der Anaesthetie' (1955) 165.

The same Sauerbruch is supposed to have opposed the introduction of endotracheal intubation, the trademark of British anaesthesia. Although Franz Kuhn (1866-1929), a surgeon from Kassel in Germany, had developed a steel precursor of the wide bore endotracheal tube in 1902, the application of endotracheal intubation did not get off the ground in the German hospitals. This was attributed to Sauerbruch, because he advocated his own ways of ensuring adequate respiration during intrathoracic surgery, which will be discussed later, and did not want to admit another specialty into his territory.<sup>16</sup> Rudolf Nissen (1896-1981), a Jewish surgeon who left Germany in 1933, described the negative role played by Sauerbruch, his chief in Berlin, during a lecture in Liverpool, England in 1953: ‘Today it seems hard to believe that Sauerbruch rejected the method of endotracheal insufflation although this was only in small part due to an unwillingness to learn. The decisive factor lay in the organization, or rather the lack of organization, in the field of anaesthesia. Sauerbruch rejected on principle the idea of setting up anaesthesia as a branch in its own right.... His voice was sufficiently influential in the continent to hold up a development there from which, in other countries, thoracic surgery was to benefit more than any other.’<sup>17</sup> A nuance should be added to this quotation, which is that Nissen, in his inaugural speech a year earlier in Basel, Switzerland referred to Sauerbruch as the founder of modern thoracic surgery and the defender of unity in surgical science and praxis.<sup>18</sup>

But it was not only Sauerbruch who counteracted; all leading German surgeons were put in the same category. Jean Henley (1910-1994), an American anaesthetist who visited several German hospitals in the American occupation zone by order of the US High Commissioner for Germany after the Second World War, also came to this conclusion. Anaesthesia in Germany had stagnated for 50 years while anaesthetics were administered by nurses and young doctors. As the main reason for this old-fashioned system she pointed to the dictatorial style of the surgeons: ‘The chief of every [surgical] service is a little God.’<sup>19</sup>

### 1.3. The uneven comparison to be investigated

An overview of the history of differences between Britain and Germany shows Britain depicted as the standard and Germany, in fact the whole European continent, as the exception. This is actually a negative approach to these differences. Historians did not explain why anaesthetic specialization took place in Britain, but rather why anaesthetic specialization did not take place in Germany. A fair and historically correct comparison

16 Kuhn, ‘Die pernasale Tubage’, (1902) 1456. Brandt, ‘Die Geschichte der Intubationsnarkose’ (1986) 529.

17 Nissen, ‘Development of pulmonary surgery’ (1955) 10.

18 Nissen, *Zeitloses und zeitgebundenes in der Chirurgie* (1953) 28.

19 Petermann, ‘Development of anaesthesiology’ (2005) 135.

however should be made from the same starting point: the time when the first anaesthetists appeared in Britain. This gives rise to many questions: Why did British doctors start to specialize in anaesthesia? Were all anaesthetics in Britain administered by anaesthetists? Who administered anaesthetics in German hospitals? What was their qualification? What were their tasks? Did German surgeons differ from British surgeons? Did the attitude of German surgeons change after the Second World War, when German hospitals began to appoint anaesthetists? Which anaesthetic techniques – general with ether or chloroform, endotracheal, local or regional – were used, and for which reasons? Was the difference in anaesthetic techniques a cause or an effect of anaesthetic specialization? Were Britain and Germany just out of sync or did the process of medical specialization itself differ? These are many of the questions about anaesthetic specialization, few of which have answers.

#### 1.4. The general process of medical specialization

Until now, the development of the anaesthetic specialty has been considered separately from other medical specializations; it is regarded as an indulgence in navel-gazing. Anaesthetic specialization however does not exist on its own. It is only one medical specialty amidst dozens of others. Before anything about anaesthetic specialization can be explained there should be a consideration of the process of how a medical occupation becomes a medical specialty. During recent decades this process has garnered more and more attention. Usually, studies like this one focus on a single specialty, like the arch study of ophthalmology by George Rosen in 1944 and the more recent study on rehabilitation medicine by Glenn Gritzer.<sup>20</sup> The current standard work on medical specialization in general is *Divide and Conquer* by George Weisz. In contrast to what its title suggests, the onset of medical specialization in the 18<sup>th</sup> century was not due to a division of labour within the medical profession. It was instead the merger of medicine and surgery,<sup>21</sup> which brought surgeons, who until that time had had no medical education, into the medical order. In the 19<sup>th</sup> century within this merged field of medicine the many specialties known today were formed by a division of labour, although a principle division between contemplative and cutting specialties still exists. Specialized medical care is now a formidable power in the field of healthcare and a hot potato for every healthcare administrator. Its interests have always been big. The German doctor Carl August Wunderlich observed in 1841 in Paris, 'Jetzt ist die Spécialité Not, Bedingung für jeden, der schnell Reichtum sammeln und berühmt werden will. Sie bringt Geld und Ehre. Eine Spécialité zu erdenken ist die Hauptsorge des jungen Pariser Arztes; und es ist dahin

20 Rosen, *The Specialization of Medicine* (1944). Gritzer, *The Making of Rehabilitation* (1985).

21 Weisz, *Divide and Conquer* (2006) 6.

gekommen, dass man darauf stolz ist, ein *homme spécial* zu heissen. Jedes Organ hat seinen eigenen Priester, und für einzelne sind sogar besondere Kliniken eingerichtet.<sup>22</sup>

Not all specialties are defined in the same way. Some focus on a specific disease (e.g. rheumatology), some on a specific organ or group of organs (ear, nose and throat medicine, ophthalmology), and some on a specific group of patients (paediatrics, geriatrics, obstetrics) or a specific technique (radiology, endoscopy, anaesthesia). Every specialty has its own features and its own borders and overlap with other specialties. A medical specialty has degrees that can exist on their own but can also be a phase in a cumulative process towards a full-blown exclusive specialty.

#### 1.4.1. The phase of the individual specialist

The first step towards the development of a specialization is the identification of a ‘special thing’ of medicine by a doctor, who identifies it and starts to develop his own practice of it. This ‘special thing’ could be part of an existing clinical domain, for instance plastic surgery within general surgery, or a new clinical domain like radiology or anaesthesia.<sup>23</sup> In either case it has to be a definable and recognizable part of medicine. Doctors who practice specialized medicine define it by writing textbooks on their subject. They become teachers or researchers and publish papers about their work. Their work, if appreciated, is sometimes even crowned with a professorial chair. A way to visualize their special interest is to develop a trademark, a touchable thing, preferably an instrument.<sup>24</sup> This leads to the symbiotic relationship between specialist doctors and instrument makers that was mentioned earlier.<sup>25</sup> When the specialist becomes well-known his innovations, in earlier days often designed in the hospital’s workplace, are put into production by local instrument makers. The instruments bear the name and sizing of their designer. This enforces the status of the individual specialist and the industrial company. Appealing examples include the stethoscope, the obstetric forceps, the percussor and the ophthalmoscope. In the case of anaesthetics the trademarks are indispensable devices such as endotracheal tubes, intravenous needles and the catheters needed to provide free, waterproof and airtight access to and control over the respiratory and circulatory system. In this study the development of these devices will be followed closely. Up to this point the practice of the ‘special thing’ can still be a one-man action and not every ‘special thing’ turns into a specialty in the sense that it is exclusively practised by certified specialists. On the contrary, most ‘special things’ remain individual

22 ‘Now the specialty is necessity, condition for everybody who wants to collect richness quick and to become famous. It brings money and honour. To invent a specialty is the main concern for the young doctor in Paris; it has come that far that one is proud to be named a special man. Each organ has its own priest, and for some special clinics exist.’ Wunderlich, *Heilkunde in Deutschland und Frankreich* (1841) 35.

23 Rosen, *The Specialization of Medicine* (1944) 3.

24 Gritzer, *The Making of Rehabilitation* (1985) 7.

25 Weston-Davies, ‘The surgical instrument maker’ (1989) 41.

areas of interest. For example, Billroth can be considered a specialist in gastric surgery, but gastric surgery has never become a protected field of surgery.

#### 1.4.2. The phase of the evolution from specialist to specialty

The threshold of the next phase of medical specialization is the publication of a journal or the foundation of a scientific society. This achievement is a clear step further because, for the first time in the development of a new specialty, a group of practitioners with the same scientific interest are invited to work together. The reason to form a specialist group is for doctors to profile themselves as the guardians of a special field of medicine, to promote their scientific and industrial products, to inspire one another but also to control each other. At the same time a group of specialists is a suitable partner for industry and means by which to tune and improve their products. It is simply impossible for industry to have a product named for every individual specialist in the country in its assortment. The grouping and hence ranking of individual specialists provides the opportunity to have one design accepted by all specialists in a particular field. This mechanism becomes even more important as the production process evolves from handcraft into a more complex industrial craft. In anaesthesia this took place when industries like gas compression or rubber companies entered the anaesthetic devices market.

The purpose for this grouping of specialists does not necessarily have to be the foundation of an exclusive specialty. Whether this happens depends on the desirability and possibility that the ‘special thing’ can become a full-time occupation enabling the doctor to earn his daily bread. In this phase the specialist’s ‘thing’ will be subjected to economic laws and challenged to prove both its market value and its workability.

The market value of a specialist has always been high, as a consequence of social pressure from prosperous communities to gain victory over malformation, pain, disease and ultimately death. Doctors, medical scientists and particularly medical specialists are supposed to comply with this wish.<sup>26</sup> The ability to command the services of a medical specialist endows the patient with a certain degree of prestige.<sup>27</sup> This mechanism further increases the market value of the specialist because doctors who specialize can command higher fees.<sup>28</sup> The spread of health insurance, which made specialized medical care more available to larger groups of people, further enlarged this market.<sup>29</sup> Whether a new specialty meets with such success depends on its interaction with existing specialties, which are usually not inclined to give up a part of their domain (read power, read income) unless the new specialty will substantially reduce workload without reducing income.

A new specialty between existing specialties, which has not previously been a part of an existing specialty, is easier and could even be welcomed by existing specialties. In

26 Waddington, *The Medical Profession* (1984) 191.

27 Rosen, *The Specialization of Medicine* (1944) 72.

28 Rosen, *Structure of American Medical Practice* (1983) 87. Snow, *Operations without Pain* (2006) 178.

29 Lloyd George, *The People’s Insurance* (1911) 3-32. Starr, *Social Transformation of American Medicine* (1982) 235-237.

addition, medical specialists not only deal with other medical specialists; they must also confer with general practitioners and work with various non-medical practitioners who are at times responsible for medical tasks.

Whether the specialist can realize his full market value depends on his specialty's economies of scale. Because a healthcare specialist earns his money by treating the patient face-to-face the likelihood of full-time work in the specialty is strongly enhanced when there is a concentration of similar patients. This is what happened when in the 19<sup>th</sup> century patients with specific diseases were concentrated in specialized hospitals necessitating specialized doctors.<sup>30</sup> The concentration of patients by illness or condition brought about efficiency and economic feasibility. Next, specialization gradually reinforced itself. Full-time occupation with the 'special thing' enhanced the experience of the practitioner. The specialists could not only study and treat diseases better but could also provide better education to medical students. By receiving brief training in one specialty after the other the new doctor would become acquainted with every clinical picture.<sup>31</sup> It speaks for itself that the concentration of patients is highest in cities; therefore the urbanization accompanying the industrial revolution was a strong motor for medical specialization. In Britain and especially in London there was a boom in the foundation of such specialized hospitals from 1850 to 1890.<sup>32</sup> New York, as the biggest urban agglomeration in the new world in the 19<sup>th</sup> century, was the breeding ground for almost all medical specialties in the US.<sup>33</sup> The opposite is also true. When a specialized kind of medicine is not concentrated and has to be available all the time, around the clock, and in all places, it is not likely to become an established specialty. As Weisz stated, in such cases the target group of patients is not manageable. In anaesthesia the concentration of patients began with the hospitalization of surgery at the end of the 19<sup>th</sup> century, when surgery was no longer performed in the patient's home or the surgeon's practice but in hospitals with operating theatres. Yet, the anaesthetist could not concentrate his own patients. He still depended on the organization of one or more surgeons. Anaesthetic logistics became a significant issue for the new specialty.

Warfare creates an interesting concentration of medical care. It creates a concentration of patients in specialized military hospitals and in theory supplies those hospitals with enough money, factors that according to Rosen are important requisites for medical specialization.<sup>34</sup> In the literature on anaesthetic specialization, however, the influence of warfare has been used selectively. The Great War from 1914-1918 is supposed to have boosted the anaesthetic specialty in Britain. Germany participated in the Great War as well and its soldiers suffered the same injuries and the same deformities but had to wait for the Second World War to see a similar effect.<sup>35</sup> The intriguing question of why the

30 Rosen, *The Specialization of Medicine* (1944) 31.

31 Weisz, 'Emergence of Medical Specialization' (2003) 540-542.

32 Kershaw, *Special Hospitals* (1909) 25-41. Peterson, *The Medical Profession* (1978) 261.

33 Rosen, *The Specialization of Medicine* (1944) 38.

34 Cooter, 'War and Modern Medicine' (1993) 1545.

35 Petermann, 'Development of anaesthesiology' (2005) 134.



Great War failed to stimulate the development of anaesthesia in Germany has not yet been addressed. This gap in anaesthetic historiography is in line with the statement by Cooter that much historiography about war and medicine is naively positive, simple and partial.<sup>36</sup>

The Second World War is generally accepted to have boosted the anaesthetic specialty around the world.<sup>37</sup> 'World War II was a time of growth and development of anesthesia as a physician specialty. Wartime training exposed neophyte physician-anesthetists to role models who showed the potential of anesthesiology and to the richness of practicing anesthesia. Wartime anesthesia required dexterity, imagination, and pluck, and surgeons and other physicians were suitably impressed'.<sup>38</sup> But not every author accepts this one-to-one relationship. 'In anesthesiology, it is difficult to estimate how much progress was actually due to the effects of World War II. Almost every graph related to growth and development, however, shows a sharp upward trend about this time.'<sup>39</sup> All this uncertainty of the influence of warfare on anaesthetic specialization justifies the separate consideration of the world wars in the 20<sup>th</sup> century in this book.

#### 1.4.3. The phase of interest organization, certification and exclusivity

The next phase begins when the 'special thing' has proven to be successful enough to sustain a day-time job with a reasonable fee. Like the former phase, which started with the foundation of a scientific society, the next phase of medical specialization starts with the foundation of a shared interest association of practitioners in the specialty. In this respect Rosen was right when he stated that the genesis of a medical specialty is marked by this development of associations based on shared interests that allow practitioners in the same field of medical practice to deal with common problems more effectively.<sup>40</sup> To make this new phase worthwhile specialized doctors have to be available in sufficient numbers.<sup>41</sup> There is a critical minimum number of specialized doctors necessary to create a society, to guarantee its continuity and to provide a geographic representation of the specialty. Moreover, political power in the battlefield of medical care can be achieved only with a substantial number of practitioners. The opposite is also true. A shortage of doctors attenuates medical specialization. Weisz noted that medical specialization in France slowed down after the Great War with that country's significant loss of doctors.<sup>42</sup>

Certification of medical specialists is the powerful instrument used to protect the scientific and economic territory of a medical specialty and to delineate it from other medical specialists and paramedical staff. The way this process evolves depends on the legislative and governmental habits of a nation. Britain and Germany differed consider-

36 Cooter, 'War, Medicine and Modernity' (1998) 6.

37 Rushman, *History of Anaesthesia* (1996) 37.

38 Waisel, 'Development of Anesthesiology' (2001) 912-913.

39 Davis, 'Anesthesia in the World Wars' (1968) 29.

40 Rosen, *The Specialization of Medicine* (1944) 36.

41 Weisz, 'Emergence of Medical Specialization' (2003) 539.

42 Weisz, 'Mapping Medical Specialization' (1994) 184.

ably in this respect. Medical specialization in Great Britain was able to develop quickly in the absence of governmental regulations. It was self-regulating. France had strong central government control over academic and practical medicine. Germany combined characteristics of British and French politics in medical specialization.<sup>43</sup> Either way, only a diploma can form the basis for certification. Certification is also the basis for the exclusivity of a particular terrain in patient care. It is the end stage of medical specialization. After all, the 21<sup>st</sup> century definition of a certified medical specialist in the European Union of Medical Specialists (EUMS) reads: 'A specialist is a doctor who has completed his postgraduate specialist training and may practice independently in a specialized discipline.'

### 1.5. Anaesthesia, the special specialty

Anaesthesia is a special specialty. It is not contemplative like neurology, not diagnostic like radiology, not therapeutic like internal medicine. It is not a cutting specialty like general surgery, not reconstructive like orthopaedic or plastic surgery. Anaesthesia is enabling, controlling, protecting and homeostatic. Anaesthesia has the broad general medical task of making it appear to the surgical patient that nothing is happening or has ever happened. Anaesthesia is also a specialty that, with some exceptions, cannot be practised on its own. There is always another specialist involved with the same patient, at the same time and in the same room: the surgeon. Surgery under anaesthesia is the most intense multidisciplinary treatment of a patient. It is a perfect medical example of the division of labour. Despite or because of these particular properties in numbers of practitioners anaesthesia constitutes the largest medical specialty in the Western world, next to psychiatry and internal medicine.

In that respect it is all the more remarkable that Weisz paid so little attention to anaesthesia as a medical specialty. The razor-sharp difference between Britain and Germany in terms of the existence of an anaesthetic specialty would have been the ultimate challenge for his comparative study of medical specialization. Weisz' focus on the influence of large research institutions, universities, governmental regulation and international harmonization on medical specialization on the Continent would not have been able to explain this difference. For the development of anaesthesia as a specialization of medical practice and not primarily medical science three extra aspects have to be taken into consideration. The first is the special relation with the surgical specialty that was described above. The second is the influence of industry. Anaesthesia as a 20<sup>th</sup> century specialty was steered by industrial innovations and the introduction of new raw and synthetic materials. While surgical specialties stuck to steel for their instruments, anaesthetists began using rubber and plastics. The third aspect is the feasibility and practicability of anaesthesia as a specialty. The necessity for anaesthesia to be an

43 Gelfand, 'The History of the Medical Profession' (1993) 1134-1136. Weisz, 'Emergence of Medical Specialization' (2003) 537.

‘on-the-spot’, 24/7 medical specialty meant that there were significant logistical problems to overcome in order to claim and cover its part of medical care. This study is meant to shed light on this underexposed part of medical specialization and to analyse specialization in anaesthesia against the phases of medical specialization. For each phase the circumstances that influenced this process in different ways in Britain and Germany will be identified.

## 1.6. Methodological remarks

### 1.6.1. Terminology

The subject of this book is the evolution of the administration of anaesthetics into a medical specialty. This process is also referred to as ‘anaesthetic specialization’. For its practitioners this is the transition from an administrator of anaesthetics into an anaesthetist. In the German language it is the transition from Narkotiseur into Anästhesist. In this classification an administrator of anaesthetics or Narkotiseur is a person, irrespective of his qualifications, who administers general anaesthetics. An anaesthetist or Anästhesist is a doctor whose profession is the administration of anaesthetics. In relevant passages this will be emphasized by the adjective ‘professional’ or ‘medical’. In later phases he is a member of an anaesthetic society or is certified in some way as an anaesthetist. In Britain especially this implies that the meaning of the noun ‘anaesthetist’ varies according to the historical phase. An anaesthetist in 1900 is different from an anaesthetist in 1955. A nurse-anaesthetist is a nurse who administers general anaesthetics on her own responsibility. The noun ‘anaesthetic(s)’ will be used for the chemical substances that produce general anaesthesia. Inhalational, gaseous, intravenous or endotracheal are types of general anaesthesia named after the anaesthetic used or the route of administration. The term ‘local anaesthetics’ will be used for the chemical substances that produce local or regional anaesthesia. In local anaesthesia the surgical field is infiltrated with the local anaesthetic; the nerve ends are anaesthetized. In regional anaesthesia the local anaesthetic is applied somewhere between the nerve ends and their entry into the central nervous system; the nerve stimulus is blocked. Spinal anaesthesia is the main form of regional anaesthesia. ‘Anaesthesia’ not preceded by the adjectives ‘general’, ‘regional’ or ‘local’ is the name for the domain of the anaesthetic specialty. The adjective ‘anaesthetic’ will be used to indicate a relation with anaesthesia. The content of this domain changes through the years; at first it will only include the administration of anaesthetics, later also the management of ventilatory and circulatory homeostasis. Anaesthesiology, or in the American spelling ‘anesthesiology’, is the name of the specialty that has been used since 1945. American anaesthetists assumed that title to distinguish their specialty from the work of nurse anaesthetists. The term ‘anaesthesiology’ will be avoided in this book. For the dynamic process that will be described in the following chapters the definitions given above are sometimes too rigid. Especially in citations and their translations it can be necessary to break rules.

### 1.6.2. The period and area investigated

This story of the evolution of the anaesthetic specialty begins in 1890. Until that time no identifiable administrators of anaesthetics were known. The famous mid-19<sup>th</sup> century physician John Snow did not call himself an anaesthetist and in the 1870s there were only scattered mentions of etherists or chloroformists. But in 1890 for the first time five doctors bearing the qualification 'anaesthetist' were mentioned in the Medical Directory in London. The end of the 19<sup>th</sup> century also saw the completion of the hospitalization of surgery. The endpoint of this story will be 1960. By that time organizations were well-established in Germany and other European countries and moreover after 1960 there is too much distortion from adjacent activities such as intensive care, pain treatment and perioperative care.<sup>44</sup> In fact by that time the process of specialization within the anaesthetic specialty itself had begun. The period between 1890 and 1960 also encapsulates the emergence of techniques that are still the basis of safe anaesthetic care: the control of vital functions. The period also contains both of the world wars that are supposed to have played an important role in anaesthetic specialization. The three-stage rocket of anaesthetic specialization, individual specialization, group specialization and certification, will be spread over five chapters. These will be the turn of the century (1890-1914), the Great War (1914-1918), the interwar years (1918-1939), the Second World War (1939-1945) and the postwar period (1945-1960). Setting aside overlaps and periods when Britain and Germany were out of phase, Chapters 1, 3 and 5 will correspond with the three phases of specialization. The periods of the two world wars are discussed separately because of their extraordinary circumstances and their coincidence with transitions from one phase to the other. Throughout the story the degree of congruence or incongruence between Britain and Germany is highlighted and explained.

During these periods Germany and Britain have not always had the same geographical boundaries. The Great War reshaped Germany with respect to her western border: the Rhineland. In 1921 Ireland split from the United Kingdom and Northern Ireland remained within it. The aftermath of the Second World War split Germany in two and reshaped her eastern border with Poland. In this book, if not stated otherwise, Germany will be considered as the area governed from Berlin before 1945 and West Germany after 1945. Britain will be considered as England, Wales and Scotland.

### 1.6.3. Sources and literature

The basis of this research could only be the stage where it all happened: the operating theatres. An account of the organization of surgical and hence anaesthetic care was found in operation registers. The choice was limited by the availability of the registers. Preferably the British and German hospitals included had to be comparable in size, location, university versus general and above all in their range of operations. This source has not been used systematically in earlier historical anaesthetic research. At the same time it limits the examination to hospital-based anaesthesia. Anaesthetic administrations for

44 Rolly, 'Anaesthesiological manpower in Europe' (1996) 326.

dental surgery at the dentist's home and midwifery at the patient's home are not included.

The anaesthetic industry is a vast and ever-developing terrain. It includes pharmaceuticals, anaesthetic machines, anaesthetic access devices and, since the 1970s, monitoring equipment. The research into the anaesthetic industry was limited to those assortments that enabled the administration of anaesthetics and permitted control over ventilation and circulation as vital organ functions, the trademarks of the anaesthetist. Sources were the catalogues that were published by surgical and anaesthetic instrument companies. The pharmaceutical industry was not included.

Information about the development of anaesthetic knowledge was found in textbooks about anaesthesia. Via the bibliographic Internet search engines Picarta® and Worldcat® all pertinent books published between 1890 and 1960 in Britain or Germany were identified. For Britain the title keywords were anaesthesia and anaesthetics; for Germany the keywords were Anästhesie, Narkose, Schmerzbetäubung (analgesia), or Schmerzverhütung (pain prevention). As in the industrial catalogues the development was confined to the management of ventilation and circulation. Special attention was paid to textbooks with successive editions, since they can give insights into how the state of the art changes. Zuck pointed to the importance of the study of textbooks for historical research: 'The study of textbooks has much to offer the historian of anaesthesia. A good textbook will expound the 'state of the art'. It will describe techniques and apparatus, and explain their applications. It will indicate contemporary practices and attitudes, and will discuss the major problems of its time and the ways of tackling them. ... It may inadvertently reveal some social history in relation to the status of the anaesthetist and the structure of the specialty.'<sup>45</sup> A confinement to anaesthetic textbooks however would have given an incomplete picture of the anaesthetic practice in its early years. To complete the picture of the anaesthetic state of the art, surgical textbooks too had to be included. For this reason all books with the title keywords surgery or Chirurgie were traced. Again, books with successive editions were especially sought. Surgical textbooks describing a special part of surgery were only included when they formed part of an edition with several volumes covering the whole field of surgery. For reasons mentioned in the historiography textbooks concerning military surgery or Kriegschirurgie were also included.

The politics around the development of anaesthesia are derived from statements regarding the position of the anaesthetist in the textbooks and from publications in major British and German journals. These included *The Lancet* (published independently since 1823), the *British Medical Journal* (published by the British Medical Association since 1846), the *British Journal of Anaesthesia* (published independently since 1923; organ of the Faculty of Anaesthetists of the Royal College of Surgeons since 1949), the *British Journal of Surgery* (published by the Royal College of Surgeons since 1913), *Deutsche Medicinische Wochenschrift* (published independently since 1875),<sup>46</sup> *Berliner Klinische Wochenschrift*

<sup>45</sup> Zuck, 'From Buxton to Lee' (1986) 218.

<sup>46</sup> From 1904 '*Medicinische*' continued as '*Medizinische*'.

(published independently since 1864; continued from 1922 as the *Klinische Wochenschrift*, (Organ der Gesellschaft Deutscher Naturforscher und Ärzte), *Archiv für Klinische Chirurgie* (published for Deutsche Gesellschaft für Chirurgie since 1861), *Der Chirurg* (published independently since 1928) and *Schmerz Narkose-Anaesthesie* (published independently from 1928-1944). Their indexes were scanned for articles, correspondence and the minutes of meetings regarding the marketing and politics around the new specialty. Standard economics and statistics books and records give insight into the economic development in both countries.

To reconstruct the influence of the wars on anaesthetic specialization the official medical reports of the world wars, textbooks on war surgery and publications in general medical journals discussing this issue were used. The world wars are two important but relatively short spans of time. This implied that sources for these periods can be limited. The certification of doctors, medical specialists and hence anaesthetists differed in Britain and Germany. In the first half of the 20<sup>th</sup> century governmental organizations tried to keep away from the registration of medical specialists. The ‘Bundesärztekammer’, the Federal Medical Association in Germany, only registered doctors and not their specialty. The General Medical Council in Britain did the same and only added the Royal College of Physicians or Surgeons that had licensed the doctor. In both countries there was only a kind of informal registration in commercial yearbooks meant for the orientation of other doctors or commercial companies serving the field of medicine. For Britain this is the *Medical Directory*.<sup>47</sup> For Germany it was the *Reichs-Medizinal-Kalender* (National Medical Almanac). Two years, 1914 and 1937, were studied in both directories, for the capitals of the countries, London and Berlin.<sup>48</sup> Other sources of registration were the membership figures of anaesthetic societies and the qualifications of the editorial boards of the first anaesthetic journals: *Schmerz Narkose-Anaesthesie* and the *British Journal of Anaesthesia*. The source for information about the careers of anaesthetists in Britain and Germany was the laudations and obituaries that have been published in their respective society journals, the *British Journal of Anaesthesia*, *Anaesthesia* and *Der Anaesthetist*.

#### 1.6.4. ‘Statistics’

The union of statistics and historiography is an uneasy marriage. At several points in this study percentages are used to indicate a certain development or support a hypothesis. These retrospective, selective arithmetic exercises do not comply with the demands of the current science of statistics and should not be considered in that way. They are no more and no less than a numerical illustration of a historical process.

<sup>47</sup> The Medical Directory is a commercial non-governmental product containing the names of health practitioners and data from healthcare establishments in the United Kingdom. It has been published since 1845.

<sup>48</sup> *Reichs-Medizinal-Kalender*. Schwalbe (ed.), 1914. *Reichs-Medizinal-Kalender*. Lautsch (ed.), 1937.

Existing war statistics also have to be considered with great care. First, there is a definition problem. When a soldier dies from suicide, which happened at a considerable scale, the decision has to be made whether or not to record the death as attributable to the war. When a soldier dies several months after the war concludes, the same decision has to be made. Not all sources provide an account of their definitions. Second, the number of losses in the tables only refers to the number of mobilized service personnel. The number however should also reflect the time and extent to which the mobilized forces were in battle. The sources do not take this into account.





## 2. The turn of the century 1890-1914

‘By far the most important factor in the safe administration of anaesthetics is the experience which has been acquired by the administrator’.

Report of the Anaesthetics Committee of the British Medical Association, 1900.

### 2.1. Preview

This chapter begins around 1890. In Britain and Germany, as in most European countries, the first modern hospitals with specially designed operation departments and theatres had been brought into use. In them, inhalational anaesthesia was applied on a large scale and the first problems had arisen. Death in the course of general anaesthesia made a deep impression and reached the columns of newspapers and medical journals. This chapter will explore how the hospitals and doctors involved dealt with this problem. The story of the growing awareness of the role of the administrator of anaesthetics and his level of education will be told. At the end of the 19<sup>th</sup> century the discussion turned from the question, ‘What anaesthetic is the best, ether or chloroform?’ to the question, ‘Who is to be considered capable of the administration of anaesthetics and its ever-more complex administration systems?’ Besides many similarities in practice, the responsibility for and teaching of the new medical domain of anaesthesia will prove to have been different in Britain than in Germany.

### 2.2. The surgical world towards the end of the 19<sup>th</sup> century

Surgery in the second half of the 19<sup>th</sup> century was in a dynamic phase. Actually in this phase the great majority of the standard operative procedures of today were laid down.<sup>1</sup>

<sup>1</sup> Ellis, *A History of Surgery* (2001) 101.

The application of inhalational anaesthetics had meant a revolution in the conquest of pain and had brought about a giant leap forward in surgical possibilities.<sup>2</sup> With inhalational anaesthesia the experience of surgical pain could be eliminated temporarily and in a controlled way. General anaesthesia could be switched on and off. The time spent under general anaesthesia could be tailored to the surgical procedure. Instead of rapid, mainly destructive surgery, precise dissection, haemostasis and reconstruction became possible. The extent of surgical procedures could increase. After a period in which general anaesthesia had been a kind of luxury, one that took its toll, it became a *sine qua non* for modern surgery from 1860 on.<sup>3</sup>

It would be however too simplistic to contribute the changes in surgery only to the introduction of inhalational anaesthesia. Other factors improved surgery as well. The application of antisepsis improved surgical survival rates in a considerable way. More accurate diagnostics, refinement of surgical techniques and better training of surgeons and auxiliary personnel were also important. The maintenance of physiological homeostasis in the surgical patient would improve survival rates. The combination of all these innovations humanized surgical care. Surgery was no longer synonymous with an almost certain and painful death. Three developments are particularly relevant to the context of this book. In this phase they do not seem to be immediately interrelated but in the course of this book they will be shown to lead eventually to the anaesthetic specialty.

### 2.2.1. The hospitalization of surgery

With all innovations at the end of the 19<sup>th</sup> century surgical care had become more labour-intensive. More workers or assistants, including an administrator of anaesthetics, and ever-more facilities were needed to perform all the tasks around the surgical patient. The surgical patient also needed more aftercare in a hygienic setting. Because of the growing extent of the surgical procedures more postoperative disorders of the physiology of the patient were imminent. Consequently the patient could not be left at home after his surgery. This complexity moved surgical care from the patient's or surgeon's home towards the hospital.<sup>4</sup> In this phase modern hospitals were built with separate surgical wards and specially designed operation departments. These consisted of large theatres with an abundance of windows facing the north for optimal light, anaesthetic rooms for the induction of general anaesthesia, instrument handling rooms and dressing rooms.<sup>5</sup> In these hospitals staff members were charged with the administration of anaesthetics. The hospitalization of surgery would become one of the mechanisms that made organized anaesthetic care feasible.

2 Armstrong Davison, *The Evolution of Anaesthesia* (1965) 15.

3 Snow, *Operations without Pain* (2006) 185.

4 Wagenaar, *The Architecture of Hospitals* (2006) 29-30. Wilde, 'Truth, Trust, and Confidence in Surgery' (2009) 308-310.

5 Tansey, 'From the Germ Theory to 1945' (1997) 112.

### 2.2.2. Physiological homeostasis

The second interrelated development in surgical care that needs to be magnified in the context of this book is the management of physiological homeostasis. As the extent of surgery increased at the end of the 19<sup>th</sup> century circulatory disturbances began to develop more often. These were recognized clinically by a weakening of the pulse and by the skin turning cold and pale. Treatment was discussed in separate chapters in British and German surgical textbooks. It was clearly perceived as part of the surgeon's job. Most frequently an absolute shortage of circulating volume or blood was considered to be the cause of circulatory failure. The treatment consisted of the administration of blood or other fluids. The German-language textbook published by the surgeon Carl Emmert in 1850 had already discussed the application of direct and indirect blood transfusion, which had its place in both countries.<sup>6</sup> The stimulating effect of blood transfusion on the circulation was known to have an effect far beyond that of electrolyte solutions. But due to ongoing problems with blood clotting and transfusion fever the administration of intravenous or subcutaneous isotonic saline had been preferred since the 1890s.<sup>7</sup> The devices for access to the intravenous space had at first been manufactured from natural materials like chicken bones. After 1850 devices became available in steel versions. Intravenous access devices included steel cannulas, needles and 'through the needle' or 'over the needle' cannulation systems. Their diversity, bearing the proper names of their designers, was nearly infinite.<sup>8</sup> In the catalogues they were offered in special chapters on puncture, infusion and transfusion.<sup>9</sup> Anaesthetic textbooks and chapters on anaesthesia in surgical textbooks in Britain and Germany discussed circulatory changes primarily as a consequence of the administration of anaesthetics. Circulatory failure was supposed to be caused by nervous deregulation by the anaesthetic or by an exhaustion of the central nervous system due to continuous stimuli in surgical stress situations. As therapy the subcutaneous administration of circulation-stimulating drugs like adrenaline and alkaloids like strychnine, spartein or ephedrine was advocated. This pharmacological treatment of circulatory failure was considered to be the task of the administrator of anaesthetics.<sup>10</sup> As will be shown in following chapters it would not be until after the Second World War that all homeostasis, surgical and anaesthetic, became the task of the anaesthetist.

6 Emmert, *Lehrbuch der Chirurgie* (1850) 225-232. Rose, *A Manual of Surgery* (1900) 192-193.

7 Hewitt, *Anaesthetics* (1893) 324. Rose, *A Manual of Surgery* (1898) 212-214. Müller, *Narkologie* (1903) 180. Lexer, *Lehrbuch der allgemeinen Chirurgie* (1904) 13-15.

8 Gardner, *Catalogue of surgical instruments* (1901) 199. Weiss, *Catalogue of surgical instruments* (1901) 37-38. Woolley, *Catalogue of surgeon's instruments* (1903) 53. Arnold, *Catalogue of surgical instruments* (1904) 837. Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 78-79; *Katalog A Instrumentarium* (1930) 5-17.

9 Transfusion is a direct transfer of blood from the donor to the recipient. The connection consisted of rubber tubing or a steel pump mechanism. Infusion is the administration of fluids from a bottle via rubber tubing into the body of a patient.

10 Hewitt, *Anaesthetics* (1901) 480. Boyle, *Practical Anaesthetics* (1911) 125.

### 2.2.3. General anaesthetic mortality

The third consequence of the modernization of surgery towards the end of the 19<sup>th</sup> century had been the appearance of general anaesthetic mortality. After William T.G. Morton (1819-1868), an American dentist, had publicly demonstrated the first general anaesthesia by the inhalation of ether on October 16<sup>th</sup> 1846 at Massachusetts General Hospital in Boston, and James Y. Simpson (1811-1870), a gynaecologist in Edinburgh introduced chloroform one year later as a more rapid-acting and more pleasant smelling inhalational anaesthetic, again one year later the first death during general anaesthesia was recorded.<sup>11</sup> Hannah Greener, a healthy fifteen-year-old English girl, died during the administration of chloroform for the removal of a toenail on January 28<sup>th</sup> 1848. The coroners' inquest of this drama was reported immediately in *The Lancet* on February 5<sup>th</sup> 1848. General anaesthesia proved to be a blessing but not a panacea and certainly not without danger. General anaesthesia did not lower the death rate from surgical procedures. On the contrary, there are indications that the death rate was raised by 5 deaths in every 100 procedures; still this was less than the surgical death rate, which was some 27 per 100 amputations, for instance.<sup>12</sup> Although most patients died from their disease, trauma or surgery, the continuing flow of published reports of death under chloroform led to a medical debate about whether ether or chloroform was the ideal anaesthetic. In Britain in 1864 a chloroform committee was appointed by the Royal Medical & Chirurgical Society to study the effect and risks of the administration of chloroform. Its conclusion was that ether acted more slowly but was safer and mainly influenced respiration; chloroform acted faster and mainly depressed the heart's action. If applied with care, both agents had their values. Decisive for the safety was the attention that was paid to the anaesthetized patient. Especially the airway, respiration and pulse should be watched over carefully.<sup>13</sup> In other words anaesthetics were as safe as their administrator. Although the message was clear, no consequences were drawn yet. The almost public ether-chloroform debate by surgeons, gynaecologists and anaesthetists, but also general practitioners, dentists, physiologists and even criminal lawyers would go on for decades until the 1900s. For the time being it was easier to debate about substances than about persons and their competences, but the conclusion that anaesthesia was as safe as its administrator would become inevitable.

### 2.3. General anaesthesia, as safe as its administrator

Like sketched above general anaesthesia played an important role in developments in the surgical world. Within general anaesthesia the debate on its risks and mortality was dominant. Although mortality under general anaesthesia through the years has been very low compared to the mortality due to the disease or surgical complications, it has

11 Simpson, 'A new anaesthetic agent' (1847) 549-550.

12 Pernick, *A Calculus of Suffering* (1985) 217.

13 Anonymous, 'Committee on Chloroform' (1864 II) 69-72.

never been accepted. This contradiction symbolizes the expectation that patients and surgeons have from general anaesthesia. Anaesthesia is meant to make the patient look like nothing is happening. If, in that situation, something happens due to that ‘nothing’ it is incomprehensible and hence unacceptable. This phenomenon is illustrated by the fact that at the end of the 19<sup>th</sup> century among all medical deaths, only deaths regarded as related to general anaesthesia were object of an inquest by the coroner's court.<sup>14</sup> In the same way death under general anaesthesia was addressed frequently in the general medical journals. Like the first reported anaesthetic death in 1848 most publications on anaesthetic deaths were case reports describing what had happened and what possible mechanism had caused the fatal outcome. A constant question was whether the patient had died because the toxicity of the applied anaesthetic. From the beginning of its use chloroform had been suspected of being more dangerous than ether. Early studies on this subject are vital to consider, because in the end they would unintentionally form the basis of an anaesthetic specialty.

### 2.3.1. The Hyderabad Chloroform Commission

A typical study that focussed on one specific anaesthetic, in casu chloroform, was performed in Hyderabad, India. To offer scientific grounds for the discussion on chloroform toxicity animal experiments were carried out by Edward Lawrie (1846-1915). He was a military surgeon, had been trained in Edinburgh, the birthplace of chloroform, and worked in India from 1885 until his retirement in 1901. He was an advocate of the use of chloroform. To prove its safety he conducted experiments on dogs.<sup>15</sup> The Nizam (ruler) of Hyderabad in India sponsored this work and instituted a commission with Lawrie and some of his co-workers to investigate the safety of chloroform. This commission became known as the Hyderabad Chloroform Commission. It produced its first report in 1889, concluding that chloroform was not primarily toxic to the heart, contrary to current opinion in the medical literature. Lawrie even stated that chloroform was completely safe provided that the dog or the patient received meticulous care. Problems during the administration of chloroform, as with ether, could arise when the respiration failed.<sup>16</sup> Because *The Lancet* was critical of the report, the Nizam financed a second series of experiments in the presence of an observer appointed by *The Lancet* in the person of the respected physician Thomas L. Brunton (1844-1916). The report on this second series of experiments appeared in 1890 and reached the same conclusion as the first report. The Hyderabad conclusion was adopted by British anaesthetists of the time, such as Frederic W. Hewitt (1857-1916), who stated that it was the level of experience of the administrator that decided the outcome of general anaesthesia. This fit well with his striving for better training in the administration of anaesthetics.<sup>17</sup>

14 Lawrence, ‘Experiment and experience in anaesthesia’ (1992) 268.

15 Masson, ‘Edward Lawrie’ (1969) 1002-11.

16 Lawrie, ‘The Hyderabad Chloroform Commission’ (1889) 952-953.

17 Hewitt, ‘The Hyderabad Chloroform Commission’ (1890) 513.

### 2.3.2. The ether versus chloroform debate

In both Britain and Germany, early anaesthetic mortality statistics focussed on the use of ether or chloroform. The data were collected through voluntary reporting by major hospitals. In Britain W.R. Williams, specialty unknown, reported in *The Lancet* that the mortality rate was 1:1.236 for chloroform and 1:4.860 for ether.<sup>18</sup> Despite this critical note chloroform remained in use and the flow of case reports describing death under general anaesthesia went on in the general medical journals, with a marked peak from 1894 to 1896. In Germany Ernst Julius Gurlt (1825-1899), professor of surgery in Berlin and the editor of *Archiv für Klinische Chirurgie*, carried out six consecutive surveys of all anaesthetic-related deaths in German hospitals from 1891 to 1897 to identify risk factors. The statistical results were published in his journal and showed a mortality rate under general anaesthesia that was comparable to Britain: 1 in 2.075 for chloroform and 1 in 5.112 for ether.<sup>19</sup>

In Germany, Gurlt had advised the use of ether instead of chloroform in his second report in 1893. Gurlt's reports led to a fierce discussion between surgeons and gynaecologists from different notable German hospitals. Some preferred ether, some chloroform. In the end they agreed that both anaesthetics had their merits provided that they were used for the right indication and administered soundly.<sup>20</sup> The discussion about ether and chloroform had moved towards the conclusion that anaesthetics were only as safe as their administrators. In 1890 Arno Krüche (1854-1926), a German surgeon, had already stated that 'Beschaffung mindestens eines zuverlässigen Assistenten', charging of at least a reliable assistant, was one of the security measures for the administration of anaesthetics.<sup>21</sup> Safety rules for the administration of anaesthetics and chloroform in particular were formulated in hospitals. For instance in the Barmer Krankenhaus the surgeon L. Heusner (1843-1916) dictated: 'Der Chloroformirende soll keine anderen Hülfeleistungen bei der Operation übernehmen, sich auch nicht an Gesprächen beteiligen, sondern seine Aufmerksamkeit einzig und allein auf den Verlauf der Narkose richten, für welche er die Verantwortung mit zu tragen hat.'<sup>22</sup> An oracle from Bonn in the person of Oskar Friedrich Witzel (1856-1925), professor of surgery, ended the debate. He concluded that only well-trained doctors should administer anaesthetics. 'Auf Umsicht und Gewissenhaftigkeit bei der Anwendung eines der gebräuchlichen Mittel kommt es viel mehr an als auf die Wahl zwischen den verschiedenen chemischen Körpern, die sämtlich Gifte sein. Die Einleitung und Durchführung einer Narkose ist eine

18 Williams, 'Relative Safety of Anaesthetics' (1890) 317.

19 Gurlt, 'Zur Narkotisierungs-Statistik' (1891) 282-301; (1893) 55-113; (1893) 139-76; (1894) 223-74; (1896) 91-168; (1897) 473-519.

20 Tschmarke, 'Die bisherigen Erfahrungen bei Ethernarkosen' (1894) 79-81; 185-87.

21 Krüche, *Allgemeine Chirurgie und Operationslehre* (1890) 347.

22 'The administrator of chloroform must not take over any other assistance to the operation nor involve himself in conversations, but devote his attention only to the course of the anaesthesia, for which he is jointly responsible. 'Heusner, 'Regeln für die Anwendung des Chloroforms' (1891) 1121.

Kunstleistung, zu der nur ein tüchtiger Arzt fähig ist.<sup>23</sup> The use of chloroform diminished only slowly. For both patient and administrator it was too attractive an anaesthetic for the induction of general anaesthesia. In the meantime the mortality rate from general anaesthesia did not decrease. In 1909 Gustav Adolf Neuber (1850-1932), a surgeon in Kiel, reported that the mortality rate from chloroform administration in Germany was still 1:2.060 versus 1:5.930 for ether.<sup>24</sup>

In Britain the debate around ether and chloroform would be settled by the Report of the Anaesthetics Committee of the British Medical Association. Members of the committee were notable surgeons like Mr Hutchinson (1828-1913) and Mr Teale (1831-1923) and anaesthetists like Dr Dudley Wilmot Buxton (1855-1931) and his colleague Dr Hewitt. This committee had been appointed in 1891 'to investigate the clinical evidence with regard to the effects of anaesthetics upon the human subject; and especially the relative safety of the various anaesthetics, the best methods of administering them, and the best methods of restoring a patient in case of threatened death.'<sup>25</sup> Its conclusion was presented in July 1900 after 9 years of work and conformed to the conclusion of the chloroform committee of 1864 and the Hyderabad Commission in 1889 and was as simple as it was true. 'From the evidence before the Sub-Committee, they are convinced that by far the most important factor in the safe administration of anaesthetics is the experience which has been acquired by the administrator.' In other words and once again, the safety of general anaesthesia depended on more than a safe anaesthetic. The report of the Anaesthetics Committee in Britain was considered important enough to be referred to in the *Berliner Klinische Wochenschrift* on January 13<sup>th</sup> 1902.

Both in Britain and Germany, with or without a committee, the conclusion had been the same. Anaesthetics were only as safe as their administrator. His experience and training level would become decisive in the development of safer general anaesthesia. It meant that the administration of anaesthetics became a 'special thing', a defined subject that would be taught in the medical curriculum to every student.

### 2.3.3. The fate of chloroform

With attention shifted to the administrator of the anaesthetic, chloroform remained in use on both sides of the Channel. Even the definitive demonstration in 1911 by Alfred G. Levy (1866-1954) of its cardiotoxicity by the sensitization of the myocardium to fibrillation did not change the daily use of chloroform.<sup>26</sup> The present study too shows that of 100 operations in Moabit Krankenhaus in 1910, most of them appendectomies and skin incisions, 32 were performed under chloroform general anaesthesia, 21 under

23 'What really matters is the caution and accuracy during the administration of the usual anaesthetics instead of the choice between the various chemical substances, which are all poisons. The induction and maintenance of an anaesthesia is an art, for which only a dexterous doctor is capable.' Witzel, 'Anwendung der Narkose' (1894) 605-607; 631-634.

24 Neuber, 'Über Inhalationsnarkose' (1909) 1116.

25 British Medical Association, *Report of the Anaesthetics Committee* (1900) 123.

26 Levy, 'Sudden death' (1911) 3-7.

ether and 20 were performed under a mix of both anaesthetics. In the Charité Krankenhaus in 1912 more than half of the surgeries were performed under chloroform general anaesthesia, often in combination with ether and alcohol. In Germany this combination was known as the 'Billroth Mischung', Billroth mixture, after its descriptor Christian A.T. Billroth (1829-1894), a surgeon in Vienna. Similar operation registers in Britain, for instance from the Withington (Workhouse) Hospital in Manchester, show that at least until 1920 the same kind of surgery was performed with the same kind of anaesthetics, ether and chloroform. In more than half of the cases chloroform was used in combination with ether. In Britain this mixture was abbreviated as ACE (Alcohol, Chloroform, and Ether). In the following chapters it will be shown that chloroform was kept in use on both sides of the Channel up to the 1930s. The Scunthorpe and District Memorial Hospital in Grimsby in England kept ethylchloride, the older volatile alternative for chloroform, in use until after the Second World War.

The question of what finally sealed the fate of chloroform remains. The mortality statistics by Sykes, an anaesthetist from Leeds known for his triptych on the history of anaesthesia, suggest that chloroform steadily decreased in use and underwent a slow death in 1950. Christopher Lawrence, Wellcome Professor of the History of Medicine, suggested that chloroform was replaced by halothane in the 1950s.<sup>27</sup> Both were wrong. The figures by Sykes were mortality statistics and had nothing to do with the absolute use of chloroform. In fact the use of chloroform decreased sharply in the 1930s when intravenous barbiturates became available as induction agents. In some hospitals studied this happened some years earlier when the volatile anaesthetic ethylchloride came into use as an induction agent. The replacement of chloroform by ethylchloride and barbiturates was shown earlier by the German anaesthetist Juergen Wawersik who reported on two hospitals in Germany.<sup>28</sup> This suggests that chloroform, at least after the Great War, was used as an induction agent. Most likely chloroform had always had this role. The existence of the ACE and Billroth mixture confirm this statement. Ether was the safe anaesthetic for maintenance but it was an unpleasant agent to use to put the patient to sleep because of its smell. Chloroform acted more smoothly and was preferred as an induction agent until intravenous induction with barbiturates became possible.

#### 2.4. The administration of anaesthetics

The conclusion was that anaesthetics were only as safe as their administrator. This administrator had to handle the choice of anaesthetic, the dosing and the technique of its administration. The essence of the administration of anaesthetics or Narkose had

<sup>27</sup> Sykes, 'Anaesthetic deaths' (1961) 32-33. Lawrence, 'Experiment and experience in anaesthesia' (1992) 288.

<sup>28</sup> Wawersik, 'Die Geschichte der Chloroformnarkose' (1997) 152.



from its discovery been the open technique by which the patient spontaneously breathes ambient air with a vaporized anaesthetic added. Ether or chloroform was dribbled on the cotton or wool padding of a mask or via more sophisticated systems with remote inhalers and tubing. These administration systems were the same in Britain and Germany and were kept in use for a long time, even until after the Second World War as will be shown in the following chapters. For this open technique of administration of anaesthetics a free and unobstructed airway was essential and was also the biggest concern, for two reasons. First, the patient needed a free airway to breathe air and to oxygenate his blood. Second, the inspired air was the carrier of the anaesthetic vapour. The amount of vaporized anaesthetic that reached the patient's lungs, blood and hence his brain depended on the spontaneous respiratory volume of the patient and the amount of anaesthetic dribbled on the mask. Control over the airway was synonymous with control over the general anaesthesia.

Control over the airway and the dosage of anaesthetic were in jeopardy in the several stages of general anaesthesia that were described by Snow.<sup>29</sup> First, during the excitation phase of the induction of general anaesthesia, often accompanied by a spasm of the jaw musculature and the vocal cords, the flow of air could be reduced heavily. The accompanying reduced input of anaesthetic vapour meant that the general anaesthesia could not deepen and the patient could not pass from the excitation stage into the surgical stage. A kind of vicious circle could develop, with life-threatening hypoxemia for the patient. When this first critical moment had passed and the patient entered the surgical stage of inhalational anaesthesia the art was to keep the patient in that stage. Administering too little anaesthetic would bring the patient back into the excitation stage. Administering too much anaesthetic would deepen the general anaesthesia dangerously close to the toxic stage in which respiratory and circulatory regulation would fail. In this stage the obstruction of the airway by the relaxation and sagging of the tongue into the pharyngeal space could produce cyanosis and lead to death within minutes. Actually all innovations in anaesthetic administration can be regarded as attempts to safeguard a free airway and to precisely gauge the dose of inhaled anaesthetic.

#### 2.4.1. The free airway

For all this trouble the pages and chapters on general anaesthesia in the medical textbooks and surgical instrument catalogues in both countries towards the end of the 19<sup>th</sup> century were dominated, in addition to threaded masks, drop bottles and simple inhalers, by manoeuvres that were sometimes patient-unfriendly, oral airways, mouth gags and tongue forceps to open the airway by force and pull out the obstructing tongue (Figure 1-4). Every individual specialist in the field of anaesthesia had his own manoeuvre

<sup>29</sup> Snow, *The vapour of ether* (1847) 1.

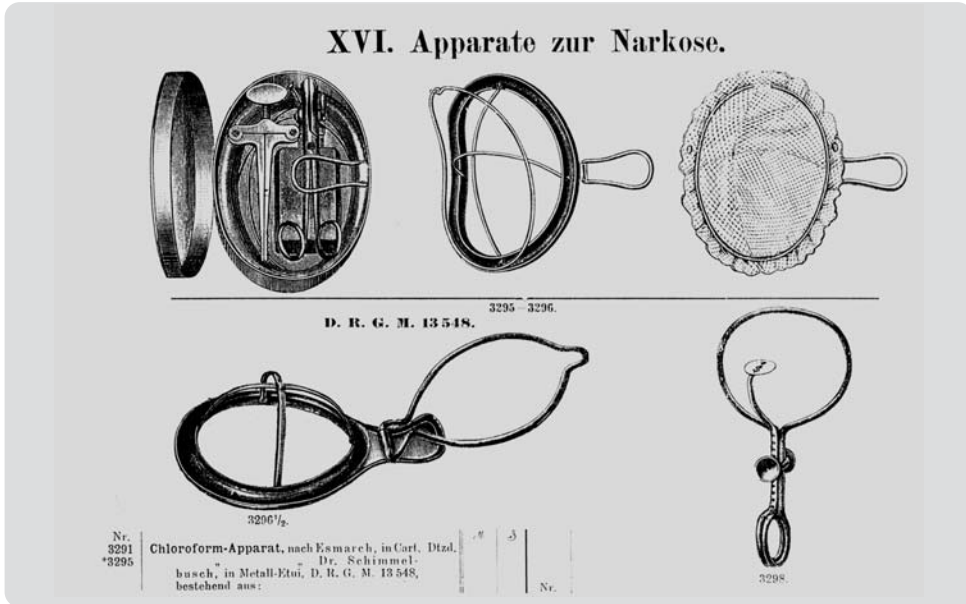


Figure 1. Instruments for the administration of anaesthetics. Aktiengesellschaft für Feinmechanik, *Erster illustrierter Nachtrag zum Haupt-Kataloge No. 5.* (1901). At that time steel, sometimes wrapped with rags, was the main raw material for these instruments.



Figure 2. Manoeuvre according to Heiberg to free the airway by lifting the lower jaw. From *Handbuch der Anaesthesie* by Dumont 1903. Actually this manoeuvre had already been described and depicted by F. von Eschmarch in *Regeln für die Chloroformnarkose* (1884) 3. Note the position of the lower teeth in front of the upper teeth.

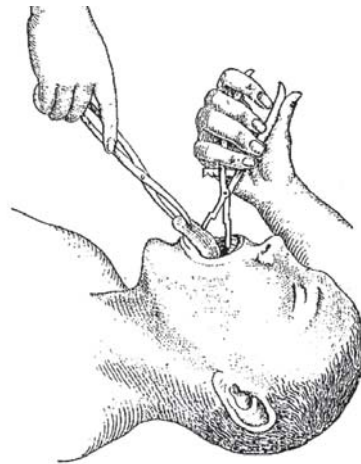


Figure 3. Opening of the mouth and pulling out of the tongue by force to create a free airway. *Lehrbuch der allgemeinen Chirurgie.* Tillmanns 1907.

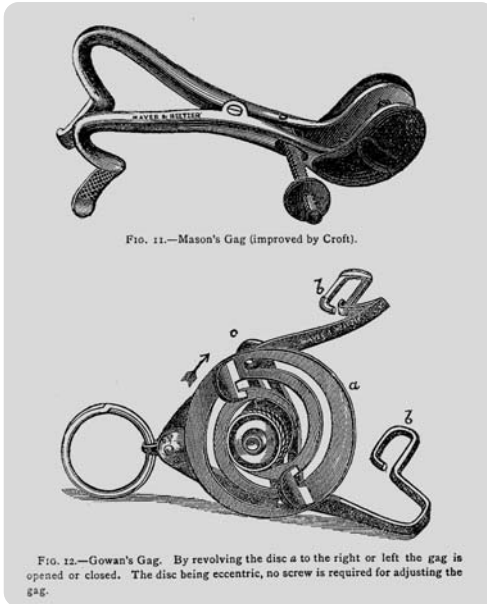


Figure 4. Mouth gags for jaw distraction in case of lockjaw. Taken from Buxton, *Anaesthetics* (1900).

and his own design for a device produced by one or more instrument makers. This was typical of the one-to-one relationship of individual specialists with the instruments industry.<sup>30</sup>

#### *Early upper airway devices*

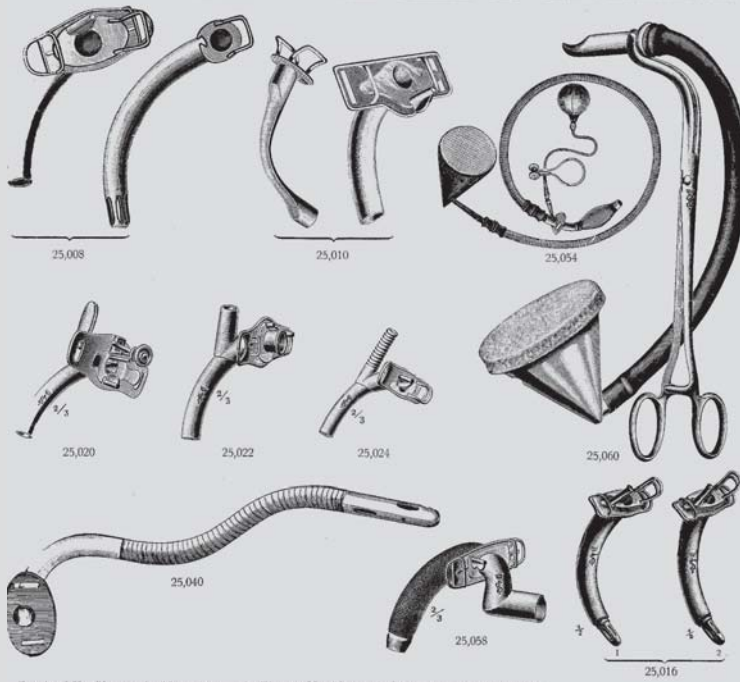
Airway obstruction problems existed in medicine long before the introduction of inhalational anaesthesia. They were connected with trauma of the neck, inflammatory processes of the larynx like diphtheria and resuscitation after drowning. For centuries the gold standard to control the airway in those cases had been the tracheotomy. Descriptions of this surgical procedure date to before the beginning of the Christian era. In 1869 Friedrich Trendelenburg (1844-1924), a leading German surgeon at the end of the 19<sup>th</sup>

30 Windler, *Preiscurant chirurgische Instrumente* (1880), article 1609-1616. Buxton, *Anaesthetics* (1892) 47-51; (1900) 78-79, 190-191. Jetter, *Illustriertes Musterbuch* (1895) 93. Tillmans, *Allgemeinen und speziellen Chirurgie* (1895) 27-28. Aktiengesellschaft, *Zweiter Nachtrag zum Haupt-Katalog* (1900) 488. Mayer, *Illustrated Catalogue* (1900) 29-43. Down, *Catalogue of surgical instruments* (1900) 828-847. Rose, *A Manual of Surgery* (1900) 1163. Windler, *Haupt-Preisliste chirurgische Instrumente* (1900) 237-238. Allen, *Catalogue of surgical instruments* (1901) 151-163; (1910) 229-271. Weiss, *Catalogue of surgical instruments* (1901) 247-250. Müller, *Narkologie*. (1903) 215-218. Dumont, *Allgemeine und lokale Anaesthetie* (1903) 14-17. Arnold, *Catalogue of surgical instruments* (1904) 625-646. Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1906) 22. Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 59-62. Wendschuch, *Haupt-Katalog* (1910) 67.

**XXVI. Instrumente für Tracheotomie und Intubation.**

25,008-25,066

355



- Tracheal-Kanüle, nach *Hagedorn*, mit Einsatz-Kanüle und Obturator von Neusilber
- do. » » » » » Silber
- do. » *Parker*, » » » von Neusilber
- do. » » » » » Silber
- do. » *Biddert*, von Neusilber, stark und schwach gebogen, Fig. 1 und 2
- do. » » Silber, » » » » » 1 » 2
- do. » *Störk*, für Larynxstenosen, von Silber
- do. » *Wegener*, für Larynxstenosen, von Silber
- do. » *Schimmelbusch*, für Larynxstenosen, von Silber
- do. » *Koenig*, elastisch, von Neusilber
- do. » » » Silber, No. 2 =  $5\frac{1}{3}$  mm
- do. » » » » » 3 =  $6\frac{1}{3}$  »
- do. » » » » » 4 = 7 »
- do. » » » » » 5 =  $7\frac{1}{3}$  »
- do. » » » » » 6 =  $8\frac{1}{2}$  »

Tampon-Kanüle, nach *Trendelenburg*, von Silber, zur Verwendung bei Operationen am Kehlkopf und Mund, um das Eindringen von Blut in die Trachea zu verhindern und das Chloroformieren zu gestatten  
 Pressschwamm-Kanüle, nach *Eugen Hahn*, von Silber, komplett mit Chloroform-Apparat, zu demselben Zweck  
 Chloroform-Apparat, nach *Doyen*, mit Einführungszange, zur direkten Anaesthetie unter Vermeidung des Eindringens von Blut in die Luftwege  
 Bürstchen zum Reinigen der Kanülen

Figure 5. Apparat nach Doyen, top right (25,060), offered by the Aktiengesellschaft für Feinmechanik vormals Jetter & Scheerer, *Illustriertes Musterbuch über Chirurgie-Instrumente* (1904) 355. The Doyen apparatus was a modification of the O'Dwyer cannula that enabled the administration of anaesthetics directly into the trachea.

century, combined the tracheotomy with a device to administer anaesthetics.<sup>31</sup> The material of the standard artificial airway through the tracheotomy was steel, as it was for all other surgical and anaesthetic devices.<sup>32</sup> This application of anaesthetics through a tracheotomy did not become routine. In anaesthetic practice tracheotomy was applied only prophylactically when airway problems were anticipated during oral surgery or because of the risk of aspiration of the stomach contents.<sup>33</sup>

Tracheal intubation via the oral route with soft rubber urinary or stomach catheters had been known since 1800 from experiments in France and Italy.<sup>34</sup> The range of indications for this intervention included inflammatory processes around the larynx and resuscitation after drowning. From the middle of the 19<sup>th</sup> century respiratory insufficiency during the administration of inhalational anaesthetics was added to this list. But in all cases the flabby catheters were merely a temporary resuscitative solution.

The only longer lasting solution to safeguard the patient's airway was the tracheotomy.<sup>35</sup> In 1878 the Scottish surgeon William Macewen (1848-1924) designed the steel 'Macewen tube' with a jointed middle part. He used the tube for elective peroral intubation during oral surgery and in the treatment of upper airway obstruction by oedema. There were several designs for the device. A short one was meant only to plug the larynx, treating obstruction; a longer one could be connected to an anaesthetic administration system.<sup>36</sup> Down Brothers in London was the only firm to offer the tube for sale. Remarkably this was the rubber variant or 'Macewen's elastic gum trachea tube', available in 6 sizes in 1900.<sup>37</sup> This is remarkable because the standard material for tracheal devices up to then had been steel.

The most common peroral device for treating laryngeal obstruction was the O'Dwyer cannula, a short rigid steel tube that was plugged into the larynx as a stent. John O'Dwyer (1841-1898), an American physician, designed the cannula in 1882 for diphtheria patients. The O'Dwyer cannula was sold as an intubation system with other instruments for 'ear, nose and throat' pathology. Around 1900 it was the most available peroral endotracheal device on the market. It existed in many sizes including paediatric.<sup>38</sup> Indications were

31 Trendelenburg, 'Operationen an den Luftwegen' (1871) 112-133.

32 Allen, *Catalogue of surgical instruments* (1901) 330-334; (1905) 330-334; (1910) 353-356.

33 Hewitt, *Anaesthetics* (1893) 41, 84; (1901) 199-200; (1907) 257-258; (1912) 259-260. Rose, *A Manual of Surgery* (1900) 1163. Müller, *Narkologie* (1903) 169. Tillmanns, *Allgemeinen und speziellen Chirurgie* (1907) 56. Bergmann von, *Chirurgie des Halses* (1907) 254. Boyle, *Practical Anaesthetics* (1907) 13-14; (1911) 10.

34 Waters, 'Endotracheal Anesthesia' (1933) 196.

35 Hewitt, *Anaesthetics* (1893) 293. Buxton, *Anaesthetics* (1900) 267; (1907) 348; (1914) 394; (1920) 438. Müller, *Narkologie* (1903) 175.

36 Brandt, '100 Jahre Intubationsnarkose' (1983) 203.

37 Down, *Catalogue of surgical instruments* (1900) 262.

38 Mayer, *Illustrated catalogue* (1900) 202-203. Down, *Catalogue of surgical instruments* (1900) 262-264; (1901) 262-264. Allen, *Catalogue of surgical instruments* (1901) 336; (1905) 336; (1910) 348. Gardner, *Catalogue of Surgical instruments* (1901) 145. Arnold, *Catalogue of surgical instruments* (1904) 471-472. Burrows, *Surgical instruments* (1910) 34-35. Surgical Manufacturing, *Catalogue*

pseudomembranous laryngitis in the course of diphtheria, other inflammations in or around the larynx, and drowning, but also laryngeal spasm during the administration of volatile anaesthetics.<sup>39</sup>

However, the O'Dwyer cannula itself had no place in the administration of anaesthetics. In the British anaesthetic textbooks the O'Dwyer cannula is never mentioned. In Germany only some anaesthetic modifications of the O'Dwyer cannula were mentioned. They were the Schlechtendahl cannula and the Doyen apparatus which was a cross of the O'Dwyer cannula and the Trendelenburg cannula (Figure 5).<sup>40</sup> The description of these cannulas often mentioned the risk of damage to the larynx because of their steel construction.

### *Kuhn's tube*

The extent to which all of the above-mentioned devices were used in general anaesthesia was limited in both countries. In the operation registers investigated only the tracheotomy is mentioned a few times. Probably all devices had their limitations. One of them was the inflexible steel construction of the devices, potentially damaging to the airways.

These limitations were more or less resolved when in 1905 the German surgeon Franz Kuhn, working in Kassel, developed a ringed metal tube derived from endoscopic instrumentation and a König tracheotomy cannula (Figure 6). It was introduced into the trachea, guided by a finger, and hooked behind the epiglottis. An important aspect of its design was the large flexible part that entered the trachea. Indications were control over the airway during oral surgery, 'Pressnarkose', insufficient general anaesthesia with the patient straining and hampering abdominal surgery, the application of overpressure general anaesthesia<sup>41</sup> and asphyxia in the course of diphtheria.<sup>42</sup>

At first this technique was welcomed as an effective way to overcome airway problems during general anaesthesia. Wilhelm Benno Müller, a German surgeon and gynaecologist, paid attention to it in the second edition of his (unique at the time) German-language textbook *Narkologie* in 1908. Direct application of the anaesthetic into the lung was considered to be the main advantage. It meant that smaller amounts of anaesthetic were needed and that the level of general anaesthesia was more controllable.<sup>43</sup> Other German

*of Surgical Instruments* (1910) 160. Woolley, *Catalogue of surgeon's instruments* (1910) 190. Medicinisches Waarenhaus, *Katalog* (1900): 48; *Chirurgie-Instrumente* (1906) 74; (1910) 195-196. Fischer, *Die technische Hilfsmittel des Mediziners* (1900) 127. Aktiengesellschaft, *Erster illustrierter Nachtrag zum Hauptkatalog* (1900) 404-407; *Illustriertes Musterbuch* (1904) 361-362. Pfau, *Spezial-Preisliste* (1905) 209-216. Maw, *Catalogue of Surgical Instruments* (1905) 133.

39 Tillmanns, *Allgemeinen und speziellen Chirurgie* (1907) 38. Bergmann von, *Chirurgie des Halses* (1907) 184. Wullstein, *Lehrbuch der Chirurgie* (1912) 450; (1931) 357. Bockenheimer, *Allgemeine Chirurgie* (1914) 299. Rose, *A Manual of Surgery* (1898) 777-778; (1900) 811; (1902) 853-854; (1905) 921-922; (1911) 927-928.

40 Müller, *Narkologie* (1908) 312.

41 Kuhn, 'Die perorale Intubation' (1905) 467-520.

42 Kuhn, *Die Perorale Intubation* (1911).

43 Müller, *Narkologie* (1908) 312.

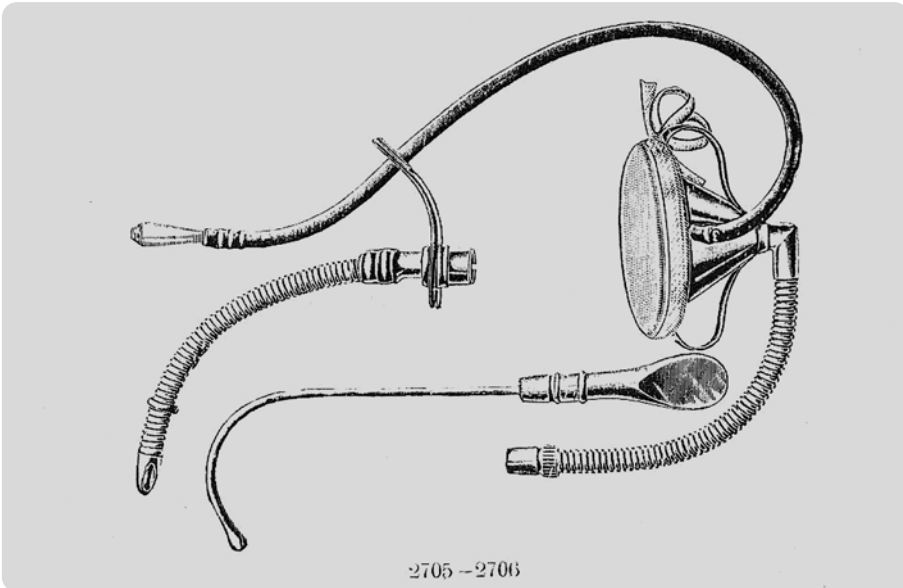


Figure 6. Kuhn tube offered by Pfau, *Katalog über Instrumente für Ohr.Nase. Hals* (1905) 191. The Kuhn tube was the first flexible endotracheal device, although still manufactured from steel.

surgeons like Hermann Tillmanns (1844-1927) from Leipzig, author of the influential line of *Lehrbuch der allgemeinen und speziellen Chirurgie*, also mentioned it as a ‘besondere Form der Narkose’, a significant form of general anaesthesia.<sup>44</sup> But gradually criticism grew. In 1913 Max von Brunn, professor of surgery in Tübingen who lived from 1875-1924, published *Die Allgemeinnarkose*. He was the first to be critical of the steel tube, especially because he had witnessed an instance when Kuhn himself could not manage to introduce the tube in a deeply anaesthetized patient.<sup>45</sup> Due to this complexity and to the difficulty introducing it in the airway Kuhn’s tube never became established. German authors after the Great War still mentioned it in their textbooks in treatment of diphtheria, but for anaesthetic application it was considered to be too difficult.<sup>46</sup> Sauerbruch dedicated three pages to the Kuhn tube including the method of introduction and its advantages during facial and airway surgery. However, ‘trotz dieser Vorzüge hat die Kuhnsche Tubage sich aber auch nicht wegen ihre Umständlichkeit einbürgern können.’<sup>47</sup> In the 1935 edition of Garrè’s *Lehrbuch der Chirurgie*, by that time continued by Borchard and Stich,

44 Tillmanns, *Allgemeinen und speziellen Chirurgie* (1907) 38. Wullstein, *Lehrbuch der Chirurgie* (1912) 13. Bockenheimer, *Allgemeine Chirurgie* (1914) 47.

45 Brunn von, *Die Allgemeinnarkose* (1913) 27-31.

46 Garrè, *Lehrbuch der Chirurgie* (1923) 166; (1935) 185; (1942) 200. Lexer, *Lehrbuch der allgemeinen Chirurgie* (1920) 100; (1922) 103; (1928) 98.

47 ‘...despite these advantages the intubation according to Kuhn has not been established due to its complexity.’ Sauerbruch, *Chirurgische Operationslehre* (1933) 40-41.

the technique was considered too difficult for general practice and for this reason not discussed at all.<sup>48</sup> In the 1930s better and simpler techniques were available as will be shown in the following chapters.

Unlike earlier steel airway devices such as the O'Dwyer cannula that were only offered in British and German instrument catalogues in the sections on intubation, laryngotomy and tracheotomy, the Kuhn tube was also offered in the section on anaesthetic equipment. It seems to have been relatively expensive. It cost between 17 and 80 German marks, depending on the number and diversity of the tubes, in child sizes for lip repair or consisting of different sizes and styles.<sup>49</sup> The Kuhn tube was also offered in Britain. Down Brothers charged \$20.65 in Canada, Mayer & Phelps charged 3£ 7s. 6d.<sup>50</sup> The design of the Kuhn tube was never changed; it was offered for the last time in 1935 by Down brothers.

The operation registers under study from both countries reveal only an infrequent use of Kuhn's endotracheal intubation. It was mentioned only a few times. It had not been as glorious as Kuhn had thought and hoped. The concept was brilliant, the design beautiful but the material was unsuitable for intratracheal use.

#### *The limitations of steel devices*

Steel was very convenient for surgical instruments because steel products were easy to sterilize. Steel tools were provided by the surgical instrument makers who in fact were specialized cutlers. During the 18<sup>th</sup> and 19<sup>th</sup> centuries as the processing of steel was refined, the manufacturers of nails, knives and domestic cutlery began making surgical instruments as a side product. This cutlery industry originated in an area in southwest Germany and the northern part of Switzerland. This location was due to the local availability of bean-iron ore, a raw material for the production of iron and steel. Aesculap, an instrument maker which will be mentioned often in this book, started its production in this area in Tuttlingen. Even Charrière, the famous instrument maker in the first half of the 19<sup>th</sup> century in Paris, came from a family of cutlers in this area, in Fribourg, Switzerland. The oldest instrument maker in London, John Weiss, had also emigrated from Germany in 1787. In its shop window in the Strand in London it was clear to see that surgical instrument makers had originally been cutlers. (Figure 7)

For anaesthetic tools, which had to be pliable and strong at the same time, steel was less suitable. The steel construction of all of the administrator's primary tools limited his ability to maintain an airtight fit of the administration system to the patient's face. This meant that a leak-proof, controlled administration of anaesthetics was impossible. For this reason during the first years of inhalational anaesthesia natural raw materials, such

48 Garrè, *Lehrbuch der Chirurgie* (1935) 21.

49 Pfau, *Katalog* (1908) 191. Medicinisch Polytechnische Union, *Neues Instrumentarium zur peroralen Intubation* (1905) 16. A pamphlet for the Kuhn tube, comprising the medical indications, the application instructions and the possible complications. Fischer, *Gesamtes Instrumentarium* (1908) 64. Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 63. Evens, *Chirurgie-Instrumente* (1925) 215. Medicinisches Waarenhaus, *Katalog A Instrumentarium* (1930) 3-6.

50 Allen, *Surgical Equipment* (1930) 877. Down, *Catalogue of surgical instruments* (1929) 1367; (1935) 1367. Mayer, *Catalogue of surgical instruments* (1931) 501.



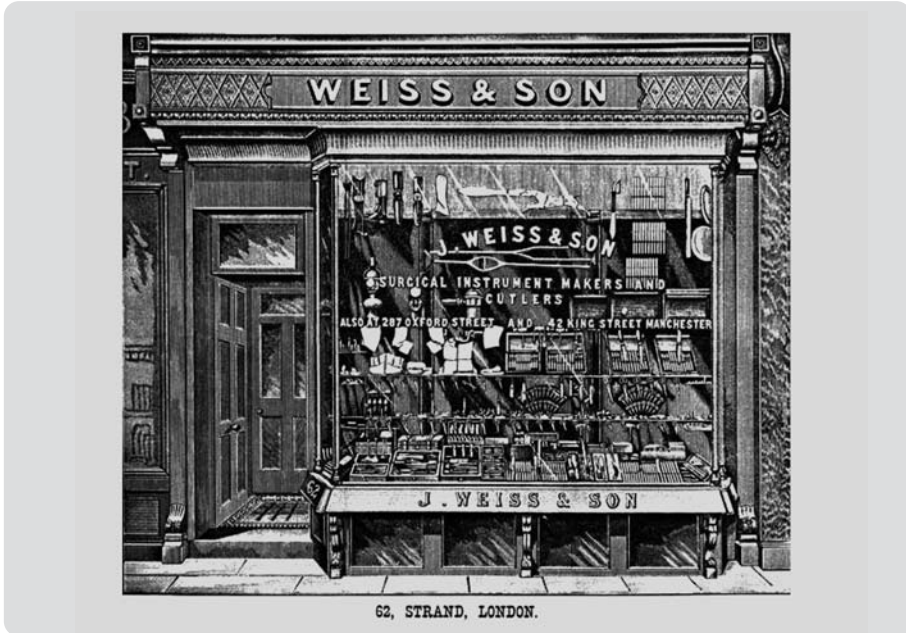


Figure 7. Shop window of John Weiss and Sons in London at Strand 62. Available at <http://www.johnweiss.com/images/History.pdf> in 2009. Note the combination of cutlery and surgical instruments.

as animal stomach, pyloric sphincter and oesophagus had been used as inhalers.<sup>51</sup> The main devices however were steel masks combined with towels and rags to prevent air and anaesthetic leakage. An important improvement to the troublesome and leaking administration of anaesthetics had been the introduction of rubber fittings for airtight facemasks and pressurized air and gas flows as propellants for volatile anaesthetics in the 1880s. They made a more precise dosing of the inhaled anaesthetic possible, but also brought about more complex apparatus. The rubber cuffed masks were still provided by the regular instrument makers but for the pressurized gases a new branch, the compressors, entered the anaesthetic market.

#### 2.4.2. Working with flows and pressure differences

The start of the 20<sup>th</sup> century saw a turning point in the administration of anaesthetics and an advanced technique for controlling respiration and the dosing of the anaesthetic in the application of airflows and pressure differences in and around the airway during general anaesthesia and surgery. It came into use when industrial means of creating pressure differences and flows by pumps and compressed gases became available for medical use.

<sup>51</sup> Emmert, *Lehrbuch der Chirurgie* (1850) 159.

### *The anaesthetic apparatus*

It was on July 1<sup>st</sup> 1868 that George Barth, a London industrialist, first produced compressed nitrous oxide for dental general anaesthesia on a commercial scale.<sup>52</sup> In August of the same year Coxeter & Son, another London industrialist, followed suit and added a face piece, bag and tubing for the administration of nitrous oxide. The face piece designed by Joseph Thomas Clover (1825-1882), chloroformist to University College Hospital and leading anaesthetist in London after the death of Snow, had modelled this system. It entered the general anaesthetic practice circa 1890. Prototypes of pressurized pure nitrous oxide administration systems were described by Hewitt and Buxton.<sup>53</sup> The combination of compressed oxygen and nitrous oxide as a propellant for an ether and chloroform vaporizer was the start of a line of anaesthetic apparatus on both sides of the Channel that continues into the 21<sup>st</sup> century and is still the core instrument of anaesthetic practice (Figure 8).<sup>54</sup>

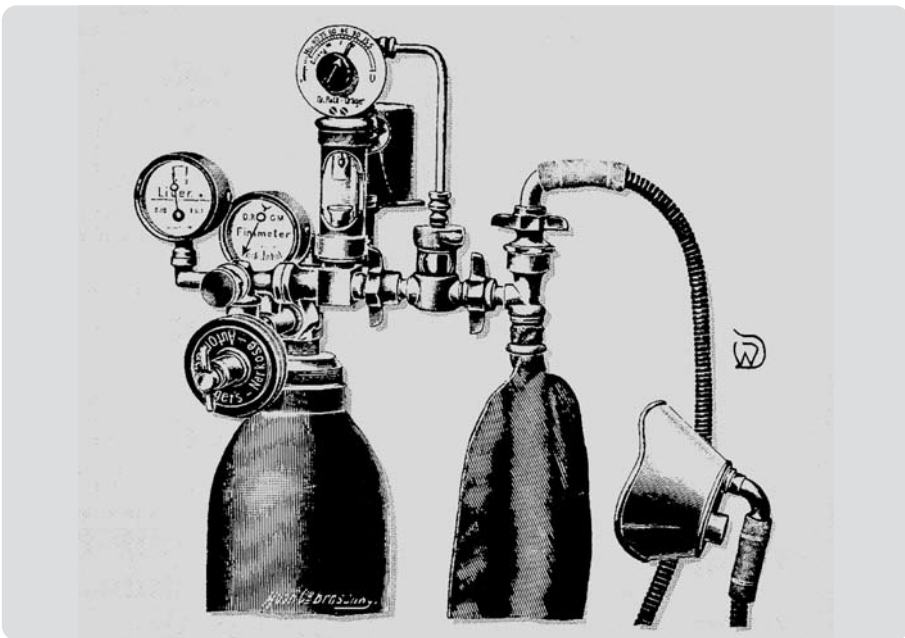


Figure 8. Dräger Narkoseapparat 1902. *Die Geschichte der Dräger-Narkoseapparate* (1970) 14. Chloroform could be accurately dosed into a flow of oxygen.

52 Duncum, *The Development of Inhalation Anaesthesia* (1947) 290.

53 Hewitt, *Administration of nitrous oxide* (1888) 15.

54 Tillmans, *Allgemeinen und speziellen Chirurgie* (1907) 64. Brady, *Catalogue of surgical instruments* (1908) 35. Haertel, *Überdruck-Narkoseapparat* (1910). Wendschuch, *Haupt-Katalog* (1910) 198. Hatrick, *Physicians' and Surgeons' supplies* (1911) 117. Windler, *Haupt-Katalog. Chirurgie-Instrumente* (1912) 630-632. Gardner, *Catalogue of Surgical instruments* (1913) 775. Luke, *Anaesthesia in dental surgery* (1919) 50, 53; (1924) 55, 60. Medicinisches Waarenhaus, *Aerztliche Instrumente* (1924) 34. Windler, *Chirurgie, Gynäkologie, Orthopädie* (1930) 135-136.

*Sauerbruch's underpressure cabinet.*

A rather unique but also illustrative application of pressure difference was developed in Germany. In 1900 Johannes von Mikulicz-Radecki (1850-1905), a surgeon educated by Billroth and working in Wroclaw (Breslau) ordered his pupil Sauerbruch to find a solution for the collapse of the lung during open thoracotomy. Both expected that if the pressure within the lung remained higher than outside the lung, the lungs would remain expanded and as a consequence the respiratory function would be preserved. For this purpose Sauerbruch developed an underpressure operating cabinet in 1904. A pump drew air out of the cabinet to an 8 mmHg subatmospheric pressure. Because the head of the patient was kept outside the cabinet atmospheric pressure was maintained in the lungs. While this pressure difference kept the lungs expanded, the patient could breathe (they thought) and the surgeon could perform his intrathoracic operation (Figure 9). The first operation by Mikulicz in the underpressure cabinet was a resection of a malignancy in the lower oesophagus. The patient died during the procedure. Later operations included lung surgery and surgery in the mediastinum.<sup>55</sup> Sauerbruch adopted the underpressure cabinet as his trademark. He gave lectures on it in the US and cabinets were built in

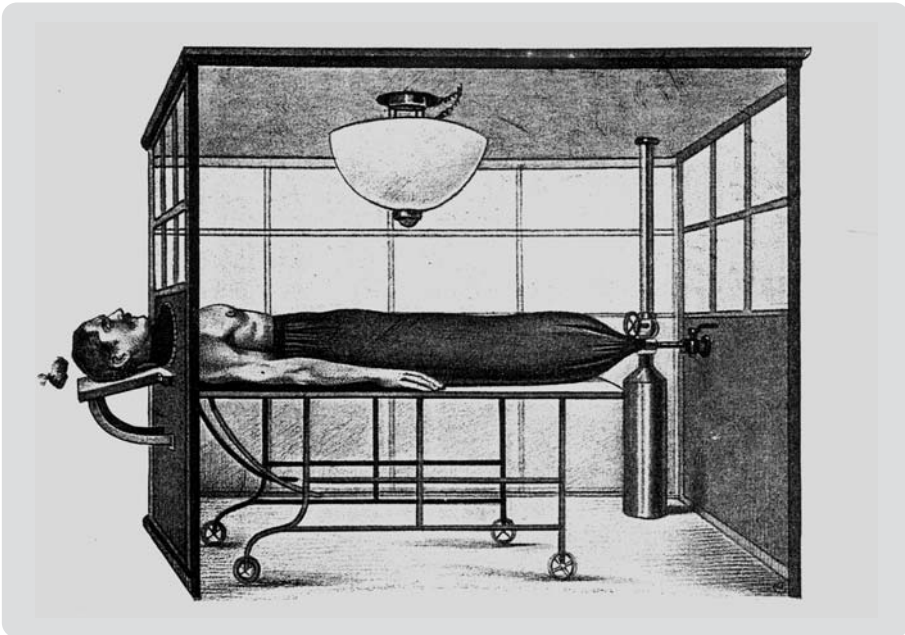


Figure 9. Underpressure cabinet by Sauerbruch, *Chirurgische Operationslehre* (1934) 441. The head of the patient was placed outside the cabinet to maintain atmospheric pressure within the lungs. The artificial subatmospheric pressure in the cabinet prevented the collapse of the lung when the chest was opened.

<sup>55</sup> Sauerbruch, *Das war mein Leben* (1951) 71-108.

<sup>56</sup> *Ibid* 174, 310.

hospitals in Zürich and Munich where he was appointed to perform surgery in his cabinet.<sup>56</sup> Sauerbruch considered his underpressure cabinet less detrimental to the circulation than overpressure in the airways. The current knowledge of physiology backed him up in this respect. The idea had been innovative; the technical realization however was too complicated for the patient and for the doctor. The installation was not portable and it was very expensive and highly susceptible to technical failure. In Britain the same point of view was taken in 1914 by William Rose, surgeon at King's College Hospital in London, in his *Manual of Surgery*.<sup>57</sup>

Sauerbruch's cabinet never advanced beyond its maiden years and was never used in daily practice except by Sauerbruch himself. This position is supported by the findings in instrument catalogues and operation registers. Although surgical instrument wholesalers offered complete operation room interiors they never offered the underpressure chamber developed by Sauerbruch. It had to be built on the spot. The operation registers under study also never mentioned the use of an underpressure cabinet. In later years German surgeons mentioned the Sauerbruch cabinet as an important invention but one that was too complex.<sup>58</sup> It must not be forgotten that in the meantime alternatives that were simpler and easier to use were at hand.

#### *Overpressure anaesthetic apparatus*

The reverse of the underpressure chamber was the overpressure case. The head of the patient, with an anaesthetic mask, was placed in this case and the hands of the anaesthetist worked in it while an overpressure was maintained. The net effect of keeping the lung expanded was supposed to be the same as with the underpressure chamber in which the open thorax was placed in an underpressure chamber. The Dräger Company, a leading German firm for the use of compressed gases offered such an overpressure cabinet in 1906.<sup>59</sup> The Medicinisches Waarenhaus was one of the German wholesale companies that sold these overpressure cases.<sup>60</sup> These cases were not offered in British catalogues (Figure 10).

A step further was the creation of overpressure in the anaesthetic administration system itself. If airflow was continually applied to the airways a kind of overpressure or Continuous Positive Airway Pressure, CPAP as it is now known, developed. This was applied especially during the more difficult general anaesthesia for intrathoracic and intra-abdominal surgery. CPAP could in a way prohibit the collapse of the lung and paradoxical breathing during open thoracic surgery. In 1905 Kuhn described this overpressure general anaesthesia technique in combination with his previously mentioned peroral intubation. He advocated it as the alternative or reversed equivalent of Sauerbruch's underpressure chamber. Without endotracheal intubation the essential requirement for this reversed

57 Rose, *A Manual of Surgery* (1914) 925.

58 Killian, *Narkose zu operativen zwecken* (1934) 346.

59 Dräger, *Die Geschichte der Dräger-Narkoseapparate* (1970) 22-3.

60 Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 65-67.

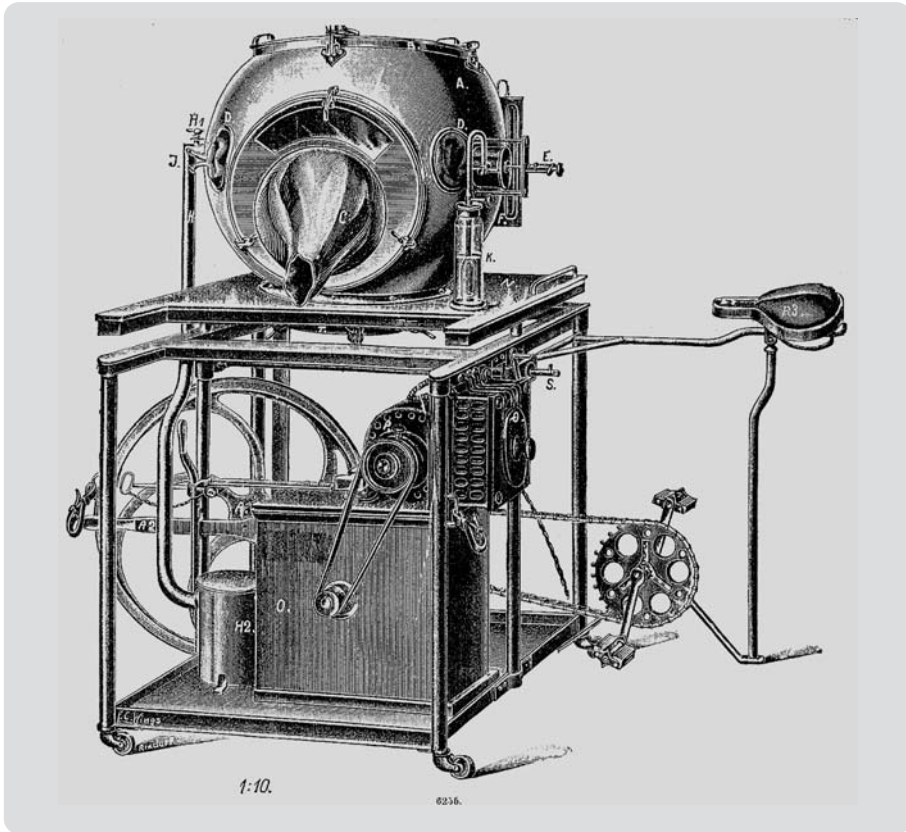


Figure 10. Overpressure case offered by Medicinisches Waarenhaus, *Haupt-Katalog nr. 33* (1910) 67. The head of the patient was placed inside a case like a diving bell. Powered by human bicycling, a super atmospheric pressure was created in the bell and hence in the patient's lung thus preventing lung collapse during open chest surgery.

Sauerbruch technique was, in addition to pressurized air, oxygen and/or nitrous oxide, the airtight fit of the anaesthetic mask to the face of the patient and a rubber balloon, integrated in the breathing circuit, in which the pressure could be maintained. A detailed description of a 'Narkose- und Überdrucknarkose-Apparat', general anaesthesia and overpressure apparatus, was developed in 1910 by Tiegel and Henle, whose design was manufactured by Georg Haertel in Breslau and Berlin. The catalogue even includes a recommendation from Professor Sauerbruch.<sup>61</sup> The apparatus would have a long life. In the issues of the German journal for anaesthesia, *Narkose und Anaesthesie*, in 1929 and 1930 the same overpressure apparatus and a 'Sauerstoff-Überdruck-Narkose-Apparat', oxygen-overpressure-anaesthetic-apparatus, were advertised. As a recommendation it was again

<sup>61</sup> Haertel, *Überdruck-Narkoseapparat* (1910).

mentioned that the apparatus had been used in Sauerbruch's clinic. They were offered by Windler and Georg Haertel in Berlin and by G. Stiefenhofer in Munich.<sup>62</sup>

### *A new industry*

The acceptance of compressed gases for the administration of anaesthetics in Britain as well as in Germany brought about an important switch in the relation between administrators of anaesthetics and industry. Innovations in the anaesthetic armamentarium could no longer be manufactured in a hospital's workshop or by the local instrument maker. The mixed chemical and physical production of nitrous oxide and oxygen, the compression of gases into cylinders and the manufacturing of pressure-reducing valves required specialized plants. The number of manufacturers was hence limited both in Britain and Germany. In Britain Georg Barth and Coxeter & Son were companies of the first hour, both housed in London.<sup>63</sup> The name of George Barth appeared on many anaesthetic devices, like cylinders, bags and masks, in British and German textbooks and wholesaler's catalogues. In London Barth had establishments in the vicinity of Charing Cross Hospital, Middlesex Hospital and University College Hospital. The definitive form whereby nitrous oxide could be mixed with oxygen appeared after 1900.<sup>64</sup> Neither Barth nor Coxeter would survive. The main company that would establish its name in anaesthetic apparatus in Britain would be the British Oxygen Company. German compressors included the Berliner Sauerstoffabrik and the Linde Company near Munich, whose oxygen-producing technique would be copied by the British Oxygen Company. The pressure-reducing valves and anaesthetic vaporizers, as the link to the safe medical use of compressed gases, were produced by the Dräger Company in Lübeck. In cooperation with a local Lübeck surgeon, Otto Roth, it designed and produced its first anaesthetic machine, the Roth-Dräger apparatus, in 1902.<sup>65</sup> This apparatus was also sold by British wholesalers.<sup>66</sup> A steady flow of new anaesthetic machines would follow.<sup>67</sup> Even a temporary closure in 1926 during the economic crisis and the shortage of rubber in the interwar years could not halt this production line.<sup>68</sup>

62 Windler, *Der moderne Chirurg* (1923) 4. Advertisements in *Narkose und Anaesthetie* 1928, 1929/1930.

63 Duncum, *The Development of Inhalation Anaesthesia* (1947) 23.

64 Buxton, *Anaesthetics* (1900) 66. Allen, *Catalogue of surgical instruments* (1901) 160-162; (1905) 160. Gardner, *Catalogue of surgical instruments* (1901) 236-240. Rose, *A Manual of Surgery* (1900) 1160; (1901) 1160; (1902) 1187; (1905) 1310. Blumfeld, *Anaesthetics* (1902) 23-28. Dumont, *Allgemeine und lokale Anaesthetie* (1903) 139. Luke, *Guide to Anaesthetics* (1905) 16; *Anaesthesia in dental surgery* (1906) 48, 52; (1910) 48, 52. Arnold, *Catalogue of surgical instruments* (1904) 637. Down, *Catalogue of surgical instruments* (1906) 1088. Boyle, *Practical Anaesthetics* (1907) 67. Hewitt, *Anaesthetics* (1907) 307.

65 Müller, *Narkologie* (1903) 202.

66 Brady, *Catalogue of surgical instruments* (1908) 31.

67 Dräger, *Die Geschichte der Dräger-Narkoseapparate* (1970) 94-95.

68 Dräger, *The History of Dräger* (2006) 14-15.

### 2.4.3. Intratracheal insufflation

Just before the Great War in 1914 the combination of a controlled airway and a flow of anaesthetic mixture led to the concept of intratracheal insufflation. Insufflation of the anaesthetic mixture through a cannula in the nose or the pharynx had already been deployed by Mikulicz amongst others. It was a technique to administer general anaesthetics without the use of a mask. The air and chloroform mixture was insufflated by squeezing a balloon.<sup>69</sup> From 1910 the insufflation of the anaesthetic mixture via a catheter directly into the trachea was introduced. This technique was based on experiments in 1909 by the physiologist Samuel James Meltzer and his son-in-law John Auer, a pharmacologist at the Rockefeller Institute in New York. They performed experiments with dogs and presumed that intratracheal insufflated air could replace spontaneous breathing. They named their technique ‘apnoeic ventilation’. In this way the problem of insufficient respiration during open thoracic surgery would be solved.<sup>70</sup> The next year Charles Albert Elsberg, a neurosurgeon in New York, described intratracheal insufflation with an anaesthetic mixture in humans.<sup>71</sup> Robert Kelly, a surgeon from Liverpool, introduced the technique with a modified apparatus based on Elsberg’s in Britain in 1912. He reported that with this technique incredible operations on intrathoracic structures had been performed on dogs. He also noted the main risk of the technique: an uncontrollable increasing pressure in the airways.<sup>72</sup> In the same year Henry Edmund Gaskin Boyle (1875-1941), anaesthetist to St Bartholomew’s Hospital in London, described a bellows-driven apparatus for the intratracheal insufflation of ether (Figure 11).<sup>73</sup> After this introductory period the bellows was replaced by a flow of air from a pump or compressed air cylinder. Ether or chloroform was added to this airflow.<sup>74</sup> Sometimes the anaesthetic mixture could be warmed, making it less irritating and faster acting. The anaesthetic mixture was insufflated through a catheter that reached past the vocal cords. This catheter had to be small enough that the insufflated air could escape from the lung via the remaining natural airway around the catheter.

Intratracheal insufflation offered more solutions than the overpressure administration of anaesthetics. It was ‘multipurpose’. Indications included intrathoracic surgery, surgery of the head and neck, surgery that required a deep general anaesthesia in which spontaneous respiration became insufficient and surgery during which the lungs had to be protected against aspiration. Its application as a more practical alternative to under- and overpressure cabinets was attractive. Rose compared intratracheal insufflation with

69 Tillmanns, *Allgemeinen und speziellen Chirurgie* (1907) 45.

70 Meltzer, ‘Continuous respiration without respiratory movements’ (1909) 622-625.

71 Elsberg, ‘Intratracheal insufflation anaesthesia’ (1910) 493.

72 Kelly, ‘Intratracheal Insufflation of Ether’ (1912) 112-114.

73 Boyle, ‘Intratracheal Ether Apparatus’ (1912) 1520.

74 Mart, ‘The Intratracheal administration of Chloroform’ (1914) 1085-1087.

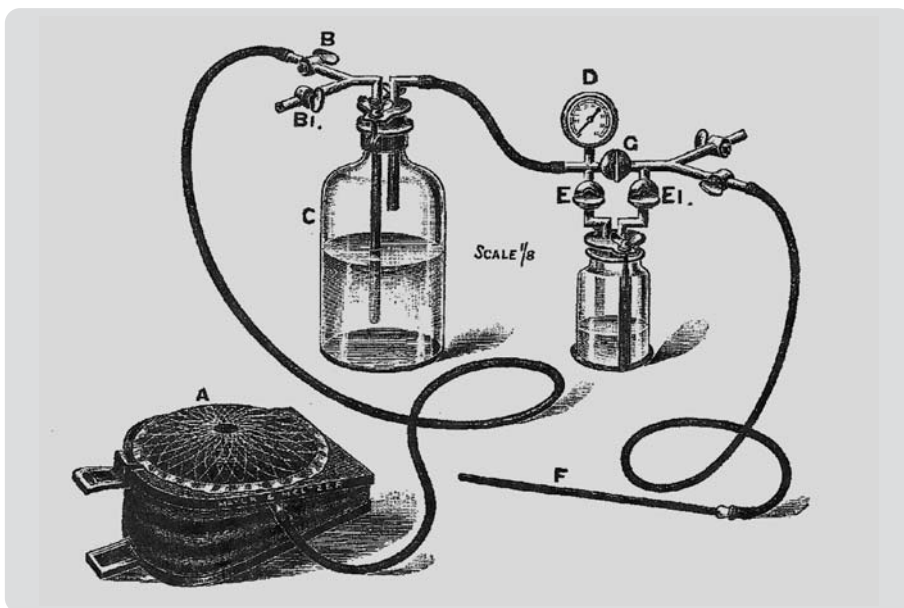


Figure 11. Intratracheal Ether Apparatus, after Boyle. *The Lancet* (1912) 1520. The apparatus was manufactured by Mayer and Meltzer. F is the intratracheal catheter.

the Sauerbruch cabinet and concluded that insufflation was far simpler and seemed to be equally effective.<sup>75</sup>

But intratracheal insufflation was also a tricky technique. James Tayloe Gwathmey (1863-1944), a pioneer anaesthetist in New York, illustrated the risk of intratracheal insufflation with an outline in his book *Anesthesia* in 1914. The mortality rate of this anaesthetic technique proved to be 1:250 versus the administration of ether through a mask or vaporizer which had a mortality rate of 1:5,623. This difference in mortality rate was naturally biased by the fact that intratracheal insufflation was used for riskier procedures.<sup>76</sup> The main threat was the blockage of expiration by laryngeal spasm. In that situation the ongoing insufflation of air into the lungs caused barotrauma with rupture of the alveolar and bronchial structures leading to pneumothorax and subcutaneous and mediastinal emphysema. Several techniques were described to prevent this grave complication. During the Great War sometimes the insufflation catheter reached only as far as the oral cavity, with gauze packed around the catheter to keep a certain insufflation

75 Rose, *A Manual of Surgery* (1914) 925-926, 1350-1351; (1922) 1035; (1924) 1048, 1488; (1927) 1032, 1463; (1937) 1519-1523. Ross, *Handbook of Anaesthetics* (1919) 96-108; (1923) 145-162; (1929) 150-166. Buxton, *Anaesthetics* (1920) 185-193. Blomfield, *Anaesthetics in practice and theory* (1922) 124-130. Boyle, *Practical anaesthetics* (1923) 133-139.

76 Gwathmey, *Anesthesia* (1914) 843.



pressure in the mouth and pharynx.<sup>77</sup> Later improvements consisted of the implementation of a safety valve or release of the insufflation pressure every 30 seconds to normalize intrapulmonary pressure.<sup>78</sup> In intratracheal insufflation the choice of the right size for the catheter was stressed by all authors. The wider the catheter, the smaller the remaining space in the trachea through which the mixture had to leave the lungs. For adults the ideal external diameter was between 18 and 25 French scale, corresponding to 6 to 8 millimetres. Boyle noted the diameter in English Gauge 14-16, corresponding to 24-27 French scale or 8-9 millimetres.<sup>79</sup> The catheters were manufactured in the same process used for urethral catheters, in woven silk with a surface coat of white enamel. Apparatus for intratracheal insufflation and the necessary intratracheal catheters were found in the catalogue of every respectable British company. The design of the apparatus varied according to its inventor (Kelly, Magill, Shipway, Matthew's and so on).<sup>80</sup>

In Britain intratracheal insufflation was first mentioned in an anaesthetic textbook by Buxton in 1914.<sup>81</sup> Hewitt too adopted the technique.<sup>82</sup> Most authors of British anaesthetic textbooks agreed that intratracheal insufflation provided much more control over the airway. At the same time intratracheal insufflation was used as a point of demarcation. Joseph Blomfield (1870-1948), an anaesthetist at St. George's Hospital in London and the author of one of the series of anaesthetic textbooks, was convinced of the benefit of intratracheal insufflation but discussed the technique only very briefly. In his view this new technique was only suited for use by specialists while his textbook was meant for general practitioners.<sup>83</sup> How established intratracheal insufflation really was in British operating theatres remains in doubt. The technique is not mentioned in any of the operation registers under study for this thesis. In the end, intratracheal insufflation had its disadvantages; it was a troublesome technique.<sup>84</sup> Moreover, unique indications were few; in fact only deep intrathoracic surgery was an indication, one for which there was no alternative anaesthetic technique.

The insufflation technique was known in Germany as well. The publication by Kelly on intratracheal insufflation was cited in the *Berliner Klinische Wochenschrift* one month after its original publication in the *British Medical Journal*.<sup>85</sup> Von Brunn incorporated it

77 Daly, 'Anaesthetics' (1919) 431. Macpherson, *Surgery of the war I* (1922) 179; *II* (1922) 45-47.

78 Gardner, *A manual of surgical anaesthesia* (1916) 139-143.

79 Ross, *Handbook of Anaesthetics* (1919) 103; and many more authors. Boyle, *Practical anaesthetics* (1923) 137. See also Appendix 5 on the sizes of surgical instruments.

80 Down, *Catalogue of surgical instruments* (1914) 1092-1093. Mayer, *Illustrated catalogue* (1915) 527, 620. Allen, *Catalogue of Surgical Instruments* (1921) 15. Surgical Manufacturing, *Catalogue of Surgical Instruments* (1921) 332. Surgical Manufacturing, *Catalogue of Surgical Instruments* (1925) 405, 410; (1930) 515-517. Gardner, *Catalogue of surgical instruments* (1929) 75-76. Mayer, *Catalogue of surgical instruments* (1931) 507-515. Thackray, *Catalogue of surgical instruments* (1935) 15.

81 Buxton, *Anaesthetics* (1914) 188-198.

82 Hewitt, *Anaesthetics* (1922) 310-319.

83 Blomfield, *Anaesthetics* (1917) V, 124.

84 Silk, *Modern Anaesthetics* (1920) 89-93.

85 Weydemann, 'Narkose durch intratracheale Einblasung' (1912) 1678.

in his standard work *Die Allgemeinnarkose*.<sup>86</sup> The experiments by Meltzer were repeated by German surgeons.<sup>87</sup> Philipp Bockenheimer (1875-1935), a professor of surgery in Berlin, mentioned the innovative technique in his surgical textbook in 1914.<sup>88</sup> But others considered the technique to be too 'experimental'.<sup>89</sup> From the start the main obstacle had been the correct introduction of the catheter into the trachea, requiring a well-trained doctor. The vocal cords, as a difficult-to-pass barrier in the airway, were a sacrosanct demarcation where only trained doctors were allowed to go. Altogether in Germany at the time, and also in the following interbellum period, intratracheal insufflation was not in current use and the trusted overpressure technique remained the favourite for anaesthetic administration in more complex cases.<sup>90</sup> In this regard it is important to note that intratracheal insufflation equipment was not found in German catalogues. This again is a support for the contention that this way of administering anaesthetics was not used in Germany.

Although intratracheal insufflation as sketched above never entered common practice, its concept played an important role in the domain of anaesthesia. Intratracheal insufflation was deemed exclusively for use by specially trained doctors. Intratracheal insufflation surpassed the competence level of the general practitioner, an important step towards a medical specialty.

## 2.5. The domain of anaesthesia

Proficient administrators of anaesthetics were expected to be competent in the choice and use of the techniques sketched above. But whose responsibility was it to teach these techniques? Who owned this domain? Who decided who was competent for a particular technique of administration? As the complexity of the administration of anaesthetics increased these questions became ever more important. In this respect an essential difference between Britain and Germany is recognizable.

### 2.5.1. German surgeons adopt anaesthesia

In Germany medicine was performed, taught and studied in and near large academic hospitals and surgery was an integral part of that sphere. In these hospitals the leading physicians, surgeons and gynaecologists were at the same time the directors of their medical or surgical departments. Sauerbruch and his confrères were 'Geheimrat', a high governmental rank, in university hospitals. Other doctors were 'Stabarzt', 'Oberarzt' or 'Unterarzt', principal, deputy principal and auxiliary doctors. In fact in German uni-

86 Brunn von, *Die Allgemeinnarkose* (1913) 38-41.

87 Unger, 'Experimente zur Bekämpfung der Athemlähmung' (1913) 118-122.

88 Bockenheimer, *Allgemeine Chirurgie* (1914) 59.

89 Garrè, *Lehrbuch der Chirurgie* (1923) 7.

90 Sauerbruch, *Chirurgie der Brustorgane* (1920) 398; *Chirurgische Operationslehre* (1934) 452.

Garrè, *Lehrbuch der Chirurgie* (1923) 181. Killian, *Narkose zu operativen Zwecken* (1934) 345.

versity and governmental hospitals the medical staff were organized like an army. The head of a surgical department controlled every aspect of care within his department including anaesthetic care. This hierarchical structure, later also depicted as dictatorial, safeguarded a holistic approach to patient care. The care for a single patient was not divided between doctors from several disciplines. The head of the department or his deputy commanded all medical treatment of the patient.<sup>91</sup> This can be seen in the operation register from 1912 of the Charité Krankenhaus, Berlin, where the main surgeon and the administrator of anaesthetics are mentioned. The ‘Narcotisierende’ ranged from student to the above-mentioned *Unterarzt*, *Oberarzt* or *Stabarzt*. These persons all had a rank in the surgical staff and some of them acted as chief surgeon in other cases. Anaesthesia was surgery and vice-versa.<sup>92</sup>

Anaesthetics and their administration were discussed in surgical textbooks. The *Lehrbuch der Chirurgie* by Carl Emmert published in 1850 gives a detailed description of all of the blessings of ether. Several pages are dedicated to its use. Other leading German surgeons followed his model: Adolf von Bardeleben in the 8<sup>th</sup> edition of his *Lehrbuch der Chirurgie und Operationslehre* in 1879, Krüche in the fourth edition of his *Allgemeine Chirurgie und Operationslehre* in 1890 and Hermann Tillmanns in his *Lehrbuch der allgemeinen und speziellen Chirurgie* in 1895 all included an anaesthetic chapter on the administration of anaesthetics. These were usually entitled ‘Narkose’, narcosis, ‘Schmerzbetäubung’, analgesia or ‘Schmerzverhütung’, prevention of pain. The term *Anästhesie* was reserved for local or regional anaesthesia. The chapters are more than just a general description of anaesthesia. The action and administration of anaesthetics is discussed in detail, just like the diagnostics and treatment of an inguinal hernia in other parts of the book. Usually the administration of anaesthetics was grouped with chapters about disinfection and wound care (Figure 12). Research into anaesthetic techniques was performed by surgeons and published in solid articles in their journal *Archiv Für Klinische Chirurgie*, like the afore-mentioned anaesthetic statistics from Gurlt and the animal experiments with chloroform.<sup>93</sup> This commitment to anaesthesia is also illustrated by the fact that already in 1894 and 1898 a teaching chair for anaesthesia had been suggested by the German surgeons Carl Ludwig Schleich and Fritz Ludwig Dumont.<sup>94</sup>

### *Surgery and anaesthesia are integrated*

This integral approach also enabled anaesthetic techniques that, because of their limitations, required some fine-tuning between the surgeon and his administrator of anaesthetics. Like today, the applicability of these techniques depended not only on the

91 Holism means that parts of a system cannot be considered separately from each other. This ranges from organs within a living creature to groups within a society. In the context of this book it stands for the idea that medical care for a patient cannot be divided. This and other aspects of holism are described in *Greater than the Parts* by Lawrence and Weisz.

92 See Appendix 2.

93 Burkhardt, ‘Der Einfluss der Kochsalzinfusionen’ (1907) 1178-1196.

94 Klimpel von, ‘Zur ärztlich ausgeführten Narkose’ (1986) 242.

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Figure 12. Contents of the *Lehrbuch der Allgemeinen Chirurgie* by Hermann Tillmanns in 1895. Note the almost natural place of 'Die Narcose', anaesthesia, within 'Allgemeine chirurgische Operationstechnik', general surgical technique, like antisepsis.

type of patient (elderly, ill, having co-morbidities) but also on the type and expected extensiveness of the surgical procedure. It is easier to tailor the type and length of general anaesthesia when it is in the hands of one person or one discipline. No dispute about the depth or extensiveness of general anaesthesia will arise when the surgeon himself is responsible for it.

This applies especially to 'Rauschnarkose', flush general anaesthesia. The German surgeon Paul Sudeck (1866-1945) from the Chirurgischen Universitätsklinik in Hamburg published this technique in 1901 and in 1909. After heavy premedication with morphine and scopolamine the patient was anaesthetized to the start of the surgical stage of inhalational anaesthesia or the stage of tolerance, which was described by Snow in 1847. The surgeon could apply this technique himself without trained assistance. 'Für die Thätigkeit des practischen Arztes ist es von Wichtigkeit, dass man sich nicht zu scheuen braucht, den Aetherrausch auch ohne irgend welche Assistenz anzu wenden.'<sup>95</sup> It was even possible to let the patient hold the ether-drenched gauze against his own face; the moment the patient dropped the gauze was the moment for the surgeon to act. It was suited to short procedures like wound dressings and the repositioning of fractures and luxations.<sup>96</sup>

The same integral approach to the surgical patient was the basis for the widespread application of local or regional anaesthesia that had entered medical practice in the 1880s.<sup>97</sup> It was the simplest way to avoid general anaesthesia with all its hazards. Local anaesthesia could be administered by the surgeon himself and needed no maintenance during the operation. In the operation register of the Charité in Berlin from 1912 no assistant was mentioned in the column 'Narkotisierende', administrator of anaesthetics, when local anaesthesia was performed. The assumption was that respiration and circulation were not influenced. Careful maintenance of the anaesthesia was not necessary.

Compared to Britain there was a considerably higher percentage of use of local anaesthesia in Germany, for instance in the Charité Krankenhaus as shown in the operation register of 1912. From the pages of this operation register, which mentions the considerable administered volumes of diluted local anaesthetic, it is clear that this was real local infiltration anaesthesia and not a regional technique like spinal anaesthesia. Local anaesthesia was used for a variety of surgical interventions, including inguinal hernia correction, superficial surgery, gastric surgery, strumectomy and rib resections. In a selection of 13 procedures local anaesthesia was used in 34% of the cases. Interestingly enough the percentage of local anaesthesia use in the Moabit (Municipal) Hospital in Berlin (5%) was comparable to percentages in London (6%) and Withington (7%). There is no indication that local anaesthesia was used because of the non-availability of anaesthetists. Because the choice of the anaesthetic technique was up to the surgeon, on the same day in the

95 'For the work of the practical doctor it is important not to eschew the application of flush anaesthesia even without any assistance.' Sudeck, 'Die Stellung des Aetherrausches' (1909) 293.

96 Müller, *Narkologie* (1903) 158-160.

97 See also Appendix 1.

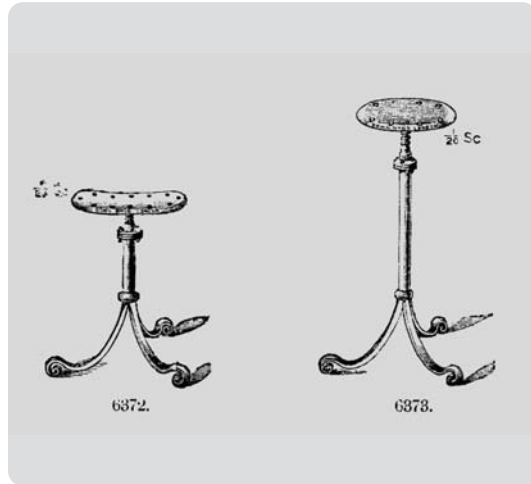


Figure 13. Anaesthetist's stool next to a surgeon's stool, offered in Down Brothers' *Catalogue of surgical instruments* (1900) 1158.

same operating theatre with the same surgical team one patient might be anaesthetized generally and the other locally.

#### *Anaesthetic textbooks by surgeons*

From 1900 a number of surgeons who were particularly interested in anaesthesia started to publish anaesthetic textbooks. In 1903 an advanced textbook about anaesthetics was published by Wilhelm Benno Müller, who specialized in surgery, gynaecology and obstetrics, with the title *Narkologie. Ein Handbuch der Wissenschaft über allgemeine und lokale Schmerzbetäubung*, Narcology, a textbook on the science of general and local analgesia. As a pioneer in the writing of comprehensive anaesthetic textbooks he could introduce his own terminology. The term 'Narkosiologie' was reserved for general anaesthesia, for local anaesthesia 'Anaesthetologie' was used. The book contained a passionate plea for the thorough training of doctors in anaesthetics. 'Es ist nicht nur eine Technik, die jedermann erlernen kann, sondern es ist eine Wissenschaft, welche nur der medizinisch durch und durch gebildete Arzt verstehen und richtig ausüben kann.'<sup>98</sup> The administrator of anaesthetics should not only be well trained but should also perform his task with great concentration. To underline this, Müller gratefully cited Johannes Mikulicz-Radecki, who had a list of commandments hanging in his operating theatre.

- Jeder Narkotisierende hat sich ausschliesslich mit der Narkose zu beschäftigen.
- Der Narkotisierende führt die Narkose ohne Unterbrechung von Anfang bis zu Ende; er verlässt den Kranken erst dann, wenn derselbe zum Bewusstsein zurückgekehrt ist, eventuell begleitet er ihn auf die Station.

<sup>98</sup> 'It is not just a technique that everybody can learn. It is a science which only the doctor thoroughly educated in medicine can understand and practice.' Müller, *Narkologie* (1903) 224.

- Die Übertragung der einmal begonnen Narkose an einen zweiten Arzt ist unter keiner Bedingung zulässig, auch nicht vorübergehend. Die Verantwortung für die Narkose trägt ausschliesslich derjenige, der sie zu Anfang übernommen hat.<sup>99</sup>

In fact all authors of German surgical textbooks stated that anaesthetics should be administered by well-trained doctors only. No similar statement about any other task in the textbooks, including the performance of an operation, was made. Dr Erich Lexer (1867-1937), an associate professor of surgery in Berlin who later became well known for reconstructive surgery, emphasized the essential attention of the administrator when he wrote 'Die Handhabung der Chloroformnarkose und der Narkose überhaupt ist mit Recht als eine Kunstleistung bezeichnet worden. Der Narkotisierende Arzt hat sich ihr voll und ganz zu widmen, ohne sich um Einzelheiten der Operation zu bekümmern.'<sup>100</sup> Hermann Tillmanns, a professor of surgery in Leipzig, emphasized the experience of the administrator when he wrote 'Jede Narkose ist nicht ungefährlich und soll daher nur in wirklich dringenden Fällen von sachkundige Ärzten angewandt werden.'<sup>101</sup> But all this expertise should be used in close cooperation and teamwork with the surgeon. Care had to be taken to prevent doctors administering anaesthetics from going their own way. Bockenheimer stated that anaesthetics should be administered by a second doctor with no other task, but he added that this doctor should work in close cooperation and share responsibility with the surgeon. 'Zur Narkose soll ausser dem Operateur stets ein zweiter Arzt da sein, der gemeinsam mit dem ersteren für ihren Ausgang verantwortlich ist.'<sup>102</sup>

#### *No anaesthetists in Germany*

Although surgeons, having incorporated anaesthesia in their specialty, agreed on the need for the thorough education of medical students in anaesthesia they did not see the necessity for separate anaesthetists and believed it would make the organization of their departments unnecessarily complicated. In 1914 anaesthetists were therefore non-existent in Germany as confirmed by the registers of medical specialists in Berlin. At the

99 'Every administrator of anaesthetics should only be engaged in the anaesthesia'; 'The administrator of anaesthetics conducts the anaesthesia without interruption from the beginning to the end; he leaves the patient only when the patient has returned to consciousness, possibly he accompanies him to the ward'; 'The transfer of anaesthesia that has begun to a second doctor is under no circumstance admitted, not even momentarily. The responsibility for the anaesthesia rests on he who starts it.' Müller, *Narkologie* (1903) 230.

100 'The maintenance of the chloroform anaesthesia and the anaesthesia in general is really to be considered as an art. The doctor who administers the anaesthetic must devote himself fully to it, without having to worry about the details of the operation.' Lexer, *Lehrbuch der allgemeinen Chirurgie* (1904) 82.

101 'Every anaesthesia is not without risk and should therefore only be applied in urgent cases by competent doctors.' Tillmanns, *Allgemeinen und speziellen Chirurgie* (1907) 50.

102 'For the anaesthesia, besides the surgeon there should always be a second doctor there, who in cooperation with the first doctor is responsible for its outcome.' Bockenheimer, *Allgemeine Chirurgie* (1914) 40.

**Table 2. Numbers (percentages) of medical specialists in 1914 and 1937 in the counties of London and Berlin, taken from the *Medical Directory* and the *Reichs Medizinal Kalender*.**

	London	London	Berlin	Berlin
	1914	1937	1914	1937
Surgeon	357 (30%)	250 (18%)	188 (12%)	294 (13%)
Physician	376 (31%)	311 (22%)	165 (11%)	440 (19%)
<b>Anaesthetists</b>	<b>129 (11%)</b>	<b>193 (14%)</b>	<b>0 (0%)</b>	<b>0 (0%)</b>
Ophthalmic surgeon	75 (6%)	68 (5%)	131 (8%)	172 (8%)
Gynecologist	59 (5%)	93 (7%)	232 (15%)	270 (12%)
ENT	49 (4%)	88 (6%)	178 (11%)	190 (8%)
Radiologist	41 (3%)	96 (7%)	17 (1%)	74 (3%)
Dermatologist	22 (2%)	41 (3%)	203 (13%)	328 (14%)
Pediatrics	6 (0%)	26 (2%)	133 (9%)	172 (8%)
Neurologist	8 (1%)	21 (1%)	110 (7%)	169 (7%)
Urologist	1 (0%)	14 (1%)	58 (4%)	33 (1%)
Orthopedics	5 (0%)	24 (2%)	30 (2%)	52 (2%)
Psychiatrist	5 (0%)	51 (4%)	27 (2%)	22 (1%)
Gastro Enterology Physician	0 (0%)	0 (0%)	61 (4%)	35 (2%)
Pathologist	48 (4%)	93 (7%)	0 (0%)	0 (0%)
Other	21 (2%)	38 (3%)	18 (1%)	42 (2%)
Specialists total	1.202 (18%)	1.407 (15%)	1.551 (37%)	2.293 (35%)
Doctors total	6.604	9.097	4.233	6.581
Population approximately	4.500.000	4.400.000	2.763.000	4.242.501
Doctor/10.000 inhabitants	15	21	15	16
Specialists/10.000 inhabitants	3	3	6	5

Note: The British *Medical Directory* listed all doctors within a city. Their specialty was only noted when the doctor was appointed to a hospital for that specialty. Every medical directory contained a chapter with the hospitals and their medical staff, with all of the known specialties and their practitioners among the staff. In addition to the specialists there usually were a number of medical officers, who were general practitioners working for the hospital and for the specialist staff. The German *Reichs Medizinal Kalender* listed all doctors within a city. In the 1937 *Reichs Medizinal Kalender* Jewish doctors were indicated by a : in front of their name. By that time 37% of the specialists were Jewish.

The bold row shows the remarkable and absolute difference in the presence of anaesthetists.



same time the table shows that German medical care did not eschew (sub)specialization (Table 2). There were chairs for the three archetypes of medical specialization – internal medicine, surgery and obstetrics – beginning around 1810 in Germany. Other chairs emerged for ophthalmology in 1855, mental illnesses in 1860, paediatrics in 1870, dermatology in 1875, ear, nose and throat surgery in 1880 and orthopaedics in 1885.<sup>103</sup> At this point it is necessary to state that surgeons and their assistants were masters of anaesthetics in the surgical clinics, but outside the hospitals there were more practitioners who administered anaesthetics. Dentists, for instance, were also using general anaesthetics.<sup>104</sup> Like the surgeons they considered it a part of their domain. Thorough textbooks on dental anaesthesia were published by German dentists.<sup>105</sup> The ‘Zahntechniker’, dental technicians, constituted a special group. They had no dental or medical education and were hence not allowed to administer anaesthetics. This limited their competitive position with regard to registered dentists, because they had to call in a doctor to administer anaesthetics. In 1901 German dentists tried to persuade the ‘Ärzttekammern’, medical associations, to forbid doctors to administer anaesthetics for dental technicians. However, one after the other ‘Ärzttekammer’ decided that it was not illegal for doctors to do so, provided that it remained an exception and was not done for material profit.<sup>106</sup>

### *Looking abroad*

Because the neighbour’s grass is always greener German surgeons from time to time looked with longing at the situation in Britain where professional anaesthetists taught and administered anaesthetics. German surgeons had been somewhat reserved towards these anaesthetists separate from surgery. Hermann Kümmell (1852-1937), a surgeon from Hamburg, had argued that professional anaesthetists would gain more experience but that this would not automatically diminish anaesthetic mortality rates. In fact he was right. By that time Britain had the same mortality rate as Germany. Moreover, he judged it a disadvantage when the surgeon was no longer interested in the general condition of the body he was operating upon.<sup>107</sup> It was contrary to their holistic approach. But German medical journals kept publishing news about the developments elsewhere. The German surgeon J.P. zum Busch, who moved to Britain in 1892, reported from London that the general anaesthesia provided by professional anaesthetists was much better, safer and more pleasant for the patient than the general anaesthesia administered by untrained personnel that he had witnessed in Germany. But the anaesthetist had his price: 63 German mark per anaesthetic.<sup>108</sup> These signals could no longer be ignored. Müller, the author of *Narkologie*, considered it only a matter of time before there would be

103 Eulner, *Die Entwicklung der medizinischen Spezialfächer* (1970) 496-511.

104 Hirschberg, ‘Aether oder Chloroform’ (1891) 99.

105 Seitz, *Die Zahnärztliche Narkose* (1900).

106 Henius, ‘Verhandlungen der preussischen Ärztekammern’ (1901) 417-418, 435, 845, 863.

107 Kümmell, *Ueber Narkose und locale Anaesthetie* (1896) 561.

108 Busch zum, ‘Londoner Brief’ (1901) 823.

anaesthetists in Germany after the British model.<sup>109</sup> The German surgeon Fritz Ludwig Dumont, in his anaesthetic textbook *Handbuch der allgemeinen und lokalen Anaesthetie für Ärzte und Studierende*, also made a shining example of his perception of the British situation, where he thought each doctor was trained for the administration of anaesthetics. ‘Und nun die Frage des Narkotiseurs! Dass derselbe sich seiner Aufgabe ganz zu widmen hat, liegt auf der Hand. Nichts ist lächerlicher, als jene Auffassung, nach welcher er eine untergeordnete Stellung bei der Operation einzunehmen hat. Er ist im Gegenteil ebenso gut Hauptperson als der Operateur, indem das Leben des sich ihm vertrauenden Patienten ebensoviele von ihm, als vom letzteren abhängt. Es ist daher, unseres Erachtens, ein sehr grosser Fehler der meisten medizinischen Studienpläne unseres Kontinentes, dass sie, im Gegenteil zu den Englischen oder Amerikanischen, gar keinen Unterricht in der Narkose vorsehen, welcher letzterer doch sicherlich zum mindesten ebenso wichtig ist, wie zum Beispiel die fast überall obligatorische Verbandlehre.’<sup>110</sup>

In *Die Allgemeinnarkose* in 1913 Von Brunn dedicated several pages to a review of the question of who should administer the anaesthetic. Conforming to current opinion he considered the training level of the administrator to be the decisive factor for the safety of general anaesthesia. Preferably the administrator should be a medically educated person. The teamwork between the surgeon and the administrator of anaesthetics was all-important. In his view, the use of an untransparent screen between the head of the table and the surgical field was a horror. Only as ultima ratio could non-medical persons be entrusted to administer anaesthetics, but in that case the professional guidance and responsibility should be entrusted to a medical person. This could be the surgeon, not to belittle the administrator of the anaesthetics but to safeguard the position of anaesthesia as a medical occupation. From an educational point of view the use of anaesthetists like in Britain and the US was to be recommended. However, the specialization of the administration of anaesthetics would have as an effect that fewer doctors would learn the art. This would be detrimental to the safety of anaesthesia in smaller hospitals and in home practices, because the specialists would be drawn to the larger hospitals.<sup>111</sup> Actually it would be detrimental to the availability of safe anaesthetic service.

### 2.5.2. British surgeons not committed to anaesthesia

The domain of anaesthesia developed in a different way in Britain. British surgeons were not as integrated into medicine as German surgeons. Actually, British surgeons

109 Müller, *Narkologie* (1903) 224.

110 ‘And now the question of the administrator of anaesthetics! It is obvious that this person must devote himself fully to his task. Nothing is more ridiculous than the opinion that he has to take a subaltern position to the surgeon. On the contrary, he is as important a player as the surgeon, while the life of the patient who trusts him depends as much on him as it does on the surgeon. Hence it is, in our opinion, a big mistake by most of the curricula on our continent, contrary to the English and American, not to provide teaching in anaesthetics, which is at least as important as the dressing course obligatory almost everywhere’. Dumont, *Allgemeine und lokale Anaesthetie* (1903) 17.

111 Brunn von, *Die Allgemeinnarkose* (1913) 7-10.

cherished their non-medical ancestry. Before they entered the medical order they had been barbers, organized in the United Company of Barbers and Surgeons. The surgeons split off in 1745 to form the Company of Surgeons. In an action that was not totally undisputed, this Company was transformed into the Royal College of Surgeons in 1800 by a Royal Charter granted by George III.<sup>112</sup> Their non-medical ancestry is clearly reflected in the fact that British surgeons still use the title Mister instead of Doctor.

The detached existence of surgeons in Britain cannot be considered separately from the total incoherence of British medicine. Medicine was not even an academic field and almost no university medical institutions and hospitals existed. Hospitals were a kind of marketplace where each doctor performed his trick in his stall. There was no team-building between the doctors to aid the patient.<sup>113</sup> British physicians and surgeons for their part were consultants in one or more hospitals. They were not part of the hospital organization, were paid little or nothing by the hospital but simply had the opportunity to treat their patients in that hospital. The hospitals provided the facilities for these visiting consultants, including beds to put the patient in, a laboratory and anaesthetic services. Evidence of this is found in the referring operation registers. In the London Hospital registers were kept per one or two surgeons and not for a surgical department as a whole as in Germany. In 1911 there were registers containing the operations of the consultant surgeons Misters Openshaw and Sherren, Misters Hutchinson and Lett, Misters Dean and Howard and Misters Furnivall and Kidd. In these registers the tasks are strictly divided. The consultant surgeons were the primary surgeon on all operations and did not perform any other task in the theatres.

These surgeons were not committed to anaesthesia. Anaesthesia was beneath their standing, something for ordinary doctors and general practitioners. As a consequence surgical textbooks, published in the 19<sup>th</sup> century after the discovery of ether and chloroform, usually did not contain a chapter about the administration of anaesthetics. For instance the fifth edition of *Principles of Surgery* by James Syme (1799-1870), a Scottish surgeon, in 1863 had no chapter on anaesthesia, and not even any mention of it. The same applies to the second edition in 1860 of *Principles and Practice of Surgery* by William Pirrie (1807-1882), another Scottish surgeon. The knowledge of anaesthetics had to be managed by general practitioners like Snow. Their books were manuals for one anaesthetic or another, describing the specific properties of that anaesthetic. They were not aimed at a specific group of practitioners.

Only in the 20<sup>th</sup> century would British surgeons start to add some information about anaesthesia in their textbooks. Rose included in his *A Manual of Surgery for Students and Practitioners* an anaesthetic chapter from the first edition in 1898; but as the title shows it was meant for general practitioners and not for specialists. After 1930 this chapter was written by Charles Frederick Hadfield (1875-1965), an anaesthetist at St. Bartholomew's in London, and later his colleague Archibald D. Marston (1892-1962) from

112 Webb-Johnson, 'The Architectural History' (1950) 343-344.

113 Stevens, *Medical Practice in Modern England* (1966) 60-61.

Guy's Hospital in London. These were notable anaesthetists who will also appear in the story of the Association of Anaesthetists. *A Short Practice of Surgery* by Henry Hamilton Bailey (1894-1961), at the time a surgeon at the Royal Northern Hospital in London, by contrast, did not contain a chapter on anaesthesia (it was first published in 1932). The same is true of *A Short Textbook of Surgery* by C.F.W. Illingworth, which was to be published nine times between 1938 and 1972.

#### *Anaesthesia in Britain, a wilderness*

As a result in Britain knowledge of anaesthetics and their administration was not part of any existing domain. It was a general medical competency which some medical schools taught and others did not. The consequences of this were troublesome. In 1888 John Frederick William Silk (1858-1943), who in the 1880s as a general practitioner administered anaesthetics in the Great Northern Hospital in London, published an analysis of 26 fatal accidents during general anaesthesia. He found that such accidents happened more often when the administrator came from a medical school where the administration of anaesthetics was not taught (or if it was, only a little).<sup>114</sup> Consequently and in line with the conclusions of various committees he stated that anaesthetics were primarily as safe as their administrator and pleaded for the improved training of students and doctors in the administration of anaesthetics.<sup>115</sup> Silk adopted the title of 'anaesthetist' and started teaching the administration of anaesthetics in Guy's Hospital in London. His action was to be followed by more general practitioners, mainly in London, who adopted the title 'anaesthetist' and began teaching students about anaesthetics as a separate 'special thing'.<sup>116</sup> The title 'anaesthetist' clearly pointed to the anaesthetist's only trademark at that time: the administration of general anaesthetics. The currency of the term 'anaesthetist' in the British operating theatres of the time is provided by the anaesthetists stool sold by Down Brothers and Allen & Hanburys (Figure 13).<sup>117</sup> According to the unofficial *Medical Directory* in 1890 there were 10 anaesthetists in London; 23 in 1895; 32 in 1900; 66 in 1905; 92 in 1910 and 129 in 1914. In the official *Medical Register* published by the General Medical Council these persons are not listed as anaesthetists but as non-specialized general doctors licensed by one of the colleges. Some of them had participated in the aforementioned Anaesthetics Committee of the British Medical Association from 1891 until 1900.

114 Silk, 'The teaching of Anaesthetics' (1888) 689-690.

115 Silk, 'Anaesthetics a necessary part of the curriculum' (1892) 1178-1180.

116 The term 'anaesthetist' had first appeared in *The Lancet* in 1876 on page 689 in an article titled 'Dental anaesthetics and heart disease', written by S. Hamilton Cartwright and Francis Woodhouse Braine, 'anaesthetists' to Charing Cross Hospital and the Dental Hospital of London. Although both writers called themselves anaesthetists, Cartwright was mentioned as a dental surgeon in 1877 in the *Medical Directory* and Braine was mentioned as a chloroformist but was not appointed to Charing Cross Hospital.

117 Down, *Catalogue of surgical instruments* (1900) 1158; (1906) 2113. Allen, *Catalogue of surgical instruments* (1901) 21.

*Anaesthetic textbooks by anaesthetists*

The self-proclaimed anaesthetists in Britain wrote instructional textbooks on the administration of anaesthetics and the domain of anaesthetic care. The titles resembled each other. In 1888 Dudley Buxton (University College Hospital) wrote *Anaesthetics, their Uses and Administration*. In 1893 Hewitt (St. George's Hospital) wrote *Anaesthetics and their Administration*. In 1901 Probyn-Williams (London Hospital) wrote *A Practical Guide to the Administration of Anaesthetics*. In 1902 Blumfeld (St. George's Hospital) wrote *Anaesthetics: a Practical Handbook*.<sup>118</sup> In 1905 Luke (Edinburgh) wrote *A Guide to Anaesthetics*. In 1907 Boyle (Bartholomew's Hospital) wrote *Practical Anaesthetics*. In 1909 Collum (Charing Cross Hospital) wrote *The Practice of Anaesthetics*. These textbooks circumscribed the domain of the administration of anaesthetics including preoperative assessment; the choice of the anaesthetic agent; the apparatus to administer the anaesthetics; complications, especially respiratory and circulatory failure; some delayed sequelae of general anaesthesia and medical-legal aspects.<sup>119</sup> Nevertheless the books were not as comprehensive as the German textbook *Narkologie* by Müller. It was the difference between a pocket-sized book and a standard size. Pre-war experimental solutions from German surgeons for airway problems, like the Kuhn tube and the Sauerbruch cabinet, were not mentioned until after the First World War, when they were out of date. Neither did the textbooks usually contain a chapter about local anaesthesia. Only Buxton, Luke and Probyn-Williams spent a chapter on local anaesthesia, citing predominantly German sources. Although Buxton, the pioneer of these books, emphasized that only qualified persons should administer anaesthetics and even pleaded for a scientific approach to the administration of anaesthetics, it is important to note that the authors of these books did not strive to establish anaesthesia as a medical specialty.<sup>120</sup> The books were clearly meant for students and general practitioners. The administration of anaesthetics was a general practice occupation, every doctor should be able to administer anaesthetics. It was a practice, not a science. It was the task of every junior or senior house officer, including house surgeons, and general practitioners offering their services via the hospital to the surgeons.<sup>121</sup> As mentioned earlier some textbooks excluded advanced techniques like intratracheal insufflation because this was reserved for professional anaesthetists.<sup>122</sup> This line of anaesthetic

118 Although it is not stated in his official obituary it is quite conceivable that Blumfeld was the original surname of Joseph Blomfield. He changed his name during the First World War. The change is clearly visible in his line of anaesthetic textbooks. The first three editions of *Anaesthetics* were written by Blumfeld, the fourth by Blomfield.

119 Henry Lyman, a physiologist in Chicago who wrote 'Artificial Anaesthesia and Anaesthetics', published in 1881, should be mentioned as having written the first textbook to discuss anaesthesia as a domain in medical care and not just as a manual of anaesthetics.

120 Buxton, *Anaesthetics* (1888) 154-155.

121 Duncum, *The Development of Inhalation Anaesthesia* (1947) 17, 21, 36.

122 Blomfield, *Anaesthetics* (1917) V.

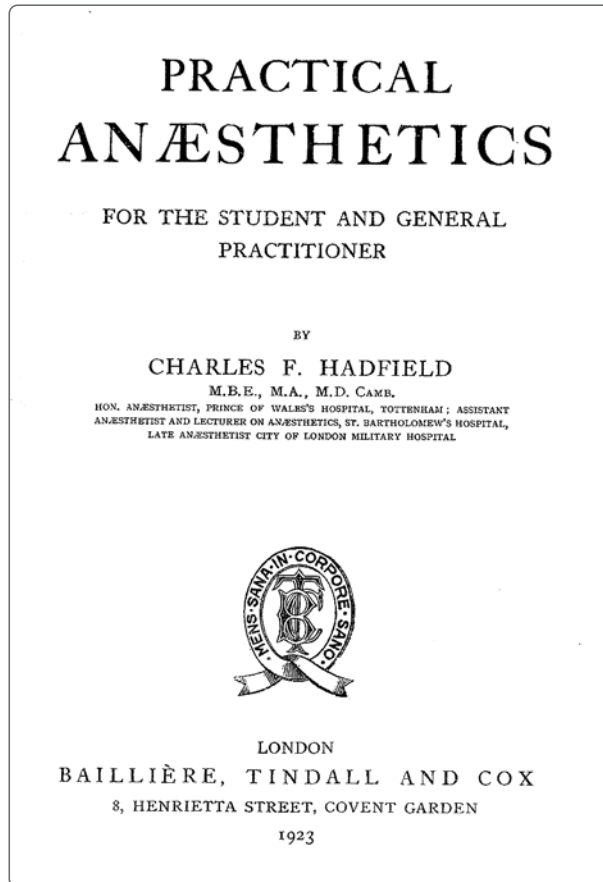


Figure 14. Title page of *Practical Anaesthetics* by Charles Hadfield 1923. Note the subtitle 'For the student and general practitioner'. The routine administration of anaesthetics was not a job for specialists.

textbooks for students and general practitioners would be continued by 20<sup>th</sup> century anaesthetists like Hadfield (Figure 14).<sup>123</sup>

### 2.5.3. Anaesthetists in Britain

So there were professional anaesthetists in Britain or rather general practitioners who had made the administration of anaesthetics their daily job. Yet there were limitations to their existence.

First, the anaesthetists were not equal to physicians or surgeons. Because the administration of anaesthetics was not regarded as a specialist task it was not under the control

<sup>123</sup> Hadfield, *Practical Anaesthetics* (1923) Title page.

of either of the two existing specialties, surgery and (internal) medicine. Their Royal Colleges did not authorize the registration of anaesthetists as they considered them to be general practitioners. Weisz had already stated, without a clear reference, that anaesthesia was the only 'specialty' general practitioners were permitted to claim.<sup>124</sup> These anaesthetists were admitted to the hospital, paid by the hospital and worked for the specialist staff.<sup>125</sup>

Second, the phenomenon of professional anaesthetists was almost completely restricted to London. In 1914 almost one-third of London hospitals mentioned an anaesthetist in the *Medical Directory*. In the Withington Hospital near Manchester on the contrary none of the administrators of anaesthetics were mentioned as anaesthetists in the *Medical Directory* until 1939.

In line with their teaching and instructing task the professional anaesthetists did not administer all the anaesthetics in hospitals. In 1911 in the aforementioned London Hospital in 63% of cases the administrator of anaesthetics was a doctor who was never involved in other surgical care; according to the *Medical Directory* almost all of these doctors were admitted to the hospital as anaesthetists. In 29% of cases the administrator of anaesthetics was a house surgeon, hoping to one day become a surgeon consultant. In most hospitals the open structure encouraged a miscellaneous group of practitioners to administer anaesthetics.

Large numbers of anaesthetics were administered by house officers, residents, visiting practitioners, dentists and uncertified persons. However, the anaesthetists controlled their employment. This is illustrated by the Standing Orders of the London Hospital. They read that every doctor in the hospital should have received approval from the Instructor in Anaesthetics that he is capable to administer anaesthetics. But in emergency cases anyone could administer anaesthetics, provided they worked in pairs (Figure 15).

With these restrictions, contrary to Germany, where anaesthesia was a part of an existing medical specialty, the British anaesthetists had to shape their specialty from the bottom. This included the scientific as well as the material and regulatory interests.

### *The Society of Anaesthetists*

The growing number of anaesthetists and the need to promote their view of the practice of anaesthesia made some kind of scientific organization inevitable. In 1893 Silk, by now a lecturer on anaesthetics at King's College Hospital, gathered in his house at 29 Weymouth Street, London, the world's first grouping in the field of anaesthesia, the Society of Anaesthetists. It was primarily a scientific association. Its objectives were to encourage the study of anaesthetics and to promote and encourage friendly relations among its members.<sup>126</sup> The society was welcomed warmly in *The Lancet* in its Annus Medicus 1893. The editor especially hoped that the new society would lead to fresh information about anaesthetic subjects like the controversy about chloroform which he considered to be still

124 Weisz, 'Medical Directories and Medical Specialization' (1997) 40.

125 Weisz, *Divide and Conquer* (2006) 174.

126 'Laws and regulations', *Transactions of the Society of Anaesthetists* (1900) b.

## APPENDIX.

*For the information of Receiving Room Officers, the Standing Orders for Administration of Anæsthetics are here given.*

### SECTION XXIII.A.

#### ADMINISTRATION OF ANÆSTHETICS.

##### Standing Orders.

1. No person shall be appointed as Resident Accoucheur, House-Physician, House-Surgeon, Receiving Room Officer, Out-Patient Clinical Assistant, or Senior Dresser to Out-Patients, unless he shall have been reported to the Warden by the Instructor in Anæsthetics as duly qualified for their administration.

2. In the absence of the Instructor, or of one of the Physicians or Surgeons, or Assistant-Physicians or Surgeons, or of one of the Registrars of the Hospital, no Anæsthetic shall be administered, unless two Members of the Resident Staff (the Receiving Room Officers being deemed Resident during their hours on duty) are present, who shall be responsible for the due administration.

But in the Out-Patient Department it shall be sufficient if two qualified persons, whether resident or not, are present at the administration.

3. Except when authorized by a Member of the Visiting Staff, the administration of Anæsthetics is to be limited to Minor Cases (as cited below\*), and every such administration is to be duly recorded in the book kept for such purpose in each Ward, and is to be initialled by the Officer responsible for the Case.

\* *Minor Cases* include—

- (a) Amputation below the Metatarsus or Metacarpals.
- (b) Adjusting fractures.
- (c) The adjustment of wounds.
- (d) Urethral Catheterism.
- (e) Ordinary Abscesses.
- (f) Secondary Hæmorrhage.

Figure 15. Standing Orders for the administration of anaesthetics in the London Hospital in 1896. The orders provided some quality and safety controls for the administration of anaesthetics by all house staff. However, in times of emergency anyone could administer anaesthetics.



unresolved.<sup>127</sup> Anaesthetists of the first hour were mainly Londoners like Francis Woodhouse Braine (1837-1907), G. Everett Norton (1847-1906), Frederic Hewitt, Dudley Buxton and Henry Davis. John Stallard (1855-1952) and Alexander Wilson (1860-1931) represented Manchester; William Fingland came from Liverpool.<sup>128</sup> Silk became secretary for four years. Woodhouse Braine was the first president. This group of doctors conducted the discussion about the training of the persons who administer anaesthetics in Britain. In this discussion they would acquire support from the surgical quarter.<sup>129</sup> But a plea by the Society of Anaesthetists for compulsory instruction in anaesthetics in the medical curriculum was rejected by the General Medical Council in 1901.<sup>130</sup>

### *The uncertain position of the anaesthetists*

While the Society of Anaesthetists took care of the scientific interests, the material position of British anaesthetists in 1900 was uncertain. First there was the question of remuneration. In the beginning the hospital or the surgeon had paid the anaesthetist, not the patient. In the workhouses for poor people the administrator of anaesthetics was paid by the Local Government Board. Its role is described in letters in general medical journals. In 1894 the *British Medical Journal* cited a letter from the secretary of the Local Government Board to the *Guardians* in England which stated that the administration of anaesthetics, like any other assistance at an operation, should be reasonably paid for to the medical officer.<sup>131</sup> In 1899 the question of the anaesthetist's fee for the administration of an anaesthetic to patients under the poor law was raised again in *The Lancet*. The answer, as in 1894, was: '...it is not the practice of the Local Government Board to raise any objection to the payment of a reasonable fee for assistance 'at an operation' (which is the official term for the administration of an anaesthetic), rendered by an outside practitioner to the medical officer of a district or workhouse in the performance of operations of difficulty or danger.'<sup>132</sup> But hospitals could also decide to dismiss their anaesthetist. A 1900 letter to the editor decried such a dismissal, in this case the anaesthetist at the Worcester General Infirmary. The administration of anaesthetics in that hospital was referred to the surgical staff. 'The constantly recurring fatalities under chloroform in provincial as well as in London hospitals when inexperienced men are giving the anaesthetic support our contention that the staff of every hospital where much operating is done should comprise an anaesthetist.'<sup>133</sup> The anaesthetists realized they had to show themselves before the patient in order to escape their subsidiary role and to get a substantial fee. 'The remedy seems to be that ... there should be a closer relationship cultivated through the medium of the surgeon between the anaesthetist and his patient.'<sup>134</sup>

127 Anonymous, 'Annus Medicus. Anaesthetics' (1893) 1626.

128 Dinnick, 'The first anaesthetic society' (1970) 181. Howat, 'The founders of the first society' (2005) 40-45.

129 Stretton, 'The teaching of anaesthetics' (1900) 1460-1461.

130 Hewitt, 'Reform movement in anaesthetics' (1911) 1486.

131 Owen, 'Payment for administration of anaesthetics' (1894) 1086.

132 Anonymous, 'Anaesthetists' fee' (1899) 263.

133 Anonymous, 'The Worcester General Infirmary' (1900) 1828-1829.

One possibility was an interview with the patient before the operation.<sup>135</sup> From 1905 the debate on remuneration in the *British Medical Journal* grew silent. Only long after the Great War would a direct financial relationship between the patient and the anaesthetist be realized as will be shown in the next chapters.

Second, simultaneously with the emergence of professional anaesthetists around the turn of the century, the division of labour around the surgical patient in Britain, surgery and anaesthesia, developed into an area of tension and brought about discussions on the division of responsibility, liability and hence money. The key question was whether the anaesthetist was working for the patient or for the surgeon. With his expertise on safe general anaesthesia the anaesthetist should make his own assessment of the patient, choose his own strategy and send his own bill to the patient. On the other side the surgeon was the only one who could estimate the urgency and necessity of the operation.<sup>136</sup> The discussion even extended to intercollegial control. When a surgeon called in the help of an inexperienced administrator of anaesthetics and something went wrong with the anaesthetics, the surgeon was responsible too.<sup>137</sup> When an anaesthetist anaesthetized a patient for surgery of an illegal kind that anaesthetist was responsible too.<sup>138</sup>

Third, the competition was heavy. Anaesthetists had learned to live with general practitioners and dentists; nurses administering anaesthetics however were totally unacceptable. Nurse anaesthetists had up to then for instance been employed in the British Royal Army Medical Corps (RAMC) during the Boer War in South Africa from 1899-1902. They were employed much to the dissatisfaction of the anaesthetists. In fact the non-medical administrators of anaesthetics were depicted as exponents of unqualified medical practice. This may look like an exaggerated reaction to trifling numbers of nurses employed to administer general anaesthesia instead of doctors, some 6,000 miles distant. For the anaesthetists of that hour however it touched the essence of their existence. The acceptance of nurse anaesthetists would mean a loss of control and a devaluation of the anaesthetic craft. Nurse anaesthetists could be allowed to administer anaesthetics on their own as in the US and would be cheaper for the hospital to employ. Because of the open, unorganized structure of the hospitals without surgical or anaesthetic departments nurse anaesthetists could be employed beyond the control of the anaesthetists. Therefore the anaesthetists depicted them as a serious threat to the health of the patient and the position of the anaesthetist. This situation is discussed in a letter in the *British Medical Journal* in 1906. The letter refers with horror to the sliding scale on the Continent where Prof. Emil Theodor Kocher, in addition to nurses, even employed the hospital porter to administer anaesthetics.<sup>139</sup> British anaesthetists and their organizations therefore would keep on fighting nurse anaesthetists like Don Quixote fought windmills.

134 Anonymous anaesthetist, 'The relation of the anaesthetist' (1903) 1464.

135 Blumfeld, 'Surgeon and anaesthetist' (1903) 1685.

136 Anonymous, 'The relation of the Anaesthetist' (1903) 1442-1443.

137 Anonymous, 'Operating Surgeons and Anaesthetists' (1908) 169-70.

138 Buxton, 'Legal responsibility and Anaesthetics' (1908) 151.

139 Anonymous, 'Unqualified Anaesthetists for the R.A.M.C.' (1906) 586.

### *Attempt to draft Legislation*

Because the practical administration of anaesthetics was so liberal, the need for regulation or legislation was felt. The scientific and ideological Society of Anaesthetists did not figure in this protection of the material interests of the anaesthetists, just as the Society stayed out of the remuneration discussion. Both debates were conducted ad hoc by doctors speaking as private persons and not on behalf of an organization. This process can be clearly illustrated by Hewitt's crusade for an anaesthetic bill.

To prohibit the administration of anaesthetics by laymen, nurses and untrained medical personnel, the tireless protagonist of better education Frederic Hewitt, whose star had been raised to anaesthetist to His Majesty the King Edward VII in 1902, lobbied for legislation. He mobilized public opinion on this subject by pointing out the deadly risks of the incompetent administration of anaesthetics during a meeting of the British Association for the Advancement of Science on September 3<sup>rd</sup> 1908. The title of his paper was 'The Prevention of Deaths under Anaesthetics'. Training the medical administrators of anaesthetics was all-important, in particular in the maintenance of a free and absolutely unobstructed respiration. Two of his closest colleagues and co-founders of the Society of Anaesthetists had sympathy for the spirit of the legislation but also had objections to it. Buxton suggested also admitting dentists to administer some anaesthetics. The lack of reliable statistics, which had been admitted by Hewitt, provided ammunition for Silk to question whether it was necessary to arrange the status of anaesthetist by law. The attention Hewitt had drawn to the subject was very good in Silk's view but the goal could also be achieved by training and by graduated steps.<sup>140</sup>

The General Medical Council, contrary to its 1901 opinion, underlined the necessity of good training.<sup>141</sup> An editorial in *The Lancet* supported the desirability of a professional status for the anaesthetist. However, this would not imply that every anaesthetic was to be administered by an anaesthetist. The simpler cases could be anaesthetized by a general practitioner with anaesthetic training. Every hospital should only have an anaesthetist for teaching. The essence of the professional status was to give the administration of anaesthetics a place within the medical curriculum and to limit the administration of anaesthetics to those who possessed medical diplomas.<sup>142</sup> This breakdown into simple and complex cases, although it was not specified whether the patient, the operation or the anaesthetic was simple, confined the role of the anaesthetists to teaching and the performance of certain special anaesthetic techniques. This compromise to deal with specialization would return in later decades, up to the period after the Second World War.

In the same year questions were posed to the Secretary of State for the Home Department in the House of Commons. Members of Parliament were concerned about the deaths under anaesthetics that were reported with some regularity by coroners. One of them, F.J. Waldo, barrister-at-law and coroner of the city of London and borough of South-

140 Buxton, 'The proposed general anaesthetics bill' (1909) 422-423.

141 Hewitt, 'Deaths under Anaesthetics' (1908) 873-874.

142 Anonymous, 'The professional status of anaesthetists' (1908) 1085-1086.

wark, had complained in *The Lancet* that the available data for deaths during general anaesthesia were imperfect due to insufficient reporting by the hospitals, especially the private hospitals.<sup>143</sup> The Commons urged an official inquiry into this problem. The fact that the General Medical Council supported the idea of making the administration of anaesthetics a compulsory part of the medical curriculum was considered too little, especially because not all the medical licensing bodies followed this advice. In December 1908 the Secretary of State asked the Coroners' Committee to investigate the problem of deaths resulting from the administration of anaesthetics.

Outside the anaesthetic circle both dentists and surgeons at first had their own objections to legislation. Some 5,000 registered dentists had been accustomed to administering general anaesthesia for their procedures themselves; they argued that an anaesthetist was not necessary and would only raise their costs. They gained support from anaesthetists of the first hour like Silk and Buxton. Surgeons for their part were afraid there would not be enough anaesthetists especially for operations conducted at night. They suggested that dental administrators of anaesthetics could fill this gap. These objections were met in the Anaesthetic Bill that was presented in March 1909 by Mr G. Cooper to the House of Commons. It read that a person registering under the Medical Acts or Dentists Acts should produce evidence that he had received theoretical and practical instruction in the administration of anaesthetics. Only these persons would be allowed to administer anaesthetics. The dentists were satisfied with this concession, but the Company of Extractors and Adaptors of Teeth, representing 1,000 unregistered dentists, addressed an official protest against the bill to the House of Commons. Because they were not registered under the Dentists Act they were not allowed to use the title 'dentist'. However, they were administering anaesthetics, local and general, during their treatments. In the present form of the bill they would not be allowed to do so anymore.

On June 22<sup>nd</sup> 1909 the bill was read for the first time in the Commons. A second reading was scheduled for the first of July but never took place. From the minutes of the Home Office it is clear that there were two reasons to hold up the bill. First, the protest from the Extractors and Adaptors was considered to be important. Second, the report by the Coroners' Committee was not yet available.<sup>144</sup> In the meantime Hewitt kept the argument going in the general medical journals and stated that the prohibition of the unqualified administration of anaesthetics fit within the prohibition of unqualified medical practice in general that was being prepared by the General Medical Council. Together with Germany, Britain was the only European country that did not yet prohibit unqualified medical practice. Germany already had an imperial bill under consideration on this subject, Hewitt wrote.<sup>145</sup> In a comment in the *Berliner Klinische Wochenschrift* the German

143 Waldo, 'Deaths under Anaesthetics' (1908) 851.

144 Home Office. Public Bills Dossier 162,583 regarding 'A Bill to regulate the administration of Anaesthetics' (1909). HO 45/10550, National Archives, London.

145 Hewitt, 'Legislation in regard to anaesthetics' (1909) 1266-1269.

reporter considered the problem of quackery, including unqualified dentistry, in Britain as the basic reason for Hewitt's endeavour to win legislation.<sup>146</sup>

In 1910 the Report of the Coroners' Committee saw the light of day. In their consideration number five the committee urged the passage of legislation: 'As the law stands at the present, the administration of anaesthetics is under no regulation. Although a man cannot sell a glass of beer to another without a licence, he may drug that other person to his heart's content, without let or hindrance from the law. Apart from any criminal intent, a bone-setter, or a beauty doctor, or a quack of any kind is as much at liberty to administer an anaesthetic to his patient for the purpose of an operation as a qualified medical anaesthetist. (...) We think that this unregulated state of affairs constitutes a serious menace to the public, and that the administration of anaesthetics should be carefully regulated by law. ...'<sup>147</sup>

The committee was more strict in its remarks about the dentists than the bill that had been presented to the Commons. The dentists were restricted to nitrous oxide for dental procedures. The key conclusions were:

- Every death under an anaesthetic should be reported to the coroner.
- No general respirable anaesthetic should be administered by any person who is not a registered medical or dental practitioner.
- Registered dentists should be confined to the use of nitrous oxide gas for dental operations.
- A small standing scientific Committee on Anaesthetics should be instituted under the authority of the Home Office. Its task should be to report on new anaesthetics and techniques of administration.

The Committee had heard and carefully considered a special position for the Extractors and Adaptors but had decided not to meet their request. The fact that they were not submitted to any examination had been decisive.

Hewitt incorporated the recommendations of the Coroners' Committee in a new version of the Anaesthetic Bill and submitted it in its most final form on August 30<sup>th</sup> 1910 as a memorandum to Winston Leonard Spencer-Churchill, by then Secretary of State for the Home Department. The dentists were given some more room to move. This Anaesthetics Act would in essence read:<sup>148</sup>

- Only a legally qualified medical practitioner is allowed to administer anaesthetics, general or local. The penalty for offence of this rule was 10£, on a second conviction 20£.
- First exception was the situation when a person anaesthetises a patient under the immediate direction and supervision of a legally qualified medical practitioner

<sup>146</sup> Anonymous, 'Aus englischen medizinischen Gesellschaften' (1909) 2217.

<sup>147</sup> Coroners' Committee, *The Question of Deaths* (1910).

<sup>148</sup> Hewitt, Memorandum to Churchill August 30<sup>th</sup> 1910. Home Office dossier 193114/15 (1910). HO 45/15558, National Archives, London.

- Second exception was the situation when a person registered under the dentist's act of 1878 anaesthetises a patient for a dental operation.
- Third exception was an emergency situation when there was no time to wait for a qualified medical practitioner.

But despite support from the General Medical Council, the Royal College of Surgeons, the Royal Society of Medicine, the British Medical Association, the British Dental Association, the Medico-Legal Society and the British Association for the Advancement of Science, Hewitt's crusade stopped in 1911 because of a lack of support for the bill in the Privy Council.<sup>149</sup> No act was passed then that would reserve the administration of anaesthetics to qualified and registered medical or dental persons. The only recommendation that was followed was the appointment of a scientific committee to study new anaesthetics and techniques of administration. This is a remarkable turn in the history of anaesthesia. What went wrong?

The initiator Hewitt himself attributed the failure of legislation to an accidental decrease in anaesthetic deaths in 1911.<sup>150</sup> In 1912 he would report a mortality rate from chloroform general anaesthesia of 1:3,162, a one-third decrease compared to 15 years earlier.<sup>151</sup> It looked like the discussion about anaesthetic management in Britain had been overtaken by its own success. The number of anaesthetists had risen sharply between 1890 and 1910. *The Medical Directory* in 1914 contained 129 London anaesthetists (Table 2). Compared to the numbers of surgeons and physicians this was an incredible number. Although these professional anaesthetists did not administer all anaesthetics, their improved instruction of all medical students in the administration of anaesthetics for its part began to yield fruit. It meant that occasional anaesthetists worked more safely than before, resulting in lower anaesthetic mortality rates.

Hewitt stood alone. There was no organized lobby from the anaesthetists. The attempt to win legislation was a personal action by Hewitt. Although present at the preliminary meetings of the society, he was not a member of the Society of Anaesthetists. Other anaesthetists like Buxton and Silk did not consider legislation to be so necessary. The Society of Anaesthetists did not consider lobbying to be its task. The transactions of the society make it clear that only scientific subjects were discussed. The only political subject was the presentation of the report by the Anaesthetics Committee of the British Medical Association which was welcomed warmly and led to a paper by Buxton, 'On the advisability of the Inclusion of the Study of Anaesthetics as a Compulsory Subject in the Medical Curriculum'.<sup>152</sup> As mentioned earlier, this request to the General Medical Council was denied at first. In 1908 the Society of Anaesthetists, by then having 103 members, had merged into the Section of Anaesthetics of the Royal Society of Medicine. At the same time 17 other specialist societies merged into the Royal Society of Medicine. This re-

149 Anonymous, 'Legislation with Regard to Anaesthetics' (1913) 873.

150 Hewitt, 'Reform movement in anaesthetics' (1911) 1486.

151 Lukis, *Problems of anaesthesia* (1935) 139.

152 Buxton, 'The study of Anaesthetics' (1901) 133-163.

directed attention once again to the scientific basis of the specialty. The Royal Charter of the Society of Medicine prohibited a political role for the Section of Anaesthetics.<sup>153</sup>

The opposition had been underestimated. The objections of registered dentists had been met but the unregistered dentists, extractors and adaptors, had been denied. It can be no coincidence that the final note in the dossier on the anaesthetic bill of the Privy Council is an objection by the Incorporated Society of Extractors and Adaptors of Teeth Ltd, North Midland Branch, dated March 22<sup>nd</sup> 1911. They point to the fact that especially the Army, the Navy and the general public with their rapidly increasing dental requirements were relying heavily on the services of the extractors and adaptors. Prohibiting them from anaesthetizing would mean great suffering for these groups. This protest was regarded by one of the servants of the Privy Council as ‘an emphatic testimony to the value of the Bill’.<sup>154</sup> Pointing out to Winston Churchill, who would change from the Home Office to First Lord of the Admiralty in the same year, the demands of the army and navy during the gathering storms of war in Europe could have stopped the whole reform of the administration of anaesthetics. Blomfield retrospectively also blamed the threatening situation in Europe for stopping the bill.<sup>155</sup> The same bill would lead to a ban on nurse anaesthetists, who had been previously employed in the British Army during the Boer War. This would lead to a shortage of manpower to administer anaesthetics in the field hospitals and was also not expedient at that time.

And finally, there was an easy way out for the politicians. The extent of the problem was uncertain. The Coroners’ Committee had emphasized that it was not clear whether all deaths were reported, whether all deaths were attributable to the anaesthetic and whether a rise in the number of deaths was due to better reporting or to more surgery. Above and beyond this, the known number of anaesthetic deaths was too small, several hundred a year, to be politically important. The Coroners’ Committee recommended a permanent committee that would study the problem in more depth. This task was eventually given to the Medical Research Committee. It returned the discussion to the safety and purity of anaesthetic drugs, an easy and harmless subject like the discussion on ether and chloroform in the 19<sup>th</sup> century. Discussion about drugs like chloroform and nitrous oxide was still easier than discussion about the competency of persons and imposing limitations on daily surgical care. It was not the first time and would not be the last time that the discussion about legislation and specialization was clouded by technical manoeuvres.

The whole issue had been deposed from the political agenda and would not return in the same form. Not until after the Second World War, with the reorganization of intramural healthcare in Britain would the question of who would be recognized as a qualified anaesthetist arise again.

153 Boulton, *The Association of Anaesthetists* (1999) 5.

154 Minutes Privy Council Office. No. 106580 regarding ‘The anaesthetics bill’ (1911). PC 8/754, National Archives, London.

155 Blomfield, ‘Sir Frederic William Hewitt’ (1927) 118.

## 2.6. Chapter review

By the end of the 19<sup>th</sup> century surgery had undergone major changes. Hygiene and anti-sepsis had moved surgery from homes to hospitals, which were spaciouly constructed and had enough fresh air and light. Surgical survival rates had increased. The extent of surgical procedures had increased. Surgery had changed from rapid and destructive to elective and reconstructive, thanks in no small part to the introduction of inhalational anaesthesia. Because this general anaesthesia was considered to be only as safe as its administrator, it became relevant to state who would be responsible for the administration of anaesthetics in hospitals.

In Britain the hospitals were free markets, based on charity and private enterprise. The government did not play a role in this field; there were almost no university hospitals. Neither was the government involved in the registration of medical specialists. That field was controlled by the Royal College of Surgeons and the Royal College of Physicians. Both had the same rights including the licensing of doctors and specialists. The surgeons, originally detached from medicine, had a strong and separate position. They considered themselves to be higher in the pecking order than any other medical practitioner. They were Misters, not doctors. British surgeons were therefore not committed to the administration of anaesthetics. In their textbooks they paid merely cursory attention to it. Actually in Britain anaesthesia was born as a foundling. Every medical or dental professional and even non-medical persons could enter the hospital and administer anaesthetics. Around 1890 a group of general practitioners, especially those active in London, began to call themselves 'anaesthetists' and took the initiative of claiming this part of medicine. In the uncontrolled field of practice these anaesthetists had to organize and fight for their existence. One of their actions was the establishment of the Society of Anaesthetists and the publication of its scientific transactions. These anaesthetists did not want to perform all of the anaesthetic procedures in every hospital. While they claimed the teaching and the scientific domains of anaesthesia, its administration could be left to well-trained medical personnel. An attempt by the professional anaesthetist Hewitt to make the principle that only sufficiently educated medical personnel would be allowed to administer anaesthetics a law failed in 1911 due to lack of support, overwhelming opposition and a lack of political significance.

Chloroform, ether and combinations of them were the routine anaesthetics. In their administration the safeguarding of a free airway and accurate dosage were the main concerns. The administration of anaesthetics in a regulated flow of oxygen and/or using nitrous oxide as a propellant (gaseous anaesthesia) was the most reliable. To maintain a free airway varying techniques were available of which intratracheal insufflation in 1914 was the latest innovation. The steel surgical instruments industry provided the steel masks for the administration of anaesthetics. With the introduction of gaseous anaesthesia the gas compressing industry became a newcomer in the anaesthetic market.

In Germany the hospital world was different from Britain. Like the whole society the hospitals had a strong central administration. The many university hospitals were



centres of rationally formed circles of non-university hospitals. The registration of doctors and specialists was in the hands of 'Ärzttekammern' that had some state control. In this organization of hospital care the new domain of anaesthesia became an integral part of the surgical specialty and several surgeons were particularly interested in anaesthesia. Their textbooks contained comprehensive anaesthetic chapters. German surgeons on the whole were more engaged in the general medical care of their patients than their British colleagues. German surgeons practiced a holistic approach to surgery, which led to the phenomenon that the administrators of anaesthetics were students and members of the surgical staff and were under the quality control of the medical head of the surgical department. However, not everyone was content with this situation. Some idealized the British 'specialists'.

In Germany the same anaesthetics were used as in Britain. The manifold assertion of the predominance of chloroform in the historiography, explaining the presence of professional anaesthetists in Britain, can definitely be put aside. Ways to accurately dose the anaesthetic and preserve a free airway, including intratracheal insufflation were the same as in Britain. Two other techniques for anaesthesia were typically German: the application of 'Rauschnarkose' and the application of local anaesthesia. Both needed the close cooperation of the surgeon and the administrator of anaesthetics. In the integral approach of German surgeons this was easier to realize than in the compartmentalized kind of medical care in Britain. Since the administration of general anaesthetics was the same, the anaesthetic instrument industry in Germany was also the same as in Britain. Actually British and German manufacturers and wholesalers worked together and provided products mutually.

By 1914 the situation with regard to anaesthesia in Britain and Germany differed in how it was embedded. In Britain it was a wilderness with a limited group of professional anaesthetists. In Germany anaesthesia was strictly controlled by surgery. German surgeons were responsible for the safe administration of anaesthetics. When this situation is set alongside the phases of specialization, Britain was on the threshold of the second phase of specialization. The professional practitioners of the administration of anaesthetics had formed a society and were publishing a journal. Germany was in the first phase of specialization. There were practitioners, almost all of them surgeons, especially interested in the administration of anaesthetics, performing experiments and publishing, but they did not yet cooperate in this special field of medicine.



## 3. The Great War 1914-1918

‘Krieg, der blutige Lehrmeister’<sup>1</sup>

Ferdinand Sauerbruch on the Great War in his memoirs, 1951.

### 3.1. Preview

At the outbreak of the Great War anaesthesia in Britain and Germany differed in how it was embedded, not in its techniques. In Germany it was a part of surgery, in Britain it was a wilderness where anaesthetists struggled to gain a foothold.

Compared to the entire period covered in this book, the period from 1914 to 1918 is quite short. Nevertheless it is described separately, with a focus on the intense military conflict of those years, with its unprecedented numbers of casualties. In the history of medical specialization war is often considered an opportune market for medical care and medical specialization in general. The specific opportunities for medical specialization during a war are supposed to be the concentration of many patients with similar disorders in specialized (military) settings and, in principle, significant financial as well as human resources. This theory however is not undisputed. A selective use of the Great War in the development of an anaesthetic specialty is observed in Chapter 1. In this chapter the story of what the Great War meant for anaesthetic care in the British and German Army Medical Services and in the mutual civil societies will be told. Did the war lead to the development of special anaesthetic techniques? Who were the administrators of anaesthetics in the armies and what was their level of training? But first the story of the differing involvement of Britain and Germany in the war on the European continent will be told. Numbers and scales will be shown to have been relevant to the impact of the war on anaesthetic care, not only at the front but also at home.

<sup>1</sup> ‘War, the bloody teacher.’

### 3.2. The scenery of the Great War

The war that raged from 1914 to 1918 mainly on the European continent and the Middle East bears several names. The Germans named it the 'Weltkrieg', World War, while the British named it the Great War. During the war the American president Woodrow Wilson tried to put it down in history as the War to end all Wars but with the armistice in 1918 it became the War without End. Its name would later be changed to the First World War so that the war that raged from 1939-1945 could be named the Second World War. These numerical names for wars are confusing because Winston Churchill in his 1954 book, *A History of the English-Speaking Peoples*, referred to the Seven Years' War from 1756-1763 about colonial possessions in the new world between Britain and France as the real First World War.<sup>2</sup> Whatever the case may be, in this chapter the term 'Great War' will be used to indicate the 1914-1918 war.

Many causes for the Great War have been indicated, varying from the formation of international alliances to the political vacuum in the Balkans after the disintegration of the Ottoman Empire to a family quarrel between the Russian tsar and the German emperor. The most basic cause however, as for all wars, was an economic interest. Warfare is very expensive, so there has to be some economic gain or at least it has to be expected. The international economy in the 19<sup>th</sup> century was dominated by the British. All parameters usually applied to sketch the development and prosperity of any country in the world indicated this. Britain had the highest Gross Domestic Product in the world and in 1880 had a threefold lead in industrial potential, compared to Germany for instance.<sup>3</sup> This was the result of the industrialization sweeping the world that had started in Britain in 1780. The industrial revolution had not only meant a switch from the use of wood to coal fuel but also led to a complex of social processes including economic growth, urbanization, the division of labour and a shift from the production of primary goods (food) toward the production of secondary goods (industrial products) and tertiary goods (the service economy, including healthcare).<sup>4</sup> Britain, not afflicted by wars on its own territory, was able to achieve a high level of industrialization and social stability.<sup>5</sup> This position as the leading economy was secured by its complete superiority at sea since the victory of the Royal Navy under Horatio Nelson at Trafalgar in 1805 which guaranteed Britain access to its worldwide colonies and dominions, providing it with an abundance of raw materials, a cheap labour force and a world market for its products.<sup>6</sup>

The state of Germany had been founded in 1871 from many independent states in Central Europe, the Kingdom of Prussia being the largest. Unlike Britain its industrial revolution had not started in every state at the same time and had only really gotten

2 Churchill, *A History of the English-Speaking Peoples III* (1957) 123.

3 Maddison, *Monitoring the World Economy* (1995) 23, 231. Ferguson, *The Pity of War* (1998) 35. See Graphs section.

4 Deane, *The First Industrial Revolution* (1965) 1.

5 Trevelyan, *English Social History* (1944) 557-562.

6 Millett, *Military Effectiveness* (1988) 72-73.

underway since 1850.<sup>7</sup> Consequently Germany was behind Britain in terms of gross domestic product, urbanization, and the numbers of its labour force active in the service industry, including healthcare and hence the lowering of infant mortality and number of doctors.<sup>8</sup> At the turn of the century the German economy was still smaller than the British but it had begun to grow faster.<sup>9</sup> The new nation, the largest in the centre of Europe, did not want to miss its chance in the scramble for colonies and the race to industrial power. Like Britain and France, Germany wanted to become a world power and hence had to be able to defend its colonies and, even better, expand them in order to secure the supply of raw materials for its industrial revolution. This process has been called 'Griff nach der Weltmacht', the grasp of world power.<sup>10</sup> The main fuels of the industrial revolution, iron and coal, were readily available, but other essential raw materials for industrialization like oil and especially rubber were not.<sup>11</sup> From the end of the 19<sup>th</sup> century rubber had played an important role in the industrialized world. It was a main raw material for machines, pumps, bicycles, automobiles and last but not least war machinery. At first the Belgian Congo, the private property of the King Leopold of Belgium, was the main producer of red rubber. Later competition from South America and Asia set in. British Malaya was to become the main exporter. For Germany, possessing few and unproductive colonies, the supply of raw materials became a strategic and political problem in its attempts to become a world power. In fact a main reason for the establishment of the new state of Germany at the end of the 19<sup>th</sup> century was to build up its naval and land forces. This was watched by France and Britain with great suspicion. The Great War therefore did not come out of the blue. Neither was the Great War a surprise for the army medical services of the European powers, the Royal Army Medical Corps for Britain and the 'Heeressanitätsdienst', the army medical service, for Germany. Like the field forces, the army medical services had been preparing for war since the turn of the century. The services had been purchasing medical equipment. An interesting manifestation of this is that around the turn of the century almost all surgical instrument wholesalers in Britain as well as in Germany included a special section of military field equipment in their catalogues.<sup>12</sup>

In the first decades of the 20<sup>th</sup> century the rising tensions about worldwide economic interests and the accompanying arms race were waiting for a spark to set them off. It was the assassination of the Archduke Franz Ferdinand of Habsburg, heir presumptive to the Austro-Hungarian throne, in Sarajevo by Gavrilo Princip on June 28<sup>th</sup> 1914 that set this powder keg off and what followed was the largest and bloodiest international military conflict ever. The uncontrollability of this war was due to the fact that the underlying

7 Cipolla, 'The industrial revolution' (1973) 13. Fremdling, *Industrial Revolution* (1996) 4.

8 See Graphs section.

9 Ferguson, *The Pity of War* (1998) 35.

10 Martel, *Origins of the First World War* (1987) 8-9. Millett, *Military Effectiveness* (1988) 104-105.

11 Teich, *The Industrial Revolution* (1996) XVI.

12 Arnold, *Catalogue of surgical instruments* (1904) 1-26. Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 35-38. Allen, *Catalogue of surgical instruments* (1910) 12.

cause was far greater than a gunshot in the Balkans. As expounded above the control over worldwide trade and colonies by states and alliances was at stake. In fact it was the same dissension that had led to the Seven Years' War 150 years earlier.

Although Britain and Germany, next to France and Russia, were principle figures in the Great War their involvement was not the same. Germany fought a territorial war on its western and eastern borders. For Britain the Great War was fought mainly on one front in France and in Flanders. Military operations elsewhere, like the Dardanelles or the Gallipoli campaign in the eastern Mediterranean Basin, were disastrous for Britain and its Commonwealth forces, but they were limited expeditionary battlefields. In fact Britain never fought territorial wars, only expeditionary wars. This was due to the natural strategic position of its unassailable home island. Its own territory was almost never threatened. The armed forces, with a leading role for the Royal Navy, were put into action overseas only when Britain's worldwide interests were threatened.<sup>13</sup> The expeditionary nature of Britain's warfare will prove to be important in the context of this book because it also influenced the demands for military medical care. The different impact of the Great War for Britain and Germany is illustrated by the numbers and percentages in their tolls of those mobilized, killed and wounded (Table 3).

**Table 3. Approximate inhabitants, military servicemen, their deaths and wounded in the Great War from 1914-1918.**

	Inhabitants	Mobilized (percentage of population)	Deaths (percentage of population)	Wounded (percentage of population)
Britain	41.000.000	4.500.000 (11%)	700.000 (1,7%)	2.000.000 (4,9%)
Germany	64.500.000	13.200.000 (20%)	2.000.000 (3,1%)	4.500.000 (6,9%)

Sources: General Annual Report of the British Army 1912-1919. Parliamentary Paper 1921, XX, Cmd.1193; *History of the Great War. Medical Services*. Mitchell 1931. p. 5 and 12; *Sanitaetsbericht über das deutsche Heer, (deutsches Feld- und Besatzungsheer), im Weltkriege 1914-1918*, Volume 3, Sec 1. Berlin 1934 p.12 and pp 62-6.

Note: This table shows Britain's reduced involvement in the war compared to Germany

<sup>13</sup> Barnett, *Britain and Her Army* (1974) 18-19.

### 3.3. Military medicine

During the 19<sup>th</sup> century military medicine had become an important and significant service to the army. For the benefit of the fighting forces it selected healthy soldiers, kept them fit for fighting, relieved the active fighting troops from the burden of having wounded comrades with them and healed wounded soldiers as quickly as possible to send them back to the front. For the benefit of the individual soldier it provided the reassurance that if he was hit, the army would be able to take care of him. This was supposed to enhance the willingness of the soldier to go to war and for the home front to send its sons to war. It suggests that an enemy might shoot a hole in soldiers, but medical facilities can fix it again. Especially in an expeditionary situation, when the soldier's home and family are not directly threatened, good medical care is a *sine qua non* and very sensitive to public opinion and social pressure. In this last respect the Crimean War (1853-1856), sometimes called the first modern war, had been a turning point. The appearance of war correspondents whose stories were cabled to England and published the same day in the newspapers made it clear that the healthcare provided by the military for the individual soldier was as yet quite insufficient. This mobilized public opinion and the politicians and led to improvements in training, housing and supplies. Military hygiene became the focus because a frequent cause of army attrition was infectious diseases and wound infections. During the Crimean War, the American Civil War (1861-1865) and the Franco-Prussian War (1870-1871) one-third of the soldiers who died of their injuries died before any medical care could reach them. The other two-thirds died of their wounds later, most often due to complications from infection. This rough 1-to-2 relation began to change with the Russo-Japanese War (1904-1905) when deaths from wounds diminished due to the application of antiseptics.<sup>14</sup> Like all medicine military medicine is a learning process. Each war led to new and greater knowledge and medical reports from the wars became reference points for military medicine. These reports were published after the war and were not military secrets. They were studied by military medical policymakers from all countries and were used to update doctrines.<sup>15</sup>

#### 3.3.1. Military surgery

Military surgery is one aspect of military medicine. Although hygiene, infectious diseases, neurology and psychiatry contribute at least as much to military medicine as surgery, in the context of this book surgery is the most relevant discipline to the consideration of anaesthetic developments. In the end, without surgery there is no need for anaesthesia. Military or combat surgery has always been different from civil surgery. The injuries are different, and penetrating injuries predominate. The ever-growing firepower over the centuries made these penetrating injuries more severe and hence more lethal. For this reason separate textbooks were issued dedicated to military surgery, both in Britain

<sup>14</sup> Bellamy, 'Combat Trauma Overview' (1997) 18.

<sup>15</sup> War Office, *Reports from medical officers* (1871).

and Germany. There was no appreciable difference in general idea of surgical treatment described in the military surgical textbooks in both countries.

*The development of echelon-based surgical care*

Since the Napoleonic Wars combat surgical care had been characterized by an echelon-based system with a line of evacuation behind the battlefield. This system was almost the same in the British and German forces. Actually, a staged system like this had been copied by Britain from the Continental forces.<sup>16</sup> Basically, medical care began in the collecting zone, which was the front line itself, and simple, improvised and movable medical facilities were located immediately behind the front. These were called Advanced Dressing Stations or 'Truppenverbandplatz', troop dressing stations. If necessary the patient was transferred from the collecting zone to the evacuating zone, which had more stationary facilities where the patient could be admitted for a longer time and where more medical facilities were present. In the British forces these were the Casualty Clearing Hospitals, during the war renamed Casualty Clearing Stations. In the German forces these were the 'Hauptverbandplätze', main dressing stations, and 'Feldlazaretten', field hospitals. If the patient's medical condition was too serious or if there was no prospect of return to the battlefield the patient was transferred from the evacuating zone to the distributing zone, which might consist of hospitals far behind the front or in the homeland. In fact it is comparable with the civilian situation with general practitioners close to the patient's home and visiting the patient there, the first aid stations in hospitals and the hospitals themselves. The big difference is the transport problem during a military conflict. During the Crimean War the growing transport alternatives by ship and train improved the transfer system between facilities considerably, but railways can be damaged by bombing and harbours are not always available and accessible. Therefore the line of evacuation was not as solid as it was depicted. Military manuals repeatedly emphasized that the functioning of the line of evacuation depended on the intensity of the fight, the mobility of the war and the availability of transport. Flexibility was the keyword, with the facilities in the evacuation zone being the pivotal point. Within this zone the facilities could change from clearing station to surgical hospital to convalescent station and back.<sup>17</sup>

In the line of evacuation, surgery was in principle postponed as long as possible and only the most urgent procedures, like bleeding control, including amputation, and tracheotomy were performed in the first echelons. During the Great War this would change when the conservative treatment of wounds recommended by Ernst von Bergmann (1836-1907), Professor of Surgery at the University of Berlin and Friedrich von Esmarch (1823-1908), Professor of Surgery in Kiel was replaced by the more aggressive treatment with early repeated excision of debris and necrotic material that was described by Paul Leopold Friedrich (1864-1916), Professor of Surgery at the University of Königs-

16 Macpherson, *Medical Services. General History I* (1921) 10.

17 War Office, *RAMC training manual* (1911) 102-134. Bopp, *Alfred Schönwerth* (2002) 59.



berg.<sup>18</sup> Repeated wound toilets for shell injuries, especially when transfer to a clearing station would take too long, were regarded as urgent surgery and performed on the front lines.<sup>19</sup> This policy meant that anaesthetics in both forces had to be administered in all echelons of the line of evacuation.

### *Shock treatment*

In military surgery circulatory and physiological instability due to blood loss was well known. Its clinical picture was recognized by anxiety, agitation, thirst, hypothermia, vomiting, sweating, flaccid respiration, cyanosis and low blood pressure. In Britain as well as in Germany blood transfusion had always been the key treatment since its introduction in the first decades of the 19<sup>th</sup> century; it was much more common than in civilian practice. Karl Seydel, who taught a surgical course for military doctors in Munich, wrote: 'Wohl keine Operation ist mit der Geschichte der Kriegschirurgie so eng verknüpft als die Operation der Transfusion, welche mehr denn jede andere berufen schien, das fliehende Leben des Verwundeten auf dem Verbandplatz zurückzurufen.'<sup>20</sup>

The application of sympathicomimetics, common in civil practice, was always an option but the restoration of lost blood was the primary goal.<sup>21</sup> However, just before the Great War there had been a dip in the popularity of blood transfusion due to ongoing problems with clotting, incompatibility and transfusion fever.<sup>22</sup> The infusion of electrolyte solutions, including sodium chloride and sodium bicarbonate, which had been available since the 1890s was introduced to replace blood transfusion.<sup>23</sup> In Britain Burroughs Wellcome introduced a ready-to-use intravenous solution for this purpose.<sup>24</sup> These electrolyte solutions had another advantage: they could be administered subcutaneously while blood always had to be administered intravenously. With the use of electrolyte solutions a venous cut down and the risk of a dislocation of the steel intravenous cannula could be avoided. But during the Great War the experience that these electrolyte solutions had only a temporary beneficial effect on the circulation was reconfirmed. In a following phase, colloid solutions that were supposed to remain in the circulation longer were advocated.

18 Rogowitz, *Die Wundbehandlung in den Kriege* (1980) 437.

19 War Office, *RAMC training manual* (1911) 113-114. Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 235. Hughes, *War Surgery* (1918) 264-265. Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer II* (1938) 768-770. Bopp, *Alfred Schönwerth* (2002) 26.

20 'No operation is as closely related to the history of war surgery as the blood transfusion, which more than any other seemed to recall the fleeting life of the wounded in the dressing station.' Seydel, *Lehrbuch der Kriegschirurgie* (1893) 39.

21 Hull, *Surgery in war* (1916) 20.

22 Seydel, *Lehrbuch der Kriegschirurgie* (1905) 79-82. Rose, *A Manual of Surgery* (1911) 278. Wullstein, *Lehrbuch der Chirurgie* (1912) 41. Oettingen von, *Leitfaden der praktischen Kriegschirurgie* (1912) 131; *2e Auflage* (1914) 132-133; *3e Auflage* (1914) 132-133.

23 Borchart, *Lehrbuch der Kriegs-Chirurgie* (1917) 119. Bazett, 'Shock and Haemorrhage' (1919) 410. Hughes, *War Surgery* (1918) 281.

24 Fiaschi, 'The administration of saline solutions' (1917) 794.

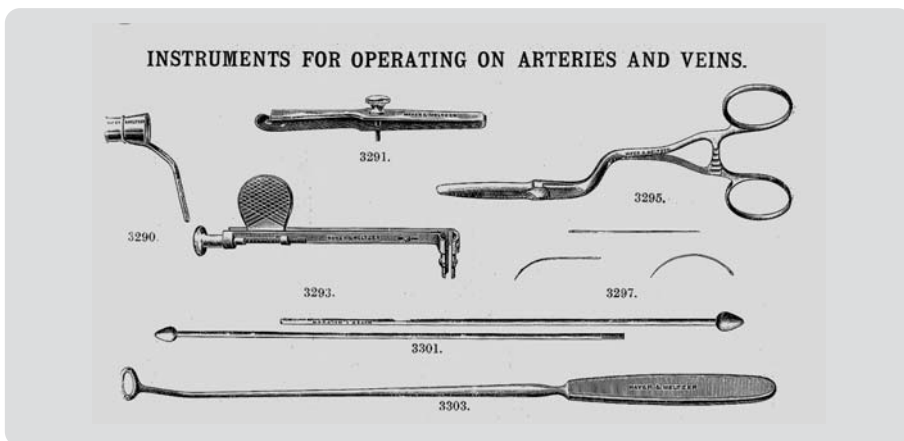


Figure 16. Instruments for direct and indirect blood transfusion according to Crile, Mayer & Meltzer, *Catalogue of surgical instruments* (1915) 171. The device top left was the actual connector between the artery of the donor and the vein of the recipient.

These were gum acacia 6% and gelatine 2.5%.<sup>25</sup> But in the end nothing was as lifesaving as blood. So during and after the Great War blood transfusion came into fashion again.<sup>26</sup> When the cross-matching of the blood groups of receptors and donors became available, physicians started to use defibrinated blood that could not clot, could be tested, stored and administered to the proper recipient later.<sup>27</sup> The most direct form of blood transfusion was the Crile anastomosis, named after the American surgeon George Washington Crile (1864-1943), known for his publications on shock. The anastomosis connected an artery in the donor directly to a vein in the recipient.<sup>28</sup> The arterial pressure of the donor pumped the blood from donor to recipient. When the donor's blood pressure started to fall the transfusion was stopped. In this way a litre of blood could be transfused in 25 minutes (Figure 16).<sup>29</sup> There are no indications that shock treatment, either in the British or in the German forces, was a task of the administrator of anaesthetics. This is understandable because their level of experience was uncertain and managing circulatory instability could be done by the surgeon simply by giving orders to other personnel. No physical handcraft was necessary, as with the administration of anaesthetics by face mask. Moreover, in civil practice this situation was the same. Remarkable but also illus-

25 Wallace, *Surgery* (1918) 271-275. Borchard, *Lehrbuch der Kriegs-Chirurgie* (1917) 119.

26 Bockenheimer, *Allgemeine Chirurgie* (1914) 143. Penhallow, *Military surgery* (1916) 21. Franz, *Kriegschirurgie* (1920) 129. Buxton, *Anaesthetics* (1920) 410-413.

27 Wallace, *Surgery* (1918) 277. Macpherson, *Surgery of the war I* (1922) 108-133.

28 George Washington Crile (1864-1943) was an American surgeon who published about the origin and treatment of shock from 1897. Mayer, *Illustrated catalogue* (1915) 171.

29 Wallace, *Surgery* (1918) 283.

trative is the *Manual of War Surgery* edited by Seymour Barling (1880-1960), a surgeon from Birmingham and consulting surgeon to the British Expeditionary Forces, in 1919. The chapter on shock and haemorrhage was written by a surgeon and contained the meaningful passage that ‘in the case of shock the anaesthetic and the anaesthetist has to be chosen carefully.’<sup>30</sup> Even in Britain with its professional anaesthetists control of the circulation was the surgeon’s responsibility.

### 3.3.2. Manpower problems on both sides

While the knowledge, the material and the doctrines for army medical care were in place, the men were not. An army cannot train all its medical officers itself. The training takes too many years and when the medical officers are ready it is too expensive to keep them in the army during peacetime. Moreover the capacity that is needed can vary considerably according to the extent of the military conflict and is hence difficult to predict. To fill these ranks a wartime army mobilizes large numbers of civilian medical personnel.

During the Great War Britain mobilized 12,700 doctors of the 41,940 total numbers of doctors registered by the General Medical Council. This meant one doctor for every 354 mobilized servicemen, while in peacetime civil practice the relation was one doctor for every 1,200 civilians. Withdrawing 30% of doctors from civil medical practice brought about tensions with the civil health authorities. Therefore during the war the army decided to send fourth- and fifth-year medical students, who had interrupted their study and enlisted in other ranks, back to the medical schools to complete their medical study and then to enlist as medical officers. Another relief for the medical services was the employment of some 1,400 American medical officers in the British army after the entry of the US into the war in 1917.<sup>31</sup>

Germany deployed a total of 26,292 medical doctors during the war in land and marine forces. This meant one doctor for every 502 servicemen, while in peacetime civil practice the relation was one doctor to 2,000 civilians. At the beginning of the war Germany had some 33,000 doctors throughout the country. To meet the demands of the army, doctors were not only withdrawn from civil practice; the largest number of doctors for the army, some 18.000, were recruited through ‘Notprüfung’, a shortened graduation from medical study. Notwithstanding these emergency measures the shortage of doctors in the German army rose from 10% to 30% over the four years of the war. Specialized doctors were the least available; they stayed in the last echelon, the distributing zone in the university and larger hospitals at home.<sup>32</sup> Some of them were assigned as ‘Beratender Chirurg’, consultant surgeon, to coach the doctors in the field from a distance.<sup>33</sup> The work

30 Bazett, ‘Shock and Haemorrhage’ (1919) 402.

31 Macpherson, *Medical Services. General History I* (1921) 147-150.

32 Schjerning von, *Handbuch der ärztlichen Erfahrungen* (1922) IX. Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer I* (1935) 30-33.

33 Hoffmann, *Die deutschen Ärzte im Weltkrieg* (1920) 310.

in the field was mainly done by non-specialized doctors. 'Nicht überall und sogleich ist fachchirurgische Hilfe zur Stelle, und zahlreiche Ärzte, welche in Frieden auf andere Gebieten der Heilkunde tätig waren, sind gezwungen, sich chirurgisches Denken und Handeln anzugewöhnen.'<sup>34</sup>

What is the meaning of these rough numbers? They show that Britain and Germany withdrew 25-30% of their doctors from civil practice. Although Germany supplemented this with a large number of doctors trained in a crash-course for the army, there was still a lower density of medical personnel in the German forces than in the British forces. This difference was caused by the lower scale of the conflict for Britain and its more comfortable starting point with almost twice as many doctors compared to Germany in the pre-war years (Graph 1). Especially for Germany this way of filling the ranks of medical officers resulted in low levels of experience in the army medical services.

### 3.4. Anaesthesia in the army: as simple as possible

The above-mentioned aspects of military medicine and surgery during the Great War: manpower problems, surgery in great numbers in every line and low levels of experience, had consequences for the management of anaesthetics. These consequences can be divided into technical and personnel-organizational aspects.

#### 3.4.1. Anaesthetic techniques

Despite the different kinds of injuries seen during wartime, the type of surgery required, with repeated wound toilets, wound dressings, amputations and laparotomies was not so different from civil practice that it required other or new anaesthetic techniques. On the contrary, with the level of anaesthetic training and experience being low, the anaesthetic technique had to be as simple as possible. The mask and drop bottle techniques from civil practice were applied in military practice in the same way. This is reflected in the textbooks dedicated to military surgery and the official medical reports from the Great War in both countries, with a predominant role for safe respiratory management.

#### *In the German forces*

As in civilian practice all German military surgical textbooks paid attention to the administration of anaesthetics, including considerations about technique. In the view of German military surgeons anaesthesia had to be as simple as possible. The preferred technique was a 'Tropfmaske', a mask and drop bottle, with ether or chloroform. Its simplicity had the logistical advantage of speed and minimal material demands especially in a situation with mass casualties.<sup>35</sup> The basic anaesthetic equipment of 'Tropfmaske',

<sup>34</sup> 'Specialized surgical assistance cannot be everywhere and at the same time on the spot; numerous doctors who practised other fields of medicine in peacetime have been forced to adopt the surgical way of thinking and acting.' Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 1.

<sup>35</sup> Läden, 'Der Schmerz' (1922) 48.

drop masks, 'Tropfflasche', drop bottles, 'Zungenzange', tongue forceps, and silver tracheotomy cannulas was standard equipment for a 'Sanitätscompagnie', medical company.<sup>36</sup> Indications for (prophylactic) tracheotomy were gunshot in the neck area with laceration of the larynx or trachea.<sup>37</sup> The 'Ätherrausch', flush anaesthesia, which Chapter 2 showed was already known in German pre-war surgery, pre-eminently met the demand of simplicity, provided that it was administered by a doctor trained in this technique. It was used for the repositioning of fractures and luxations, the incision of abscesses, wound dressings and even amputations in which the proximal fracture end was accepted as the amputation level.<sup>38</sup> In the German forces ether was even available in the 'Feldbesteck Manövertasche', field pannier, for use on the soldier lying in the field or in a trench.<sup>39</sup> This was not meant to anaesthetize the wounded soldier for surgery but to provide him some analgesia before he was moved to a collecting point.

More complicated and newer anaesthetic techniques like the overpressure administration of anaesthetics or the intravenous administration of ether were also mentioned.<sup>40</sup> Intratracheal insufflation, which had been introduced just before the Great War, was not mentioned in the German war surgery textbooks.

As it did in the civilian sector local anaesthesia had an important place in military anaesthesia in the German forces. It fit the desire for simple and efficient anaesthesia in the field hospitals. Fritz Härtel, an associate professor of surgery in Halle, propagated the extensive use of local anaesthesia in military surgery, especially in early surgery, on war casualties. When a local anaesthetic could be used for a surgical procedure this would spare the need for an administrator of general anaesthetics, medical or non-medical. This led him to report a percentage of 54.6% of instances of local anaesthesia during the war.<sup>41</sup> Läwen, the same surgeon from Leipzig who experimented with curare earlier but was also interested in local anaesthesia, developed an outline of 500 surgical procedures and the applied anaesthetic technique in a major surgical field hospital (Table 4).<sup>42</sup> Some 50% of these procedures were performed under local anaesthesia. This fifty-fifty rate of employment of local anaesthesia is reported in other instances.<sup>43</sup> It is important to note again that this was basic local anaesthesia by infiltration of the surgical field with a local anaesthetic. Regional anaesthesia, like spinal or lumbar anaesthesia, was controversial. Some considered it preferable to general anaesthesia, others

36 Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 34. Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer I* (1935) 90-3.

37 Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer II* (1938) 769.

38 Oettingen von, *Leitfaden der praktischen Kriegschirurgie 2e Auflage* (1914) 160. Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 20-21.

39 Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910) 36.

40 Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 11. Hoffmann, *Die deutschen Ärzte im Weltkrieg* (1920) 32-3. Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer I* (1935) 148.

41 Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 235-55.

42 Läwen, 'Der Schmerz' (1922) 49.

43 Heeressanitätsdienst, *Sanitätsbericht über das Deutsche Heer I* (1935) 220.

feared complications due to the troublesome hygienic circumstances in the field.<sup>44</sup> Carl Franz (1870-1946), a professor of military surgery in Berlin and the author of a series of books on this subject, added to this discussion that regional anaesthesia had to be performed by a doctor accustomed to this technique, usually not available in the military surgical setting.<sup>45</sup>

**Table 4. Anaesthetic techniques in a German major surgical field hospital in the Great War**

	Local anaesthesia	General anaesthesia	Combined local and general anaesthesia
Head	151	13	5
Neck	4	9	1
Thorax, back and genital organs	57	10	2
Laminectomy	3	2	1
Laparotomy	7	39	57
Upper extremity	13	39	1
Lower extremity	12	77	—

Source: Läden in Von Schjerning's *Handbuch der Ärztliche Erfahrungen* (1922) 49.

Note: This table shows the extensive use of local anaesthesia in the German army

A more detailed outline of wartime surgery and anaesthesia is given in a report from one of Germany's hospital ships, the Sierra Ventana, from August 1914 to November 1918. Of the 931 surgical procedures on this ship 54% were performed under local anaesthesia. Of the 15 thoracic procedures performed, all of which were rib resections, 14 were performed under local anaesthesia.<sup>46</sup> Remarkable in the report is the high number of procedures not related to war injuries. The list includes 301 appendectomies, 116 inguinal hernia corrections and 52 varicectomies. Around 200 procedures were related in some way to war injuries. This means that in the distributing zone, where the hospital ships were located, there was a transition to daily civil surgery.

A rate of more than half of the surgical procedures under local anaesthesia is at the least remarkable. It is a rate more frequent than it would ever be in civil practice, as will be shown in the next chapter. This phenomenon underlines the emphasis on simplicity

44 Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 239-44. Hildebrand, 'Kriegschirurgische Erfahrungen' (1917) 187.

45 Franz, *Kriegschirurgie* (1920) 40.

46 Verth zur, *Das Lazarettsschiff* (1920) 98-103.

in anaesthetic care in combat surgery. In the end general anaesthesia requires more facilities and is more labour-intensive than local anaesthesia.

*In the British forces*

The same simplicity of anaesthetic techniques used in the British Army can be garnered from the minimal inventory of their surgical units. Comparable to the equipment in the German forces, it consisted of drop bottles, tongue forceps, sponge holders, mouth gags, ether and chloroform inhalers, Schimmelbusch masks and tracheotomy instruments for endangered upper airways. The only slight difference with Germany might be the presence of oxygen cylinders, pointing at but not proving to more elaborate postoperative care.<sup>47</sup> Otherwise this was the most basic equipment for the most basic administration of anaesthetics in the field. The same arsenal of instruments had dominated the pages on airway management in textbooks and industry catalogues from the advent of inhalational anaesthesia. This basic, simple anaesthesia could be, as in civilian practice, the task of a general practitioner – in military terms, a medical officer. For this reason more advanced anaesthetic techniques were not mentioned in military surgical textbooks. These books discussed only marginally the more advanced intratracheal insufflation anaesthetic technique, which had been introduced just before the Great War. The indication in wartime surgery was abdominal surgery and procedures in or around the upper airways. By then an anaesthetist who was familiar with the Shipway apparatus for example was required to perform this technique. Considering the above-mentioned experience level of medical officers and the only casuistic mention of it, the application of these techniques must have been limited.<sup>48</sup> Another support for this thesis is the fact that the first standard anaesthetic machine for the Royal Army Medical Corps, produced by Coxeter and Son, was described for the first time in 1920, after the Great War had ended.<sup>49</sup>

Local anaesthesia, as an alternative to inhalational anaesthesia with all its hazards, had only a moderate place in British war surgery, as it did in civilian surgery. Some, like Alfred J. Hull, surgeon to the British Expeditionary Force, recommended it for thoracic surgery, mainly resections of one or more ribs.<sup>50</sup> Others advised general anaesthesia for this surgery.<sup>51</sup> The problem was that British surgeons, as was shown in the previous chapter, were not used to operating under local anaesthesia. Even in cases of surgery on the head or face, which was pre-eminently suited to local anaesthesia, a combination with general anaesthesia was used. If only general anaesthesia was used during facial surgery the intratracheal administration of ether was applied.<sup>52</sup>

47 Macpherson, *Medical Services. General history I* (1921) 413. Macpherson, *Surgery of the War II* (1921) 111.

48 Hughes, *War Surgery* (1918) 552. Wallace, *Surgery* (1918) 220.

49 Restall, 'Military anaesthesia' (1989) 193.

50 Hull, *Surgery in War* (1916) 27-28.

51 Murphy, *Wounds of the Thorax in War* (1915) 69-70.

52 Macpherson, *Surgery of the War II* (1921) 12-13, 27, 45-47.

### 3.4.2. Organizational aspects

The fact that anaesthetics had to be administered at every stage of the line of evacuation and the high level of flexibility that was demanded meant that all medical officers (and, as will be shown, in the German forces even non-medical personnel) had to be able to administer anaesthetics. Any specialization or limitation with regard to the administration of anaesthetics would lead to inflexibility and was highly undesirable.

#### *Royal Army Medical Corps (RAMC)*

For British surgeons, who were often assistant surgeons themselves, the anaesthetizing medical officers were the equivalent of anaesthetizing general practitioners and assistant surgeons in the civilian situation. Also in accordance with the civilian situation British textbooks on military surgery (Hull, Penhallow, Wallace and Hughes) did not pay systematic attention to the administration of anaesthetics.<sup>53</sup> All surgical books published during the Great War mentioned anaesthetics only for specific types of surgery. It was the *Manual of War Surgery*, written by Barling after the war in 1919, that for the first time contained a separate chapter on the administration of anaesthesia. This chapter was not written by a surgeon as were all the other chapters of the book but by the anaesthetist Ashley Skeffington Daly (1882-1977) from the London Hospital; he had been an anaesthetist in the Great War and would become the highest ranking anaesthetist in the Second World War. Although the organization of anaesthetic care was not the surgeon's responsibility, the surgeons recognized its value. In the Oxford War Primers series R. Morison, senior surgeon at the Northumberland War Hospital, considered a capable and sympathetic anaesthetist the greatest blessing and gave him a special place in an Operation Theatre plan (Figure 17).<sup>54</sup>

While capable anaesthetists might have been found in the war hospitals at home, in the field at the beginning of the war such a development was utopian. 'At first were administered by one or other of the medical officers. It was not until 1916 that special anaesthetists were appointed as additional officers on the staff of the Casualty Clearing Stations'.<sup>55</sup> Like in civilian pre-war anaesthetic care these anaesthetists did not strive to administer all anaesthetics. They advised and supervised the medical officers who administered anaesthetics. John F.W. Silk, one of the founders of the Society of Anaesthetists, was one of these anaesthetists with the rank of Lieutenant-Colonel in the Malta Command. After the war he dedicated his book on anaesthetics 'to the medical officers attached to the military and war hospitals in the Malta and home commands. As a tribute to their patriotism and devotion to duty and in acknowledgement of their unflinching courtesy to their former consulting anaesthetist (1915-1919)'.<sup>56</sup>

Towards the end of the war when the number of casualties was at its highest and shortages of medical officers were imminent '...these [medical officers and anaesthetists] were

53 For details on titles see bibliography.

54 Morison, *Abdominal injuries* (1915) 42-44.

55 Macpherson, *Surgery of the War I* (1922) 178.

56 Silk, *Modern Anaesthetics* (1920) V.



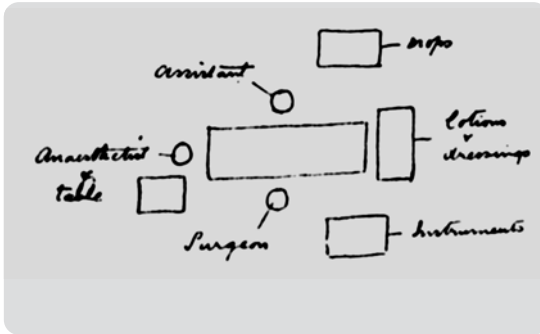


Figure 17. Plan of operating Theatre. Morison, *Abdominal injuries* (1915) 42. Note the position of the anaesthetist at his own table.

supplemented by over 200 nursing sisters who had been specially trained during the previous year. Their employment as anaesthetists proved of great service and many of them became very skilful. They also freed a corresponding number of medical officers for duty at the front when there was a serious shortage of the latter'. The actual number of nurse anaesthetists employed is uncertain. Not all of them were authorized by the Nursing Board of the War Office to administer anaesthetics.<sup>57</sup> Not only the Nursing Board opposed the employment of nurses for anaesthesia, the anaesthetists protested too. In their view the administrator of anaesthetics should be a doctor with proper training.<sup>58</sup> In all, the contribution of nurse anaesthetists seems to have been very limited.

#### 'Heeressanitätsdienst', *Army Medical Service*

As in civilian surgery and in contrast to Britain, German surgeons considered themselves responsible for the administration of anaesthetics. German military surgical textbooks dedicated thorough chapters to its administration and organization. As in civilian surgery the administration of anaesthetics had to be entrusted to a well-trained doctor; the surgeon was not capable of dividing his attention between the surgical procedure and the anaesthetics. Before the Great War the author of a series of military surgical textbooks, Karl Seydel, said that based on his experience in relatively limited military conflicts: 'Sind wir gezwungen zu narkotisieren, so übertragen wir die Narkose, wenn dies möglich ist, dem erfahrensten der Assistenten, welcher bereits viele Narkosen geleitet hat. Es gibt nichts Unangenehmeres bei einer Operation, als wenn der Operateur jeden Augenblick wegen Anomalien der Narkose mit dem Operieren aussetzen oder während der ganzen Narkose die Hälfte seiner Aufmerksamkeit auf dieselbe richten muss.'<sup>59</sup>

<sup>57</sup> Macpherson, *Medical Services. General history II* (1923) 165-166.

<sup>58</sup> Anonymous, 'The administration of anaesthetics' *BMJ* March 18<sup>th</sup> (1916) 425.

<sup>59</sup> 'When we are forced to anaesthetize, if possible we hand over the administration of anaesthetics to the most experienced assistant, who has already administered many anaesthetics. Nothing is more uncomfortable during an operation than when the surgeon has to stop surgery because of disturbances in the administration of anaesthetics or when he has to keep half his attention on the anaesthetic all the time.' Seydel, *Lehrbuch der Kriegschirurgie* (1893) 74; (1905) 129-130.

But the Great War with its unprecedented scale and the shortage of sufficiently trained medical personnel in the German army as explained above caused the surgeons to abandon their pre-war point of view. Facing the growing number of casualties and the growing shortage of medical officers they were naturally forced to accept the employment of non-medical personnel for the administration of anaesthetics. Simply because 'Geübte Narkotiseure waren nicht vorhanden. Die älteren Ärzte hatten alle Hände voll mit der Versorgung der massenhaft zuströmende Verwundeten zu tun und konnten nicht zur Narkose herangezogen werden. Die jungen Ärzte (Feldunterärzte) besaßen noch keine Erfahrung. Schwestern gab es nicht.' Just like in the British army these auxiliaries were not available at first. 'Das männliche Hilfspersonal, aus dem sich später brauchbare Narkotiseure heranziehen liessen, musste erst eingerichtet werden.'<sup>60</sup> The auxiliaries were non-commissioned officers who were charged with all non-sterile occupations in the operation theatre. These included 'die Überwachung des Zu- und Abtransportes der Kranken zwischen Operationssaal und Station, Lagerung, Injektionen, Anlegen des Bluteerschlauches, Ausführung des Narkosen und so weiter.'<sup>61</sup> 'Die Narkose konnte ohne Sorge einer Schwester oder einem Wärter überlassen werden.'<sup>62</sup>

The employment of non-medical personnel was afterwards expressly considered a compromise of the fine art of anaesthesia under the pressure of war circumstances. The supposedly uncomplicated anaesthesia given to wounded soldiers justified this compromise. Carl Franz in the first edition of his *Kriegschirurgie* said that '... die Allgemeinnarkose von einem Angehörigen des Sanitätspersonals gemacht worden kann. Letzteres erscheint auffallend, denn die Narkose gilt mit recht als eine feine ärztliche Kunst. Allein es ist die Tatsache wichtig, dass die Narkosen beim verwundeten Soldaten viel einfacher und störungsloser sind, als wir es sonst im Frieden zu sehen gewöhnt sind.'<sup>63</sup> This concept of minor or simple anaesthesia, the administration of which did not demand a high level of training, will be coming back in the following chapters as a constant hindrance to establishing the exclusivity of the administration of anaesthetics.

60 'Trained administrators of anaesthetics were not at hand. The older doctors were busy caring for the mass of incoming wounded and could not be employed for anaesthesia. The younger doctors (field assistant doctors) had no experience. Neither did the nurses'; 'Male auxiliaries, from which later employable administrators of anaesthetics were recruited, had to be arranged first.' Läwen, 'Der Schmerz' (1922) 48.

61 '...the control of the transport of patients to and from the operation theatre and the ward, positioning, injections, application of tourniquets, administration of anaesthetics and so on.'; 'The administration of anaesthetics could be entrusted without a problem to a nurse or an attendant.' Härtel, 'Die Wahl des Betäubungsverfahrens' (1917) 2, 33.

62 Hildebrand, 'Kriegschirurgische Erfahrungen' (1917) 187.

63 '... general anaesthesia can be performed by a member of the nursing staff. This seems unusual, because anaesthesia is rightly considered a fine medical art. It is however important that the anaesthesia for a wounded soldier is much more simple and trouble-free, than we are used to experiencing in peacetime.' Franz, *Kriegschirurgie* (1920) 38.

### 3.5. The situation at home

In Germany the situation on the battlefield with shortages of human and material resources had its repercussions for the home front. The drain of assistant surgeons, doctors, crash-course trained doctors and medical students to the army deprived the hospitals at home of much of their assisting medical personnel. Because of this the heads of the surgical departments were forced to employ auxiliary nurses to administer anaesthetics. This is dramatically shown in the operation registers of the Charité Krankenhaus between 1912 and 1916. In 1912 there had as usual been a mix of administrators of anaesthetics or 'Narkotiseure', including doctors, surgical staff and medical students. The change came in 1916 when the only administrator of anaesthetics, if stated at all, was 'Schwester Meta', Nurse Meta. Under the circumstances there was no opposition to this policy. Every German, also those at home, wanted to win the war. The consequences of this change in the manning of anaesthetic positions in German hospitals cannot be overestimated. Its effect would last long after the armistice of the Great War, would back off in the interwar years and be revived during the Second World War.

In Britain a shift towards the non-medical administration of anaesthetics is not detectable. In the Withington Hospital in Manchester for instance in 1916 all anaesthetics were administered by doctors, although not dedicated doctors; they were all members of the surgical house staff. This adaptation to prevailing circumstances meant that anaesthesia remained a medical occupation and it could be reversed easily in the years after the Great War.

### 3.6. Chapter review

At the outbreak of the Great War anaesthesia in Britain and Germany differed mainly in the way it was embedded and not in its techniques. In Germany anaesthesia was a part of surgery, in Britain it was a wilderness where anaesthetists tried to gain a foothold. Although the Great War was not fought on British or German territory itself, it had consequences for the civilians in both countries. A war of such proportions is not limited to the army. A multitude of servicemen is needed for support of all sorts, including healthcare, while at the same time healthcare for civilians must continue. Civilian and military societies are communicating vessels in such situations.

In 1914 Britain and its Royal Army Medical Corps were prepared for the inevitable war. The Great War however, would be different from earlier wars especially in its unexpected and unprecedented scale. This led to a withdrawal of 30% of doctors from civilian healthcare. Thanks to the relatively high number of doctors in Britain, the expeditionary character of the war for Britain and the fact that inexperienced young doctors tended to enlist and the older and more experienced doctors tended to stay at home, civilian healthcare in Britain was, with regard to anaesthesia, not much affected by the drain on medical personnel. There was an opposite effect in the army. The young

medical officers knew merely the outline of what to do. The army manuals described ranking and logistics, not the substance of surgical care or anaesthesia. The scarce numbers of textbooks on military surgery, like their civilian analogues, did not consider anaesthesia. British military surgeons were not committed to anaesthesia, just like those at home. At the same time the demand for anaesthesia for fracture repositioning, amputations and repeated wound toilets in all stages in the line of evacuation was enormous. Young medical officers functioned as unqualified administrators of anaesthetics in the hospitals. Scarce professional anaesthetists like Silk, one of the founding members of the Society of Anaesthetists, stayed at a distance and were consultants to the army. The lack of experience in the field resulted in simplicity in the administration of anaesthetics, with versatility as the dominant factor. Steel masks and drop bottles were the routine instruments.

Compared to Britain the German army medical service, saw an even larger mass of casualties and therefore experienced a larger and, in the end, insufficient mobilization of doctors. A shortage of everything, medical personnel in particular, was the dominant factor. As they did on the home front the German military surgeons considered the administration of anaesthetics to be an integral part of surgical care. Shortages in medical personnel were compensated for by the employment of a mix of persons with varying levels of training who reported to the surgeon. In principle every medical assistant and auxiliary was to be able to administer anaesthetics. Their level of experience was generally very low to non-existent. At home the situation was the same. The drain of medical personnel from the home front to the battlefield led to the introduction of 'Narkose-schwester', anaesthetic nurses, in the civil hospitals. The anaesthetic techniques were the same or even more simple than in civilian practice and did not evolve. They were satisfactory for the type of surgery required. 'Rauschnarkose' sufficed for short procedures like changing dressings or fracture repositioning. Local anaesthesia was applied in 50% of the procedures.

When the war stopped the British anaesthetists were in the same situation as before. No new techniques had been introduced, specialization did not progress. Germany experienced a shifting of tasks, even a kind of 'despecialization' within the surgical team. When this situation is laid alongside the phases of specialization the British anaesthetists were still in their second phase of specialization. Germany was still in its first phase of specialization within an existing specialty: surgery.

## 4. The interwar years 1918-1939

‘Unendlich viel, ja fast alles hängt vom Narkotiseur ab’<sup>1</sup>

Gerhard Düttmann in the *Klinische Wochenschrift*, 1924

### 4.1. Preview

The Great War had not led to anaesthetic specialization. The immediate effect of the war had even been a process of ‘despecialization’. The keywords for anaesthetic management had been flexibility and maximal availability, in time and in place. Against the background of shortages of medical personnel this had led to simplification and the employment of non-medical administrators of anaesthetics. It has also been shown that this effect of the Great War was basically the same for Britain and Germany; however the extent of the effect had been greater for Germany than it had been for Britain.

In the following chapter the thread from before the Great War in British and German operating theatres will be picked up again. From both sides the story of how they dealt with the main inheritance of the war, nurse anaesthetists and ‘Narkoseschwestern’. In Britain the professional anaesthetists were as uncompromising towards them as before the war. In Germany the surgeons, still the rulers of anaesthetics, learned to live with anaesthetic nurses. Meanwhile innovations went on. In German and Swiss pharmaceutical laboratories one of the main anaesthetic innovations was brought forth. It was intravenous anaesthesia as alternative, next to the existing local anaesthesia, for inhalational anaesthesia. In British operating theatres inventive anaesthetists made endotracheal intubation applicable. Industrial involvement increased. But with every innovation the administration of anaesthetics became more complex. More choices were possible and hence the questions ‘Who is competent to administer which anaesthetic technique?’ and ‘Shouldn’t the administration of anaesthetics be a postgraduate specialization?’ became relevant again.

<sup>1</sup> ‘Endlessly much, if not everything, depends on the administrator of anaesthetics.’

## 4.2. Armistice

Britain survived the war in relatively good condition. There had been no war damage to the home island, industrial production had grown throughout the war years, and the loss of human lives had been, compared to Germany and France, low. Most importantly, its colonial empire had been safeguarded. In a sense Britain had won the war. But it was a complicated victory. The aid of the US with its endless resources had been needed to settle the armistice at eleven o'clock on the eleventh day of the eleventh month of 1918. The war was not over. Britain's important ally France had been weakened especially in its willingness to ever go to war again. Britain's occasional ally Russia had changed into an autistic communist state and the Austro-Hungarian Empire, which had been a stabilizing factor in Central Europe, had disintegrated. Nevertheless for the time being British daily life could be picked up again.

In 1918 Germany was economically rather than militarily forced to agree to an armistice. The money had run out, the gross national product had shrunk, the people and the land were exhausted and support for the war was gone. The Austro-Hungarian Empire had been the first ally in the war to throw in the towel. The conditions of the armistice in the Treaty of Versailles were disastrous for Germany. Germany had to pay the allies compensation for the war damage it had inflicted. It was deprived of its few colonial possessions, its sources of raw materials, and stringent limitations were put on its armed forces. Germany was to be kept from industrial development and world power. Despite the armistice Germany had lost the war. Looking at the parameters for economic development and prosperity it is however clear that this setback was partial and temporary. Common indicators of prosperity kept improving. Urbanization kept increasing, infant mortality rates kept shrinking and the difference in the number of doctors compared to Britain shrank.<sup>2</sup> Unchanged by the Great War however was the need for a supply of raw materials for further industrialization, especially oil and rubber, which was still Germany's weakness. Illustrative of the importance and value of rubber in this regard is the war story of the submarine *Deutschland*, which was an unarmed cargo submarine used for high value transport between Germany and the United States during the Great War. On its first trip in 1916 it brought dyes to the US and returned with 345 tons of rubber, 341 tons of nickel and 93 tons of tin: the main raw materials Germany did not have at its disposal. During and directly after the Great War, economic blockade, the disruption of free trade and nationalistic politics would make Germany's lack of essential raw materials especially clear.<sup>3</sup>

<sup>2</sup> See Graphs section

<sup>3</sup> James, *The end of globalization* (2001) 101-106.

### 4.3. The anaesthetic heritage of the war

As explained above anaesthetic care simplified during the Great War under the pressure of extraordinary circumstances. New anaesthetic techniques were not introduced; rather, existing ones were extended like the abundant application of local anaesthesia in the German army medical service. The other feature of the simplification was the employment of non-medical personnel for the administration of general anaesthetics. Both features had to be dealt with in the years after the Great War.

#### 4.3.1. Local anaesthesia and its limitations

After the war German surgeons became well aware of the limitations of local anaesthesia. These limitations concerned not only the site or extensiveness of the surgery but also the danger that proved to be associated with local anaesthesia.<sup>4</sup> A discussion held during a meeting of the 'Deutsche Gesellschaft für Chirurgie', the German Society for Surgery, in Berlin in 1921, is illustrative. Heinrich Braun (1862-1934), a surgeon from Zwickau and one of the proponents of local and regional anaesthesia in Germany, reported on his experiences with local anaesthesia.<sup>5</sup> He performed half of his surgical procedures under local infiltration anaesthesia; regional anaesthesia methods like spinal anaesthesia he applied very rarely, only 1%. Braun reported a mortality rate of approximately 1:500, almost ten times the mortality rate associated with ether general anaesthesia. In the same report Braun saw another danger as a consequence of numbers of local and regional anaesthesia administrations that were too high. He stated that it could lead to diminished experience levels of doctors in the administration of general anaesthesia, with all of the associated hazards. An animated discussion between proponents and opponents led to the final conclusion by Sauerbruch that local and regional anaesthesia should not be applied too often. Westmann, from the Berlin surgical clinic of August Bier (1861-1949), actually the godfather of local and regional anaesthesia, made the same observation. He argued that general and local anaesthesia should not be considered as rivals but as complementary in conformity with the general opinion of German surgeons. In the same review article he pleads for the use of anaesthetists only for difficult cases; the simple cases were to be handled by doctors with less training, a division into minor and major anaesthesia that had been suggested earlier.<sup>6</sup> As the safety of general anaesthesia increased and the limitations of local anaesthesia became apparent Gerhard Düttmann, assistant surgeon in Giessen, stated that 'Der kritische Vergleich der Leistungsfähigkeit und der Gefährlichkeit der Allgemeinnarkose in ihrer heutigen Form und der verschiedenen Methoden der örtlichen Schmerzbetäubung lässt klar erkennen, dass das Bestreben, die erstere mehr und mehr zu verdrängen, in den letzten Jahren zweifellos übertrieben

4 Schmidt, 'Die Leistung der Stickoxydulnarkose' (1928) 119.

5 Braun, 'Die Grenzen der örtlichen Betäubung' (1921) 185-189. Braun, 'Die Abgrenzung' (1921) 426-427.

6 Westmann, 'Allgemeine oder örtliche Betäubung' (1921) 1331-1332.

worden ist. ... Unendlich viel, ja fast alles hängt vom Narkotiseur ab.<sup>7</sup> With all this in mind the surgeon had to weigh the pros and cons when a patient needed to be anaesthetized. In Britain local anaesthesia was performed in no more than 10% of cases in the hospitals under study. As before, general anaesthesia was the technique of choice. That is the reason why a debate like the one described above was not conducted in Britain.

Local anaesthesia, however, which from its discovery in 1884 had been the alternative to general anaesthesia, was not that easily removed from its traditional place in German surgery. It kept a definite place although the operation registers of the German hospitals studied do show that percentages of local anaesthesia varied. Its application ranged from 16% at the Charité Krankenhaus to an intermediate rate of 2-22% at Moabit Krankenhaus to a high in Tübingen in 1930 with 65% of the 13 most common procedures undertaken under local anaesthesia. More detailed information is given in the appendix on the operation registers. Strumectomies and herniotomies in particular were performed under local anaesthesia. Again, according to the operation registers from German hospitals, local anaesthesia was applied in 2/3 of these cases. As will be shown in the following chapters the use of local anaesthesia declined only after the Second World War.

This wide-ranging and long-term application of local anaesthesia seems almost irresponsible against the background of the ten-times higher mortality rate that was reported by Braun. A comparison with the chloroform debate suggests itself. Probably the same complexity of judging anaesthetic mortality clouded the discussion. It is not certain whether this higher mortality rate indicated local anaesthesia and its toxicity as a risk factor itself or the patient's disability as a cause of death. After all, local anaesthesia was advocated in surgical textbooks especially for the older or disabled patient.<sup>8</sup> The third factor in perioperative mortality, the surgical procedure itself, can be excluded as a cause. From the operation registers under study it is clear that about 90% of the surgical procedures recorded consisted of the most common 13 procedures and that this percentage did not change during the period investigated. It is also conceivable that in Zwickau in 1921 no different surgical procedures were performed than in 1900, when ether and chloroform were predominant.

### *Regional anaesthesia*

It should be noted again that the local anaesthesia discussed was purely local infiltration anaesthesia. Application of local anaesthetics closer to the nerve roots or the spinal cord bringing about regional or spinal anaesthesia had been known since 1900 but, as was

7 'The critical comparison of the efficiency and danger of general anaesthesia in its present form and the miscellaneous methods of local analgesia makes it clear that the striving to put aside the first more and more has undoubtedly been exaggerated in the last years. ... Endlessly much, if not everything, depends on the administrator of anaesthetics.' Düttmann, 'Bekämpfung der Narkosegefahren' (1924) 1586-1589.

8 Wullstein, *Lehrbuch der Chirurgie* (1931) 647.



shown in preceding chapters, had been used infrequently in peacetime and during the war. Post spinal puncture headache due to the large-bore needles used and infectious complications due to poor hygienic circumstances caused this reticence. Its popularity only began to grow both in Britain and Germany in the late 1930s and 1940s when thinner needles answered these objections. Still, its use was heavily subject to the hospital's habits. In Germany it ranged by then from 0% in the Charité Krankenhaus to 15% in Tübingen in 1935. In Britain it would range from 13% in London Hospital in 1941 to 37% in Crumpsall in 1947. The administrators of spinal anaesthesia were both anaesthetists and surgeons in Britain; in Germany only surgeons used this technique since they administered all anaesthetics.

#### 4.3.2. Nurse anaesthetists in Britain

After the war the British anaesthetists, like all British subjects, picked up their daily lives again, including their concern about the position of their medical occupation. After all, the non-medical administration of anaesthetics that Hewitt had tried in vain to forbid by law was still not forbidden. On the contrary the Great War had revived a phenomenon from the Boer War: nurse anaesthetists in the army. These nurse anaesthetists were considered to be the main threat to the interests of the anaesthetists, even though their contribution to the administration of anaesthetics during the Great War was limited and confined to army situations. For the anaesthetists however, it was a matter of principle. Immediately after the war the British anaesthetists acted quickly to put nurse anaesthetists back in their place. They were depicted in the columns of *The Lancet* as a last resort in wartime but a threat to safe anaesthesia in peacetime.<sup>9</sup> Anaesthetists in Britain like Buxton and Blomfield who had not openly supported Hewitt's crusade before the war now battled against the non-medical administrators of anaesthetics. There were several arguments, directed especially against nurse anaesthetists. To protect a patient during the surgical procedure the administrator of anaesthetics had to have the same educational level as the surgeon. The surgeon, perhaps during the most difficult part of the operation, would not be able to oversee the complicated condition of the patient. Only an anaesthetist with a thorough knowledge of anatomy, physiology and pathology could assess all of the sequences of an operation and the anaesthetic. Nurse anaesthetists, the anaesthetists suggested, could undoubtedly administer anaesthetics adequately but would continue to use fixed routines and would not introduce new techniques.<sup>10</sup>

As usual the government withdrew from the discussion and left it to the profession. When there were questions in parliament about whether this administration by non-qualified personnel should be investigated, the secretary of health Dr Addison answered that there was no need for that, that enough scientific research had been done.<sup>11</sup> The

9 Anonymous, 'Nurse Anaesthetists' (1919) 584-585. Reynolds, 'Nurse Anaesthetists' (1919) 624-625.

10 Blomfield, 'Nurse Anaesthetists' (1919) 666. Buxton, 'Nurse Anaesthetists' (1919) 708.

11 Anonymous, 'Medical Notes in Parliament' (1920) 583.

minutes of the Home Office in 1922 contain a note on this issue: 'The Secretary of State is concerned very little.'<sup>12</sup> This rather liberal laissez faire policy was typically British. It was rooted deep in the administrative culture of Britain with its restrained government and in fact was the reason why Hewitt's crusade had failed. However, as often happened in British common law, jurisdiction was ahead of legislation. Contrary to the politicians and in the absence of legislation, individual judges adopted in their judgements the standard that anaesthesia should be doctor-based.<sup>13</sup> In common law individual jurisprudence has consequences that are further reaching than in Roman jurisdiction that formed the basis of the continental European system. In any case, in the examined operation registers nurse anaesthetists were not mentioned. Obviously nurse anaesthetists were minimally employed. It must be emphasized that this debate in journals, courts and operating theatres had nothing to do with anaesthetic specialization. It was a discussion about nurses versus doctors and not about general doctors versus specialists.

#### 4.3.3. 'Narkoseschwestern', anaesthetic nurses, in Germany

Unlike in Britain where nurse anaesthetists were heavily disputed and banned, German surgeons incorporated these workers, whose position arose as an emergency measure during the Great War, in their daily practice. The statements on this subject in the textbooks showed a subtle change compared to pre-war statements. It became accepted to leave the administration of anaesthetics to well-trained non-medical persons provided that final medical authority rested with the surgeon. Lexer stated, as he had before the Great War, that in principle 'Der narkotisierende Arzt hat sich ihr [die Chloroformnarkose] voll und ganz zu widmen, ohne sich um Einzelheiten der Operation zu bekümmern.'<sup>14</sup> More important than this was the level of training of the administrator of anaesthetics. It was not his rank in the hospital hierarchy or his qualifications that should be the determining factor but his competency. 'Geübten Wärtern oder Krankenschwestern kann die Narkose häufig mit grösserer Sicherheit überlassen werden als einem ungeübten Arzte. Stets aber muss ein zweiter Arzt ausser dem Operateur oder in den allerdringendsten Fälle wenigstens ein Gehilfe anwesend sein.'<sup>15</sup> Carl Garrè (1857-1928), a surgeon who started a line of surgical textbooks that was continued by his pupils long after his death, also underlined the necessary medical authority for the administration of anaesthetics. He wrote, 'Der Narkotiseur, der sich ausschliesslich mit der

12 Home Office Minutes regarding deaths under anaesthetics January 11<sup>th</sup> 1922. HO 45/15558, National Archives, London.

13 A trained nurse, 'Nursing sisters as Anaesthetists' (1919) 584.

14 'The anaesthetizing doctor must devote himself fully to the administration of chloroform, without worrying about the details of the operation.' Lexer, *Lehrbuch der allgemeinen Chirurgie* (1920) 96; (1922) 98; (1928) 92.

15 'The anaesthesia can often be entrusted with more safety to a trained attendant or nurse than to an untrained doctor. But a second doctor besides the surgeon or in very urgent cases a servant should always be present.' *ibid.*

Narkose zu beschäftigen und sie bis zum Erwachen durchzuführen hat...'<sup>16</sup> Only under his medical authority could a non-medical person carry out the administration of anaesthetics. '... Übernimmt ein Nichtarzt die Narkose, so hat der Arzt die Verantwortung.'<sup>17</sup>

In fact this change of view by the German surgeons compared to the pre-war period was not as radical as it seems. It fit their integral view of surgical patient care. There was one team, headed by the surgeon. He oversaw the holistic approach to the patient, which had always ruled German medicine, including the administration of anaesthetics. In cases where there was a shortage of trained hands and in suitable cases he could delegate part of patient care to a nurse instead of a doctor but the surgeon still held final medical authority. It was not that far from the pre-war position held by some other surgeons like Ludwig Wullstein (1864-1930) from Halle, that a doctor should administer anaesthetics.<sup>18</sup>

In practice the 'Narkoseschwestern' were a temporary phenomenon and were restricted to certain areas. When possible they were gradually replaced by doctors from the surgical staff, as the operation registers show. In the University clinic in Tübingen in 1928 10% of the anaesthetics were administered by nurses. In 1930 there were no nurses active in the administration of anaesthetics in that hospital. German anaesthetic nurses were not allowed to administer anaesthetics under their own authority. A doctor in the surgical team was responsible for the anaesthesia. This made the 'Narkoseschwestern' different from the British and American nurse anaesthetists, who had their own authority and could hence function on their own.

#### 4.3.4. 'Kleine Narkose' or minor anaesthesia

German surgeons, in the same spirit as before the Great War, felt responsible for the administration of anaesthetics, irrespective of the origin of the actual administrator. Because anaesthetic nurses were still necessary in some regions, the surgeons also felt responsible for their proper training. The goal was to maintain quality and safety in the administration of anaesthetics. It depended on teamwork. In 1934 the custody of the German surgeons over their anaesthetic nurses was illustrated by the publication of a series called *Kleines Narkosebuch; eine Anleitung zur Erlernung der Allgemeinnarkose für Schwestern und Heilgehilfen* (Little anaesthesia book; an introduction to general anaesthesia for nurses and non-medical auxiliaries), by Fritz Hesse, a surgeon from Saarbrücken. The first edition was an abstract of the book by the same Fritz Hesse, L. Lendle and R. Schoen, all surgeons, entitled *Allgemeinnarkose und örtliche Betäubung* (general anaesthesia and local analgesia), from the same year. The goal of the book was clear: to instruct non-medical personnel in assisting a medical administrator of

16 'The administrator of anaesthetics, who occupies himself exclusively with the anaesthesia and manages it until the awakening of the patient...' Garrè, *Lehrbuch der Chirurgie* (1923) 8; (1935) 16; (1949) 25.

17 'When a non-medical person takes over the anaesthesia, the doctor is responsible.' Ibid.

18 Wullstein, *Lehrbuch der Chirurgie* (1931) 2.

anaesthetics and to enable them to administer simple anaesthetic techniques, minor anaesthesia, under medical supervision. Obviously this little book met a definite need. It was published ten times between 1934 and 1967.

A boundary existed however between what could be done by a nurse and by a doctor. This boundary was the more advanced airway management which separated simple or minor anaesthetic techniques with a mask and drop bottle from more advanced or major techniques with apparatus, endotracheal tubes or intravenous barbiturates. The concept of 'kleine Narkose' or minor anaesthesia was used in a different way in Britain and Germany. In Britain it was used to distinguish cases that could be done by any doctor, including general practitioners, and cases that should be done by professional anaesthetists, in either case under their own responsibility. In Germany it was used to separate cases that could be handled by anaesthetic nurses and cases that were reserved for doctors, but in any case everything was done under the supervision and authority of the surgeon and as part of a surgical team. The concept of minor anaesthesia was the practical solution for the desired degree of availability during unsuitable times of the day or in unsuitable hospital locations. Highly trained personnel were too expensive to be available all day and night and in every part of the hospital.

#### 4.4. Major advances in anaesthesia with special reference to the free airway

When the smoke of the Great War had cleared, developments in anaesthesia were picked up again in both Britain and Germany, despite their differences in anaesthetic staffing. Major advances were scored in airway management. This was no coincidence. As shown in Chapter 2 the airway had been the main concern for the administrator of anaesthetics and the pivotal point of anaesthetic care from the beginning of inhalational anaesthesia in 1846. Since all general anaesthetics and oxygen were still administered via the airway, lack of control over the airway meant lack of control over the depth of general anaesthesia and the imminence of hypoxia, which could be fatal within minutes. In addition, towards the 1920s new challenges had arisen in airway management due to the ever-growing extent of surgery. First, there was still the desire to preserve respiratory function during intrathoracic surgery; its extent grew because of more precise radiological diagnostics and hence additional indications for intrathoracic surgery. Second, the challenge of securing the airway during facial surgery grew, especially because of the number of facial deformities suffered by servicemen wounded in the Great War. Different challenges demanded different solutions. These can be divided into techniques that bypassed the airway by intravenous anaesthesia and techniques that provided control over the airway itself. Both will be described below. One has to keep in mind that in the end the melting pot of these techniques formed the transition to more specialized anaesthesia.

#### 4.4.1. Intravenous anaesthesia to bypass the airway

A structural solution was to try to bypass the airway by administering general anaesthetics directly into the blood. Experiments to inject drugs directly into a vein had already been performed in the 19<sup>th</sup> century and were not restricted to use in surgical operations. Psychiatry and the treatment of tetanus were other fields of application all over Europe. Pierre-Cyprien Oré, a French physiologist and surgeon, used chloral for these indications and in 1874 at the end of his career he published his *Études cliniques sur l'anesthésie chirurgicale par la méthode des injections dans les veines*.<sup>19</sup> A subsequent intravenous sedative that has been used for similar indications was hedonal, in use since 1909. Unlike chloral, hedonal experienced a rapid uptake in the arsenal of intravenous anaesthetics.<sup>20</sup> Experiments to inject volatile anaesthetics that did not have to be metabolized but could leave the body through the respiration were also performed. In December 1909 Ludwig Burkhardt (1872-1924), a surgeon from Würzburg, published the results of such an experiment in the *Münchener Medizinische Wochenschrift*. After venesection a 5% solution of ether was infused. Higher concentrations, around 7%, had proved to lead to haemolysis and haemoglobinuria. A mixture of ether and chloroform was also used. Burkhardt considered the bypassing of the airway to be the main advantage. In this way, patients that were too feeble or too anxious to inhale ether could be anaesthetized in a safe way. Facial surgery also benefited from this technique because the airway was kept free from anaesthetic administering devices like masks.<sup>21</sup> In 1911 Hermann Kümmell, a surgeon from Hamburg with an avid interest in anaesthesia, described his experiences with the intravenous administration of ether.<sup>22</sup> He too considered the bypassing of the upper airway to be the main advantage. In this way it was an alternative for more complicated techniques like Kuhn's intubation.<sup>23</sup>

It is remarkable that the above-mentioned innovations were not carried out in Britain with its professional anaesthetists, that they instead had their origin in continental countries. Nevertheless they were copied in Britain as well.<sup>24</sup> Moreover, the innovation was immediately adopted by the surgical instrument suppliers in Britain like Down Brothers.<sup>25</sup> It is doubtful, however, how current the use of intravenous ether, chloroform or hedonal infusion ever became. In the investigated operation registers in Germany as well as Britain they were never mentioned as an anaesthetic technique. Their advantages did not outweigh their disadvantages.

19 Oré, *Études cliniques sur l'anesthésie chirurgicale* (1874). Sykes, *First Hundred Years of Anaesthesia* (1982) 82-91.

20 Buxton, *Anaesthetics* (1920) 193-202. Lange de, 'Barbituraten: een historisch overzicht' (1990) 170.

21 Burkhardt, 'Die intravenöse Narkose mit Aether' (1909) 2203. Brüning, 'Theoretische Bedenken' (1910) 1189.

22 Kümmell 'Ueber intravenöse Aethernarkose' (1911) 185-195.

23 Kühl, *Handbuch der Narkose* (1921) 58.

24 Silk, *Modern Anaesthetics* (1920) 94-96.

25 Down, *Catalogue of surgical instruments* (1914) 1098.

### *Barbiturates*

The idea of the intravenous administration of anaesthetics in order to bypass the troublesome airway during the induction of general anaesthesia was smart but it had to wait for the right anaesthetic. The ideal intravenous anaesthetic had to be a short-acting drug, easy to prepare in a stable solution and not precipitating when injected into the bloodstream.<sup>26</sup> Barbiturates would fulfil this promise. In 1932 a useful barbiturate for intravenous induction was introduced. A German pharmacologist named Helmut Weese (1897-1954) took the initiative.<sup>27</sup> He supervised the creation of hexobarbital or Evipan®. It was the result of a long search for an injectable hypnotic drug for psychiatric and anaesthetic practice.

The implementation of barbiturates in anaesthetic practice is not easy to study. Not all operation registers mentioned the applied anaesthetic consistently through the years and certainly did not mention induction and maintenance anaesthetic agents separately. Yet, even with these limitations interesting findings can be reported. When the London Hospital registers in 1930 and 1940 separately mentioned the induction agent it was chloroform in 1930 and Evipan® in 1940. The maintenance agent was ether. In the Moabit Hospital in Berlin in 1935 the induction agent was mentioned; in 36 out of 47 cases it was Evipan®. Again, the maintenance agent was ether. Chloroform was abandoned in these hospitals at almost the same time. This confirms the statement in Chapter 2 that chloroform had been used as an induction agent and was replaced by barbiturates. Interesting in this respect is the choice of the anaesthetic in Meiningen Hospital in Thüringen, Germany. The anaesthetic technique was well-documented in the operation registers of this hospital. Barbiturates came into regular use only in the 1960s and chloroform was used up to that time, a comparatively long period. This is another confirmation that barbiturates became the substitutes for chloroform. The situation in Meiningen also reveals another interesting point. The introduction of barbiturates took place not earlier than 1960 and coincided with the end of the employment of 'Narkoseschwester'. This suggests that anaesthetic nurses were not allowed to administer intravenous anaesthetics.

Altogether the conclusion on barbiturates must be that they were only a partial solution of the airway problem. They could be used to bridge the difficult phase of the induction of anaesthesia and bypassed the excitation phase known from volatile anaesthetics. For maintenance however, they were less suitable, as Hans Killian (1892-1982) stated in his German anaesthetic textbook *Narkose* in 1934. 'Als Vollnarkoticum soll aber (...) diese Präparat nicht für grössere chirurgische Eingriffe verwendet werden, da die Gesamtleistung mit den steuerbaren Narkotica doch nicht Schritt halten kann.'<sup>28</sup> The intravenous administration of barbiturates encroached deeper and more directly into the physiology of the human body. During the administration of volatile anaesthetics through the airway

26 Bogendörfer, 'Ueber lösliche Schlafmittel der Barbitursäurereihe' (1924) 437-438. Zervas, 'Induction of Anesthesia' (1929) 399-403. Sauerbruch, *Chirurgische Operationslehre* (1933) 61.

27 Weese, 'Pharmakologie des intravenösen Kurznarkotikums Evipan-Natrium' (1933) 47-48.

28 'This preparation must not be used for major surgery, because the overall action can not compete with the steerable anaesthetics' Killian, *Narkose* (1934) 179.

there had always been a defensive mechanism. When the patient started to breathe more flaccidly due to a deep anaesthetic level he would also inhale less ether or chloroform. With the injection of barbiturates this safety mechanism did not exist. If the dose was too high the patient would get into deep trouble. The combination of intravenous induction and volatile maintenance was born.

#### 4.4.2. Control over the airway

Not all airway problems could be overcome by intravenous anaesthesia. After all, the airway not only served to provide general anaesthesia to the patient but also to provide him with air and oxygen. Control over the airway itself remained the challenge during intrathoracic and facial procedures.

##### *The overpressure anaesthetic apparatus*

Of all the experiments in administering anaesthesia during intrathoracic surgery that had been carried out before the Great War, the overpressure anaesthetic apparatus had been the main survivor. It was recommended in several anaesthetic and surgical textbooks in Britain and Germany.<sup>29</sup> In the end Sauerbruch even abandoned his underpressure cabinet for it. Overpressure was simpler and cheaper to apply.<sup>30</sup> Although its main indication was the preservation of respiratory function during intrathoracic surgery it was also applied during abdominal surgery. In that case the deep anaesthesia needed to relax the abdominal musculature also impeded the respiratory function. It is difficult to assess how common the use of this technique was in both countries. The operation registers never explicitly mention this kind of administration. On the other hand the overpressure anaesthetic apparatus was only a slight variation on the use of pressurized gas flows, as the application of an expiration-impeding valve. It is quite conceivable that overpressure and gaseous anaesthesia were recorded as the same application. Gaseous anaesthesia was mentioned in all of the British hospitals investigated from 1930 but less often in the German operation registers. In German hospitals 'Gas- or Apparatkarnose', gaseous or apparatus anaesthesia, was a kind of luxury. The university hospitals Charité and Tübingen applied it from the 1930s; Moabit Hospital and Meiningen did not. This difference between Britain and Germany at this point was discussed by Helmut Schmidt (1895-1979), at that time 'Assistenzarzt der Chirurgischen Universitätsklinik in Hamburg', with Professor Sudeck, who was chairman of this anaesthesia-oriented clinic, and Hans Killian from the 'Chirurgischen Universitäts-Klinik Freiburg' with Professor Eduard Rehn (1880-1972) as chairman. During their trip through the Anglo-American anaesthetic community Schmidt and Killian noticed that gaseous anaesthesia, comfortable for the patient, was routine in Britain and the US. In Germany it was not. One problem was the availability of expensive compressed gas and the apparatus to admin-

29 Brunn von, *Die Allgemeinnarkose* (1913) 61-9. Bockenheimer, *Allgemeine Chirurgie* (1914) 59, 61.

Ross, *Handbook of Anaesthetics* (1919) 71-72. Wullstein, *Lehrbuch der Chirurgie* (1931) 422-423.

30 Sauerbruch, *Chirurgische Operationslehre* (1934) 448-450.

ister it to the patient. The main problem however was the level of training in anaesthesia of German students and young doctors. The operation of an apparatus with flow meters and vaporizers required more experience than the simpler and cheaper mask and drop bottle general anaesthesia.<sup>31</sup> A vicious circle was actually taking shape: a new technique was not readily available, hence no new experience was acquired; because there was no experience new techniques were not aspired to.

### *Endotracheal intubation*

Another step into airway and respiratory control was the development of air-tight endotracheal intubation. The endotracheal tube provided not only complete control over the airway but also opened the way to artificial ventilation and was to later become the sine qua non of intrathoracic and cardiac surgery. As will be shown below it was the combination of an old concept, discontent with existing solutions and above all the introduction of new material that led to this crucial development in anaesthetic devices. This material was one of the raw materials of the industrial revolution: rubber.

#### –The role of rubber

In medicine natural rubber had been in use for catheterization of the urinary and digestive tract since the 19<sup>th</sup> century. The universal manufacturing process for these catheters was a mould of woven silk with a waterproof layer. In the 19<sup>th</sup> century this was at first a resin layer, but around 1900 rubber was applied for this purpose. The result was a rather pliable catheter. In Britain rubber companies like William Warne and Company Ltd, established in 1837, and Franklin & Sons, established in 1864, are known to have produced catheters in this period.<sup>32</sup> Before the Great War Germany housed similar rubber companies. Besides catheters for the urinary and digestive tract they produced and sold tracheal catheters. In 1902 the Leipziger Gummi-Waaren-Fabrik produced ‘Catheter für die Luftröhre’, a catheter for the airways.<sup>33</sup> In 1908 Pfau offered a ‘Luftröhrenkatheter’, a tracheal catheter, and a ‘Stenosenkatheter’, a dilating catheter, in English sizes.<sup>34</sup> In 1910 Rüschi, a ‘Fabrik elastischer Chirurgie-instrumente und Weichgummiwaren’, factory of surgical instruments and soft rubber appliances in Rommelshausen, offered tracheal catheters in French and English gauges.<sup>35</sup> These airway catheters were not anaesthetic equipment. They were displayed as general equipment and were meant for resuscitative purposes.

31 Schmidt, ‘Die Leistung der Stickoxydulnarkose’ (1928) 119-175. Killian, ‘Technische Erneuerungen’ (1930) 744-748.

32 Warne, *Surgical products* (1961) Foreword. Franklin, *Catalogue* (1956) Foreword.

33 Leipziger Gummi-Waaren-Fabrik, *Haupt-Preis-Liste* (1902) 32.

34 Pfau, *Katalog* (1908) 187.

35 Rüschi, *Chirurgie-instrumente und Weichgummiwaren* (1910) 35. This catalogue was trilingual: French, German, British.



Around 1900 rubber began to be used in equipment specifically manufactured for anaesthesia. The application arose from the need to have closer contact with the anatomy and physiology of the respiratory system. Anaesthesia with compressed gases as a propellant was impossible without breathing circuits and face masks that had a soft rubber rim. The same kind of airtight contact with the mouth by masks and later with the trachea by endotracheal tubes was not possible with steel devices. The material had to be soft, pliable and a bit rigid at the same time. The final requirement was the possibility of sterilization without damaging the device too much. For endotracheal tubes expensive processes were tried in the attempt to reach this goal. The silver woven intratracheal catheter, designed in 1929 by Ralph Hargraves of Toronto, is a good example of these experiments.<sup>36</sup> Eventually commercial India rubber, improved and stiffened by vulcanization, became the material that met these demands. British catalogues in the 1930s from Down Brothers and Allen & Hanburys showed a steady increase in the variety of products including rubber endotracheal tubes.<sup>37</sup> Every new catalogue contained new apparatus and new devices, giving evidence of the unbridled experimenting with artificial access to the airway. An unlimited supply of raw materials like rubber enabled this process.

– Magill and Rowbotham

Ivan Whiteside Magill (1888-1986) was the London anaesthetist whose name is linked to the innovation of the endotracheal tube after the Great War. Magill was working as an anaesthetist together with his colleague Edgar Stanley Rowbotham (1890-1979) in the British Army Plastic Unit of the Queen's Hospital for Facial and Jaw Injuries in Sidcup, Kent. This hospital was specialized in facial reconstructive and plastic surgery for servicemen after the Great War. It was the hospital where the godfather of plastic surgery, Harold Gillies, worked. Rowbotham was at the same time connected to the Royal Free, Seamen's, and Cancer Hospitals where intra-oral cancer surgery was performed.

In both hospitals Magill and Rowbotham encountered the same anaesthetic challenges of keeping the mouth as free as possible for surgery, at the same time administering the anaesthetic in the airway and protecting the airway against the aspiration of blood and debris. At first they applied what was available in those days to achieve in the form of intratracheal insufflation or the Kuhn tube. Intratracheal insufflation was the favourite because it could be applied by the nasal route, but it also had its limitations. The patient's expiration still took place around the intratracheal catheter via the natural airway. If the insufflation flow was lower than the natural inspiration flow of the patient (partial insufflation) blood, saliva and debris could still enter the trachea during inspiration. If the insufflation flow equalled or exceeded the natural inspiration flow (complete insufflation) high intrapulmonary pressures could occur. In addition,

36 Down, *Catalogue of surgical instruments* (1929) 1363.

37 Down, *Catalogue of surgical instruments* (1936) 2069. Allen, *Catalogue of Surgical Instruments* (1938). 14-15.

Rowbotham in particular was concerned about blood and debris being projected into the surgeon's face during expiration. This hindrance for the surgeon required a solution.

To control the expiratory flow Rowbotham at first applied a rather wide-bore return catheter, size 32 French (10 millimetres), introduced through the other nostril and reaching above the larynx.<sup>38</sup> Magill developed an expiratory attachment to attach the expiratory catheter to the insufflation catheter.<sup>39</sup> In the refinement of the double catheter technique both catheters reached into the trachea. This whole procedure was presented in 1926 in the same clinical lecture in which Rowbotham discussed the possibility of using a single tube wide enough to fit tightly in the trachea that would allow the patient to breathe in and out through the same tube.<sup>40</sup> Eventually the term 'endotracheal anaesthesia' or 'endotracheal intubation' was introduced for this technique; it was first used by Magill in his historic presentation to the Section of Anaesthetics of the Royal Society of Medicine on November 2<sup>nd</sup> 1928.<sup>41</sup> In this lecture he introduced the use of commercial India rubber as the tube material of choice. It was this change in material that was the great innovation of Ivan Whiteside Magill. Steel had been too rigid and the soft tracheal or urethral catheters used for intratracheal insufflation were too flabby. The name of the device had definitely changed from 'catheter' to 'tube', as Macewen, O'Dwyer and Kuhn had named their steel endotracheal device in their day.

Magill and Rowbotham were not the only anaesthetists developing new solutions. In 1929 W. Howard Jones, a surgeon anaesthetist at Charing Cross Hospital, also published a paper about patients breathing in and out through a single large endotracheal tube.<sup>42</sup> The next week Rowbotham replied in *The Lancet* that he had been using this technique for years.<sup>43</sup> The completion of the endotracheal tube that is still in use in the 21<sup>st</sup> century was the addition of an inflatable cuff to prevent air and debris from passing around the tube and to provide complete control. This cuffed catheter design was already known from other experiments but the application of a cuff on an endotracheal tube would be attributed to Guedel and Waters in 1928.<sup>44</sup>

#### – Acceptance in anaesthetic practice

Endotracheal intubation was not immediately recognized as an important discovery. David White, one of Magill's pupils in the 1950s, mentioned that the thesis on endotracheal intubation that Magill submitted in the 1920s was rejected. It was at that time

38 Rowbotham, 'Intratracheal anaesthesia' (1920) 590-591. Rowbotham, 'Anaesthetics in the plastic surgery' (1921) 17-27.

39 Magill, 'Expiratory attachment for endotracheal catheters' (1924) 1320.

40 Rowbotham, 'Intratracheal anaesthesia' (1926) 583-584.

41 Anonymous, 'Endotracheal anaesthesia' (1928) 845-846 in the section Report of Societies. Magill, 'Endotracheal anaesthesia' (1929) 83-88.

42 Jones, 'Methods of tracheal insufflation' (1929) 330-331.

43 Rowbotham, 'Intratracheal insufflation' (1929) 417.

44 Waters, 'Endotracheal Anesthesia' (1933) 196-203.

considered just a minor trick!<sup>45</sup> In all it took almost ten years before the material and design were settled upon in daily practice. In the operation register of St. Bartholomew's Hospital endotracheal intubation is first mentioned on a small scale in 1930 for some common surgical procedures. In the 1938 operation register of the plastic and reconstructive department it had become a routine technique. In textbooks the double catheter technique through the oral or nasal route remained the standard for difficult procedures in the mouth up to 1935.<sup>46</sup> But from 1935 on endotracheal intubation became the standard in British anaesthetic textbooks.<sup>47</sup> Endotracheal intubation was more than just a new device; it was a new technique. There had to be an administration system to connect to the tube and there had to be a choice of several sizes of the tube. Such a complete apparatus for endotracheal anaesthesia was offered by Down Brothers Ltd in 1936.<sup>48</sup> A doctor who wanted to use this technique had to be able to make the right choice and above all the user had to learn the technique of introducing a tube to the trachea.

Just before the Second World War the endotracheal tube named after Magill had proven to have enough advantages to become the gold standard and superseded all previous devices for this purpose. Compared to existing devices the Magill tube had a simple design and was manufactured in a simple process. The Magill tube was cheap in comparison with Kuhn's tube; in the 1936 Down Brothers catalogue a Magill's tube cost 6 shillings 9 pence, a Kuhn tube with accessories cost 3 pounds 15 shillings. The Magill tube was easy to handle because of the balance between rigidity and flexibility. It was more reliable than the complicated, vulnerable and tricky older apparatus for intratracheal insufflation but had the same wide range of application. And finally, it was an anaesthetist's invention and supported the identity of the anaesthetists.

#### – Marketing of the endotracheal tube

The offering of a complete 'apparatus for tracheal intubation' by Mayer & Phelps in their 1931 catalogue has to be considered as the first commercial presentation of the wide-bore endotracheal technique. This design is to be attributed to Rowbotham, not Magill. This catalogue also confirms that more anaesthetists were designing endotracheal anaesthetic devices. All devices were named after their designers or their hospital, for instance St. Bartholomew's. Names of the designer or the hospital were important sales features in catalogues. In the same catalogue Magill's name is not connected to an endotracheal tube but to his double catheter technique.<sup>49</sup> Nevertheless the red rubber wide-bore

45 Written communication January 31<sup>st</sup> 2006 with David White, a former student and resident anaesthetist in Westminster Hospital. Dr Magill signed his testimony for anaesthetist in 1953.

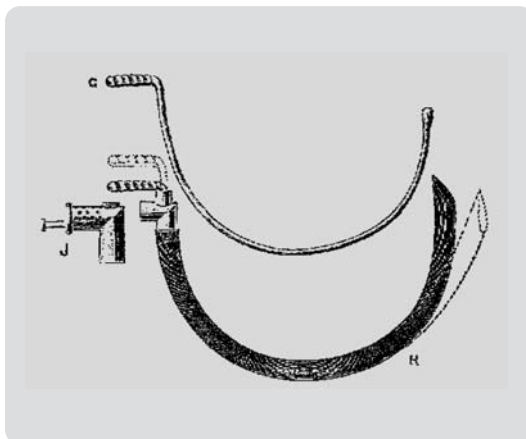
46 Ross, *Handbook of Anaesthetics* (1935) 142-149.

47 Nosworthy, *Theory and practice of anaesthesia* (1935) 131-132. Rolleston, *Modern Anaesthetic practice* (1938) 97.

48 Down, *Catalogue of surgical instruments* (1936) 2069.

49 Mayer, *Catalogue of surgical instruments* (1931) 509-515.

Figure 18. Mayer & Phelps tracheal intubation apparatus according to Stanley Rowbotham. *Catalogue of surgical instruments* (1931) 515. This was the first commercially available, flexible and patient-friendly endotracheal tube made of thin-walled but moderately hard rubber.



endotracheal tube would become known as the Magill tube. This was strongly enhanced by Magill's relationship to the industry (Figure 18).

For his endotracheal tube and corresponding breathing circuits Magill collaborated with the London instrument maker Arthur Charles King (1888-1966) and his shop in Devonshire Street. Arthur King's shop was a Mecca for anaesthetists and an important factor in the dissemination of British anaesthesia techniques before the Second World War. King produced many of the special tools and devices that Magill advised for endotracheal anaesthesia. There was a one-to-one relationship between individual specialist and local instrument maker. The first wide-bore endotracheal tubes were cut by hand by King's assistant Kate who was nicknamed Catheter Kate because of her devotion to endotracheal tubes. She bought the commercial India rubber tubing in Euston Road. King introduced 'Magill endotracheal tubes' in sizes 0 to 10 with corresponding sizes in inches of outside diameter  $15/64$  to  $33/64$  and inside diameter  $10/64$  to  $23/64$ . This  $1/64$  size system indicates the commercial origin of the India rubber that was used to produce these tubes. Up to then Magill had used the medical sizes derived from urological catheters. For instance in 1929 Down Brothers had offered Magill's double channel endotracheal catheters in those sizes. English sizes were used for paediatric catheters, French sizes for adult catheters.<sup>50</sup> A more detailed description of this range of sizes is given in Appendix 5.

King in turn had a strong relationship with Coxeter & Son, the compressor company mentioned in Chapter 2.<sup>51</sup> In his publications in *The Lancet* Magill often mentioned its name. In fact Coxeter and Son possessed the majority of shares of AC King Ltd. A catalogue dated 1939 from Coxeter & son contains a wide variety of anaesthetic machines

<sup>50</sup> Down, *Catalogue of surgical instruments* (1929) 1359c.

<sup>51</sup> Westhorpe, 'De Caux's endotracheal tube' (1992) 271.

including a Shipway intratracheal ether apparatus.<sup>52</sup> In the same year Coxeter and Son was acquired by the principle surviving British gas compression firm, the British Oxygen Company.<sup>53</sup> In 1935 this company had established a medical division, called BOC Medi-shield, that could provide central oxygen storage and delivery to hospitals. To secure its position in the medical market the British Oxygen Company acquired firms like Coxeter & Son. The distance between manufacturer and user grew, with wholesalers moving in between them. Magill's commercial interests were connected to one of these wholesalers: Medical & Industrial Equipment or M&IE, established in 1938 at 10&12 New Cavendish Street, London and one of the leading suppliers of endotracheal tubes in the world. Magill was a director of this company.<sup>54</sup> The rubber tubes it sold were manufactured by Leyland Medical International.

– Endotracheal intubation in Germany

Britain was the cradle of the red rubber endotracheal tubes. But how did German surgeons solve the airway problem? They also encountered military servicemen with wounded faces. In Germany 'Wiederherstellungschirurgie', reconstructive surgery, also existed. The general surgeon Lexer wrote several textbooks about it. Unlike his British colleagues, he performed most of his surgery under local anaesthesia. Only sometimes did he apply general anaesthesia and endotracheal intubation according to Kuhn.<sup>55</sup> Nevertheless, endotracheal techniques with rubber tubes were not unknown in Germany. In 1934, earlier than in British textbooks, Killian mentioned the endotracheal tube with Waters cuff, manufactured by King in London, as the solution to the problem of airway control.<sup>56</sup> However, the first time a Magill's endotracheal tube would be offered in a catalogue in Germany was in 1950 in *Die Neuzeitliche Ärztliche Einrichtung*, Modern Medical Equipment, published by Hänni-Verlag.<sup>57</sup> The reason for this delay is not completely clear. An interview with Heinz Rüschi in Appendix 3 contains important information on this issue. Rüschi stated that there was no market for endotracheal tubes in Germany before the Second World War because there were no doctors acquainted with its use. Actually this resembles the vicious circle with regard to the disuse of overpressure anaesthesia apparatus in Germany in the 1920s, where there was a lack of new devices, hence a lack of new experience and hence no new devices. In the case of endotracheal intubation the lack of rubber in Germany could have been a factor in the circle.

52 Coxeter, *Catalogue* (1939).

53 Wilkinson, 'A. Charles King' (1987) 510-514.

54 Written communication January 31<sup>st</sup> 2006 with David White, a former student and resident anaesthetist at Westminster Hospital.

55 Lexer, *Wiederherstellungs-chirurgie* (1920) 243.

56 Killian, *Narkose zu operativen Zwecken* (1934) 344. Kirschner, *Die Chirurgie der Brust* (1941) 410.

57 Humanmedizin, *Die neuzeitliche ärztliche Einrichtung* (1950) 21.

– Germany’s lack of rubber

In Germany the rubber companies, unlike the cutlers, did not survive the Great War and the interwar economic crisis with its blockade of international trade. ‘Kautschuk’, rubber, was a weakness in Germany’s raw material supplies. Germany had always been dependent on imported rubber. Together with cotton it was the raw material Germany absolutely lacked.<sup>58</sup> After the Great War the situation worsened. Germany was deprived of its few colonies. Germany was also excluded from the Hague Conference in 1934 on the international trade in rubber. Only the ‘Reichsverband der Deutschen Kautschuk-industrie’, the national association of the German rubber industry, was allowed to attend this meeting but without the right to vote.<sup>59</sup> Voting rights were granted to the Netherlands, Britain (for Malaya), France, Siam, Ceylon, Sarawak, India (including Burma) and North Borneo. In preparation for a new war the German government started to treat rubber as a strategic raw material. In 1934 they installed ‘Überwachungsstellen’, surveillance agencies, which regulated imports and exports and could use directives for the distribution of strategic raw materials. At the same time a four-year plan for raw material independence or autarky was started.<sup>60</sup> The drive to achieve autarky by finding synthetic replacements for raw materials had already led to the formation of a conglomerate of German chemical industries in 1925 known as the ‘Interessen-Gemeinschaft Farbenindustrie’, interest company of the dye industry, or IG-Farben. Buna-S, a synthetic rubber compound, had to replace rubber for tyres. But for medical appliances real rubber was required and Germany thus largely missed the rubber phase in anaesthetic equipment in the 1930s. This led to a period of no advancement in German anaesthetic equipment.

The lagging behind of German anaesthesia in the interwar years is reflected in and confirmed by a comparison of the catalogues of German companies producing anaesthesia supplies in various years. Before the Great War, British and German catalogues from medical wholesalers had been very much alike in their layout and assortment. The assignment of the instruments had also been much the same.<sup>61</sup> German companies usually had their catalogues printed in four languages (English, German, French and Spanish).<sup>62</sup> In fact they were multinationals and not necessarily representative of the practice in just one country. In the same context German textbooks about anaesthesia were illustrated with pictures of devices bearing the names of British manufacturers and wholesalers like Barth, Mayer & Phelps and Mayer & Meltzer.<sup>63</sup> This changed in the interwar years. While British wholesalers like Down Brothers started to offer abundant

58 Wagenführ, *Die deutsche Industrie im Kriege* (1963) 165.

59 Coates, *The Commerce in Rubber* (1987) 276.

60 Wagenführ, *Die deutsche Industrie im Kriege* (1963) 17-19. Tooze, *The wages of destruction* (2006) 81.

61 Arnold, *Catalogue of surgical instruments* (1904) Classified list of contents. Brady, *Catalogue of surgical instruments* (1908) Classified list of sections. Cuxson, *Instruments* (1910). Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1910).

62 Pfau, *Spezial-Preisliste* (1905).

63 Müller, *Narkologie* (1908) 208.

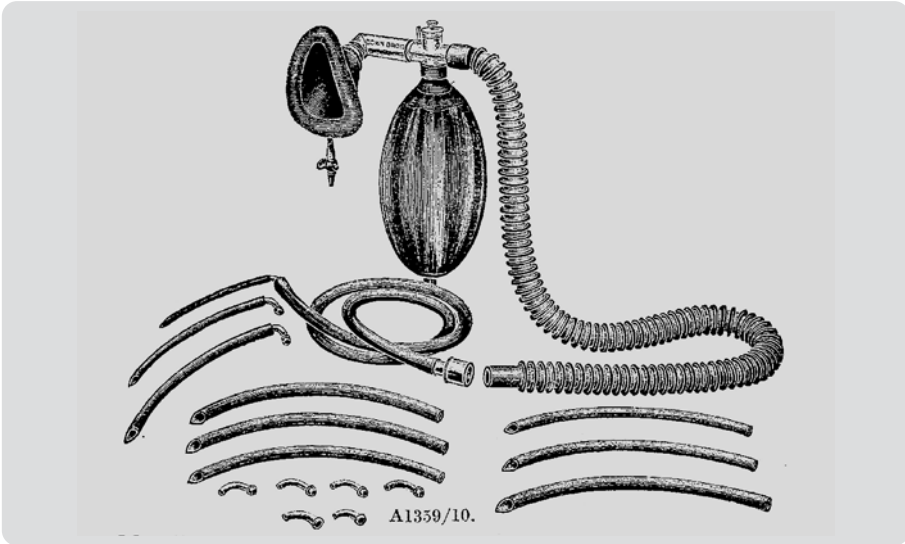


Figure 19. Magill Re-breathing Apparatus offered by Down brothers, *Catalogue of surgical instruments* (1936) 2069. Note the abundant application of rubber.

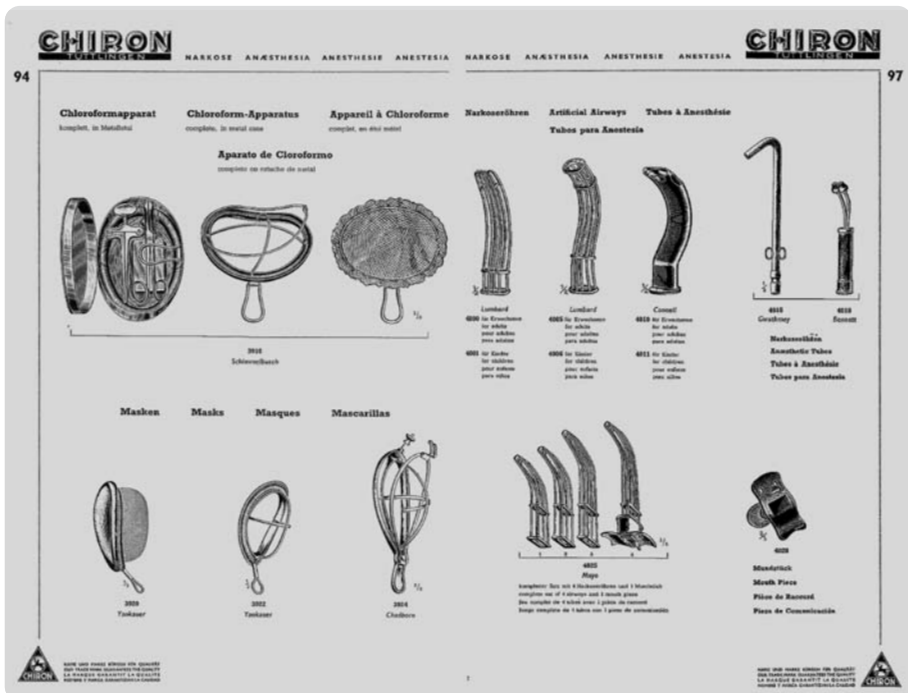


Figure 20. Anaesthetic equipment offered by Chiron-Werke in 1937, *Chiron Katalog Nr. 10*, 94, 97. Note the predominance of steel as base material.

rubber supplies, the German Chiron Katalog of 1937 shows no change in anaesthetic supplies since its catalogues in 1923 or the German Aktiengesellschaft für Feinmechanik from around 1900.<sup>64</sup> The catalogues of the Medicinisches Waarenhaus AG Berlin in 1937 (at that time Medicinhaus Aktiengesellschaft) and 1930 (at that time Medicinisches Waarenhaus A-G) were the same.<sup>65</sup> The lag was confined to rubber products. Steel devices for the administration of general anaesthesia including intravenous equipment were still produced and offered on a large scale.<sup>66</sup> The *Aesculap Musterbuch* shown in the seventh (1922) and eighth (1938) editions were world-famous and were also distributed in Britain and the US. *Der Hauptkatalog Nr. 10* by Chiron Werke displayed 30,000 articles (Figure 19, 20)

#### 4.5. Anaesthesia in Germany

When the guns of the Great War had fallen silent the pre-war voices idealizing the specialist administration of anaesthetics in Britain and the US were revived in German general medical journals. Hans Kritzler, gynaecologist and former naval doctor, proposed the employment of disabled doctors from the Great War as specialists in anaesthesia.<sup>67</sup> He gained immediate support from J.P. zum Busch, who had worked as a surgeon in Great Britain for 24 years.<sup>68</sup> But influential surgeons stuck with their arguments for better training in anaesthesia for every medical student and every doctor, just like they had always done. Victor Schmieden (1874-1945), a surgeon in Halle and a co-writer of war surgical textbooks, believed that ‘... für die praktische Chirurgie Fortschritte auf dem Gebiet der Betäubung viel sicherer zu erzielen sind durch gründliche Beherrschung und Verfeinerung der bewährten Methoden als durch

Verwendung neuer Mittel, die für die Praxis noch nicht reif sind.’<sup>69</sup> In the same review Schmieden came to the conclusion that it was precisely this training that failed in the medical curriculum. ‘Wir wissen alle, dass unsere jungen Ärzte meist weniger gute Narkotiseure sind als langjährig erprobte Schwestern.’<sup>70</sup> In fact this was the conclusion reached by earlier thinkers about the safety of anaesthesia: it was not the anaesthetic but the training of the administrator of anaesthetics that was decisive. Apart from the unchanged discussion about who would be charged with the administration of anaesthetics

64 Aktiengesellschaft, *Zweiter Nachtrag zum Haupt-Katalog* (1900) 365. Chiron-Werke, *Feinmechanischer Apparate und chirurgischer Instrumente* (1923) 44. Chiron-Werke, *Chiron Katalog* (1937) 94.

65 Medicinisches Waarenhaus, *Katalog A Instrumentarium* (1930); (1937).

66 Windler, *Chirurgie, Gynäkologie, Orthopädie* (1930) 130-137.

67 Kritzler, ‘Der Facharzt für Narkose’ (1921) 719.

68 Busch zum, ‘Der Facharzt für Narkose’ (1921) 900-901.

69 ‘Progress in the field of anaesthesia can be better achieved by thorough mastery and refinement of approved methods than by the employment of new substances that are not yet ready for daily use.’ Schmieden, ‘Ueber die Wahl des Betäubungsverfahrens’ (1927) 2062-2064.

70 ‘We all know that our young doctors usually are not as good at administering anaesthetics as nurses with many years of training.’ *Ibid*



the scientific foundation of the administration itself garnered a remarkable level of interest in Germany during the 1920s.

#### 4.5.1. German surgeons as guardians of anaesthetic knowledge

The developments described in the sections above make it clear that in Germany anaesthetic innovations like the Roth-Dräger apparatus, the Kuhn tube, the Sauerbruch chamber and also the *Kleines Narkosebuch* were initiated by individual surgeons. They wished to safeguard the scientific climate regarding the administration of anaesthetics. In 1928, when Germany was more or less recovered from the ruins of the Great War, two anaesthesia-minded German surgeons, Helmut Schmidt from Hamburg and Hans Killian from Freiburg, made a four-month study trip to Britain and the US. Back in Germany they took initiatives that eventually might have led to an anaesthetic specialty. The first initiative was to organize an assembly of German colleagues who were interested in anaesthesia. To chair this first German anaesthesia congress in 1928 Schmidt and Killian invited the American anaesthetist Francis Hoeffler McMechan, founder of the American journal *Current Researches in Anesthesia and Analgesia* whom they had met during their trip. The congress was held in Hamburg, which had become the centre of anaesthesia in Germany. The local organizing committee was multidisciplinary and consisted of two gynaecologists, Franken and Gauss; two pharmacologists, Behrens and Wieland; two surgeons, Killian and Schmidt and a general practitioner and administrator of anaesthetics, Von der Porten.<sup>71</sup> In the same year Schmidt was offered a position as associate professor of anaesthesia at the University of Hamburg. However, he considered the economic situation to be too weak to turn completely to a new specialty without an assured income and he returned to his original specialty, surgery.<sup>72</sup>

Embroidering on the first Anaesthesia congress its initiators, taking *Current Researches in Anesthesia and Analgesia* and the *British Journal of Anaesthesia* as an example, founded two German scientific anaesthetic journals in 1928: *Der Schmerz* and *Narkose und Anaesthesie*.<sup>73</sup> The next year both journals and their editorial boards merged into *Schmerz Narkose-Anaesthesie*. This journal would appear until 1944. Its establishment must not be underrated. Members of the editorial board came from all over the world including China, Japan and Canada. Several leading American anaesthetists also took part: Francis Hoeffler McMechan, James Tayloe Gwathmey (author of *Anesthesia* in 1913), Elmer Isaac McKesson, John Silas Lundy (head of the anaesthesiology section at the Mayo Clinic),

71 Killian, 'The First German Anesthesia Congress' (1985) 279-283. Schwarz, 'Attempts to establish anaesthesiology' (1989) 172.

72 Schmidt, 'Gruss an Hans Killian' (1972) 24.

73 *Der Schmerz. Deutsche Zeitschrift zur Erforschung des Schmerzes und seiner Bekämpfung zugleich Zentralorgan für Narkose und Anaesthesie*, Pain. German Journal for the research of pain and its control; simultaneously the central organ for Anaesthesia and Analgesia. *Narkose und Anaesthesie. Zeitschrift und Zentralorgan für das Gesamtgebiet der Schmerzlinderung und -verhütung*, Anaesthesia and Analgesia. Journal and central organ for the whole field of the alleviation and prevention of pain.

William James Mayo and Ralph Milton Waters (1883-1979), the first professor of anaesthesiology in the US and the designer of the Waters cuff for endotracheal tubes mentioned earlier. The Americans would stay on the editorial board until 1940. The editors belonged to all known branches of medicine and included an anatomist, physiologist, neurologist and two medical historians. The main group of editors were surgeons, gynaecologists and pharmacologists. The German journal was clearly not interested in the anaesthetists in Britain. This is almost poignantly illustrated by the fact that the only British member of the editorial board of *Schmerz Narkose-Anaesthesie*, Henry Hallett Dale from London, was not an anaesthetist. He was a pharmacologist, known for his work on neurotransmitters; a fellow of the prestigious Royal Society of London for the Improvement of Natural Knowledge and the director of the National Institute for Medical Research in Hampstead. This differing cross-Channel approach, scientific versus practical, is not confined to anaesthesia. Earlier it was stated that the medical world on the Continent was different from that in Britain. On the Continent large, university-based institutions watched over the development of the sciences, while in Britain all was based on private initiatives and individual persons.

#### 4.5.2. A difficult market for anaesthetists in Germany

Back from their aforementioned trip Schmidt and Killian reported their experiences in several articles and compared Anglo-American anaesthetic practice with the German situation. Their goal was not only the updating of the administration of anaesthetics but also the establishment of an anaesthetic specialty, as they had witnessed in Britain and the US. They extensively described the attractive incomes anaesthetists in the US could earn with their specialty. On average an anaesthetist earned \$ 10-20 per procedure, which was 10-20% of the surgical fee. But a hotshot like Gwathmey in New York was able to earn \$ 50,000 a year. Dr Hodgkin in Los Angeles, der 'Narkotiseur der Millionäre', the anaesthetist to millionaires, was paid \$500 per procedure. Schmidt and Killian saw the same economic principle as the basis for the employment of nurse anaesthetists, who were not paid as much as medical anaesthetists, by some hospitals and surgeons in the US.<sup>74</sup> Both Schmidt and Killian were convinced that one way or another an anaesthetic specialty would arise in Germany. But they considered the economy in Germany at that time too weak to enable patients to pay for good anaesthetic care. A separate specialty seemed unfeasible, so the thorough training of doctors and students remained the only objective.<sup>75</sup> The same reason why a system based on professional anaesthetists did not emerge in Germany was suggested by Dr Hans Widenhorn, a surgeon from the Chirurgischen Universitätsklinik in Freiburg, who travelled after Schmidt and Killian and worked for more than a year in the US. He stated that the financial basis in Germany was not strong enough to pay anaesthetists. For the same

74 Killian, 'Über amerikanische Narkoseverhältnisse' (1928) 448-463. Schmidt, 'Die Gasnarkose' (1928) 530-540.

75 Schmidt, 'Die Leistung der Stickoxydulnarkose' (1928) 151. Schmidt, 'Der Narkosespezialismus' (1929) 958-964.

reason it was difficult to motivate students to train for the anaesthetic specialty.<sup>76</sup> Financial problems were also given as a reason by R. Goldhahn, a surgeon and Chefarzt in Liegnitz, Lower Silesia, now Poland. He especially singled out the smaller hospitals that were not able to pay an anaesthetist: 'Die Narkose durch den Narkosefacharzt ist zweifellos das Ideal der Durchführung und die grösstmögliche Sicherung in rechtlicher Hinsicht. Da in Deutschland eine solche Einrichtung nicht besteht, können die Narkoserichtlinien solcher Länder mit Narkosefachartzen nicht auf unsere Verhältnisse übertragen werden. Da anderseits der Narkosefacharzt nur dann wirtschaftlich tragbar ist, wenn der Klinikbetrieb eine gewisse – ziemlich erhebliche – Mindestgrösse hat, ist die Einführung in Deutschland bisher stets gescheitert und wird vermutlich auch weiterhin scheitern. Das kleine Krankenhaus kann sich kein Narkosefacharzt leisten.'<sup>77</sup>

Nevertheless Schmidt kept arguing for the certification of an anaesthetic specialty in Germany. He did not worry about the science of anaesthesia; he was concerned about the craft and skills of the administrators of anaesthetics. It was the old 19<sup>th</sup> century adage: anaesthetics as safe as their administrator. In 1933 he wrote: 'Ein Spezialisimus ist günstig für jede Art der Narkose. Ich bin überzeugt, dass wir keinen Fortschritt in der praktischen Narkosekunst machen werden, wenn wir in der Zukunft nur Schwestern und unerfahren Gelegenheitsnarkotiseuren die Narkosen überlassen, die ebenso gefährlich sind wie die Gelegenheitsoperateure. Nicht die Narkosewissenschaft liegt im Argen, ... sondern die Narkosekunst bedarf der Neuerung.'<sup>78</sup> In 1934 Schmidt faced reality and explained to the 'Medizinische Gesellschaft', the medical society, in Düsseldorf that he was pursuing the compromise of 'ein Gemässigter Narkosespezialismus an den grossen Kliniken und Krankenhäusern, und damit eine bessere und intensive Einführung des Studenten und Medizinal Praktikanten in dieses wichtiges Gebiet.'<sup>79</sup> This goal resembled the British situation and was as old as anaesthesia itself: not exclusivity, but better training for general practitioners by special teachers.

76 Widenhorn, 'Narkose-Erfahrungen in Amerika' (1932) 536-538.

77 'Anaesthesia by the specialist anaesthetist is without doubt the ideal organization and offers the highest possible assurance in a judicial context. Because something like that does not exist in Germany, the guidelines for anaesthesia from countries with specialist anaesthetists cannot be transferred to our situation. Because on the other hand the specialist anaesthetist is only economically realizable when the clinic business has a – rather high – minimum scale, its implementation has up to now failed and will fail in the future. The little hospital cannot afford a specialist anaesthetist.' Goldhahn, *Die Allgemeinbetäubung* (1939) 70.

78 'A specialty is advantageous for every kind of anaesthesia. I am convinced that we will not progress in the practical art of anaesthesia if in the future we leave the anaesthetics to nurses and inexperienced occasional administrators, who are as dangerous as occasional surgeons. Not the science of anaesthesia is in disregard ... but the art of anaesthesia needs innovation.' Goerig, 'Helmut Schmidt' (1996) 621-631.

79 '...a moderate anaesthetic specialty at the large clinics and hospitals and at the same a better and more profound introduction to this important field for students and medical practitioners.' Schmidt, 'Fortschritt in der chirurgischen Anästhesie' (1934) 1731.

### 4.5.3. A second phase of anaesthetic specialization fails

Despite all of the initiatives by Schmidt and Killian no professional anaesthetists specialty evolved and anaesthesia remained under the surgeon's purview in Germany. This is reconfirmed in the *Reichs Medizinial Kalender*, the national medical almanac. If German doctors practised a specialty it was indicated by a little icon behind their name. For some persons the hospital where they were appointed, usually as head of a department, was mentioned (Table 2). Double registrations in Berlin included the combinations of dermatology with urology, surgery with gynaecology and neurology with psychiatry. In such cases the first specialty was counted. But a medical specialist was always only mentioned in one way. There was no icon for anaesthetist or Narkotiseur. When specific information was sometimes given by a name there were no references to anaesthesia. The non-existence of anaesthetists in Germany is also confirmed by the operation registers, as far as this information can be retrieved. In the interwar years it was not as common in Germany as it was in Britain to specify the administrator of anaesthetics. The name of the main surgeon as responsible head of the operation team was enough. If the administrator of anaesthetics was mentioned it was almost always a junior member of the surgical staff or sometimes a non-medical administrator of anaesthetics. Cultural, practical, financial and human resource circumstances had turned against anaesthetic specialization in several ways.

First, there was still no incentive for surgeons to concentrate on the surgery itself and leave other aspects of the human body to another doctor. On the contrary surgeons were becoming aware that an operation on one organ influenced the whole physiology of the patient.<sup>80</sup> This view also fit the holistic approach to medicine and the return to homeopathy and naturopathy under National Socialism.<sup>81</sup> The human body was considered to be a system that had to be in balance with its environment – air, water and soil. Surgery, as a mechanical model of human medicine, might be inevitable but if an illness could be cured by natural medicine it was best.<sup>82</sup> Second, a form of quality assurance at the specialist level was safeguarded because the group of administrators of anaesthetics was not as amorphous as it was in Britain. The administration of anaesthetics itself, usually by mask and drop bottle, was implemented in surgical care and hence it had its place in specialist healthcare. Third, the further development of the administration of anaesthetics stopped due to the cessation of German industrial support that was due in turn to a shortage of money and rubber. The Dräger Company had to stop its production temporarily in 1923.<sup>83</sup> Fourth, the world financial crisis at the end of the 1920s hit Germany especially hard. The unstable political climate and the flight of capital to Switzerland and the Netherlands plunged Germany into the deepest banking and insurance crisis in the world, the economic abyss that turned out to be the breeding ground for the

80 Rost, *Pathologische Physiologie des Chirurgen* (1925) III-V.

81 Lawrence, *Greater than the Parts* (1998) 5-8.

82 Kötschau, *Nationalsozialistischen Umbruch in der Medizin* (1936) 52.

83 Dräger, *The History of Dräger* (2006) 14.

Second World War.<sup>84</sup> Last but not least there were not enough doctors due to the constant emigration of German doctors to the United States and to a lesser extent to Britain in the 19<sup>th</sup> and 20<sup>th</sup> centuries;<sup>85</sup> this would reach its peak in the 1930s with the massive exodus of Jewish doctors to the United States, Great Britain and Palestine. In June 1933 the German Empire counted 51,527 doctors, including 5,557 (10.9%) Jewish doctors.<sup>86</sup> Probably there had been more than 9,000 (17%) Jewish doctors, but a part had already gone into exile. This percentage of Jews in medicine is higher than it was in the general population (0.8-1.5% depending on the definition of 'Jewish'). In big cities like Berlin the percentage of Jewish doctors was even higher, with reported percentages of 52%. The *Reichs Medizinical Kalender 1937* showed that 37% of the doctors in Berlin were Jewish. The emigration of Jews and the ban from profession for those who stayed in Germany meant an enormous drain on medical care, especially in the larger cities.<sup>87</sup>

Altogether, this meant that the initiatives by Schmidt and Killian would have no results for the time being.

#### 4.6. Anaesthesia in Britain

As described above German proponents of an anaesthetic specialty saw the British and American situations with professional anaesthetists as the ideal. The question however is how specialized these ideal anaesthetists were. For this reason a consideration of the British specialist world in the interwar years is justified.

##### 4.6.1. Specialists in Britain

As mentioned before the registration of specialists in Britain was traditionally not an area in which the government liked to be involved. Actually the registration of doctors and specialists was quite ambiguous.

The Medical Register, published by the General Medical Council, only mentioned the name of the institute that had licensed a doctor to practice medicine. These could be various bodies: one of the universities granting a MBBS (Bachelor in Medicine and Bachelor in Surgery); the Royal College of Physicians granting the LRCP (Licentiate RCP); the Royal College of Surgeons granting the MRCS (Member RCS) or the Worshipful Company of Apothecaries granting the LSA (Licentiate SA). Specialists in internal medicine or surgery were registered as Fellow RCP or Fellow RCS. As in Germany only an

84 James, *The End of Globalization* (2001) 59-63. Möller, *Europa zwischen den Weltkriegen* (1998) 80-92.

85 Rosen, *The Specialization of Medicine* (1944) 36.

86 Kröner, 'Emigration deutschsprachiger Mediziner im Nationalsozialismus' (1989) 1-17.

87 Teicher, *Untersuchungen zur ärztliche Spezialisierung* (1992) 88-89.

unofficial commercial list of further specialists is available in the form of the *Medical Directory*.<sup>88</sup>

Unlike in Germany multiple registrations were quite common in the *Medical Directory*. Gynaecologist in particular had several synonyms: accoucheur, obstetric physician, obstetric surgeon, physician for women's diseases and more. A doctor could be surgeon in one hospital and a gynaecologist in another hospital. For example, in 1937 JB Bannister was a gynaecologist at the Wood Green & Southgate Hospital, a surgeon at Chelsea Hospital for Women, a physician at the Royal Maternity Charity of London and an obstetric physician at Charing Cross Hospital. In the same year Miss G. Dearnley was a physician at Queen Charlotte's Maternity Hospital, a physician for women's diseases at the London School of Medicine for Women and a surgeon at Marie Curie Hospital. Neurologists and paediatricians were usually also listed as physicians. Ear nose and throat specialists, ophthalmic surgeons, orthopaedic surgeons and urologists were listed elsewhere as surgeons. Usually a sub-specialist was mentioned by his subspecialty in a general hospital and by his primary specialty in a specialized hospital. For instance, in 1937 the staff of the Royal London Ophthalmic Hospital included 12 surgeons and no ophthalmic surgeon. These surgeons however were all listed as ophthalmic surgeons at general hospitals.<sup>89</sup> In Table 2 such a surgeon was counted as an ophthalmic surgeon. In fact, surgical subspecialties like ophthalmic surgery, orthopaedics and urology were controlled by the Royal College of Surgeons. But even surgeons who were registered only as surgeons in a hospital could be sub-specialists. For instance Misters Th. Openshaw and H. Lett were both listed as surgeons in the London Hospital in 1914. However, according to the operation registers used in this study from 1902, 1911 and 1921 Openshaw performed orthopaedic surgery for the most part and Lett in 1921 and 1931 had noted urologic surgery in particular in his operation registers. Medical specialization, therefore, was much more elaborate than the directories and registers reflect.

In the 1920s anaesthetists were the third largest hospital specialty. Table 2 shows that in London in 1914 11% and in 1937 14% of the specialists were anaesthetists. Countrywide around 1925 circa 6% of British specialists were anaesthetists.<sup>90</sup> They had a separate position, however, and did not come from the circle of physicians, surgeons and their subspecialties. For this reason they very rarely had a double registration as physician or surgeon. They constituted a separate group of specialists together with radiologists, pathologists and dental surgeons. When a hospital did not mention surgeons or physicians, it would regularly mention its medical officers, dental surgeons, radiologists,

88 The *Medical Directory* in Britain and the *Reichs Medizinal Kalender* for Germany are not completely comparable. In Britain this directory only mentioned specialists who were appointed to a hospital. In Germany all specialists were mentioned. This difference between the registers could lead to the phenomenon that the overall percentage of specialists was higher in Germany than in Britain and that typically home-based specialties like dermatology and paediatrics are lower in percentage in the London register than in Berlin.

89 *The Medical Directory* (1937) 402.

90 Weisz, 'Medical Directories and Medical Specialization' (1997) table 4.

pathologists and anaesthetists. For example the Ealing King Edward Memorial Hospital and Provident Dispensary in 1937 mentioned five medical staff members (no specialists), three dental surgeons, five anaesthetists and one pathologist.<sup>91</sup> In the same year the Wimbledon Hospital mentioned honorary medical officers, pathologists, radiologists, anaesthetists and dental surgeons.<sup>92</sup> This special position, apart from the recognized surgical or medical specialties, is also recognizable from the separate way they were paid. Rosemary Stevens noticed earlier that this subgroup of 'specialists' were the first to be given full-time, salaried employment by a hospital.<sup>93</sup> In the context of this book the dental surgeons should be mentioned separately. Compared to the *Reichs Medizinial Kalender* they were abundantly present in the *Medical Directory*. In 1937 there were 151 dental surgeons in London hospitals and only 13 in Berlin. It is quite conceivable that they were not only there for dental problems. They may have had positions similar to the anaesthetists and administered anaesthetics too.

#### 4.6.2. Anaesthetists try to escape their sub-status

Obviously, the British anaesthetists were not real specialists. They formed only one of the occupational groups that administered anaesthetics. In fact the anaesthetists themselves were amorphous too because they had no examination or registration. They were self-made and not recognized by the Royal Colleges of Physicians or Surgeons. The professional anaesthetists had always been trying to escape this sub-status. They wanted to be paid on a realistic scale, not on a pre-war level, and to be able to negotiate with the patient directly and not via the surgeon.<sup>94</sup> From 1920, step by step they tried to upgrade their occupation into a real specialty.

In 1923 anaesthetists set up the *British Journal of Anaesthesia*, the first journal in the world devoted purely to anaesthetics. The editorial board consisted of Hyman Morris Cohen (1875-1929) (the first editor); Buxton, by now almost at the end of his career; Boyle and Blomfield. All were anaesthetists of the first hour. The experiences with newer techniques, gas and oxygen anaesthesia and the future trademark of endotracheal intubation, which had first been published in general medical journals, could now be published in their own anaesthetic journal. Comparing the set-up of the *British Journal of Anaesthesia* and *Schmerz Narkose-Anaesthesie* reveals the different approach to anaesthesia in both countries. *Schmerz Narkose-Anaesthesie* was more scientific and was not directed at shared material interests. Its board was multidisciplinary and multinational. The editorial board of the *British Journal of Anaesthesia* consisted of anaesthetists only. Its goal was not primarily scientific, combining approaches from all possible angles, but the creation of a platform where a congenial group could exchange their experiences and interests. The *British Journal of Anaesthesia* had to safeguard and protect the body of thought of the anaesthetists. The foreword to the first issue revealed this second goal

91 *The Medical Directory* (1937) 393.

92 *The Medical Directory* (1937) 397.

93 Stevens, *Medical Practice in Modern England* (1966) 61.

94 Phillips, 'Anaesthetists' remuneration' (1920) 933.

**STANDING ORDERS**  
**ON THE**  
**Administration of Anaesthetics.**

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1. No person is allowed to administer any anaesthetic in the Hospital until he shall have been reported to the Dean by the Instructor in Anaesthetics as duly qualified.
2. In the absence of the Instructor, or Assistant Instructor, or of a Physician or Surgeon, or of an Assistant Physician or Assistant Surgeon, or of one of the Registrars of the Hospital, no anaesthetic shall be administered unless two members of the Resident Staff (the Receiving Room Officers, Emergency Officers, and the Out-patient Clinical Assistants being deemed Resident for this purpose) are present.
3. The administration of every anaesthetic is to be recorded in the Book kept for the purpose in the Theatre, Ward, Receiving Room, or Out-Patient Department.  
 If Chloroform is administered the reason for doing so must be stated.
4. As Ether is so much safer than Chloroform it should be the routine anaesthetic.  
 A mixture of Ether and Chloroform may be used as a preliminary to open Ether, or in certain mouth operations when a light anaesthesia is required.  
 Chloroform must not be given except under the following conditions:-
  - (a) The presence or express permission of a member of the Visiting Staff who distinctly authorises the use of Chloroform in the particular case.
  - (b) It is found impossible to anaesthetise the patient with Ether.
  - (c) In cases where the use of a Junker's inhaler is necessary.
5. Nitrous Oxide should not be administered for more than 15 minutes, (unless mixed with oxygen.)
6. Any fatality occurring in connection with the administration of an anaesthetic is to be reported at once to the House-Governor by the Officer who administered the anaesthetic; and a detailed account of the administration, together with one of the forms prepared for the purpose, and a copy of the notes of the post mortem examination, is to be posted as soon as possible by the Administrator to the Instructor in Anaesthetics, who will report thereon to the House Committee.

*Oct. 1935.*

Figure 21. Standing Orders on the Administration of Anaesthetics in the London Hospital 1935. Except for the notes on chloroform and ether not much has changed since 1896.



of the initiators of the new journal. It was considered expedient to found an organization of anaesthetists to be able to exert influence on matters that were discussed in public. An example was the pressure that was laid upon anaesthetists by the coroners' inquests on every anaesthetic death, a consequence of the failure of the anaesthetic bill introduced before the Great War. The proposed name of the interest organization was the British Association of Anaesthetists. The goals were to promote the recognition of the administration of anaesthetics as a specialized branch of medicine, to promote the establishment of diplomas and degrees in anaesthesia, to represent anaesthetists and to promote their interests.

Almost ten years of discussion went by before the organization was founded as the Association of Anaesthetists of Great Britain and Ireland in 1932. An important problem that had to be solved before its foundation was the question of who would be allowed to become a member of the association and who would not. On one side the founders wanted to control the whole field of the administration of anaesthetics; on the other side they wanted to keep their club a select one. In the end both goals were combined. Like the Society of Anaesthetists that had existed from 1893 to 1908 and had limited its membership to around 100, the Association kept the number of members limited to 150. The requirement to become a member of the Association was an appointment as an anaesthetist in a teaching hospital or medical school.<sup>95</sup> These professional anaesthetists taught and controlled the doctors who were charged with the 24 hours/day 7 days/week administration of anaesthetics. An illustration of this unchanged position is confirmed by the standing orders of the London Hospital, the same in 1935 as they were in 1896 (Figure 21).

The teaching anaesthetists only administered anaesthetics in special cases, for particular surgeons or special patients. As before the Great War these anaesthetists worked mainly in London and to some degree in other large cities, like Manchester and Liverpool. This is confirmed in the operation registers. In St Bartholomew's Hospital London during the investigated period (from 1930 to 1961) between 20% and 50% of administrators were anaesthetists, according to the Medical Directory. In the London Hospital, 1911 - 1951, anaesthetics were administered in circa 70% of cases by an anaesthetist listed in the Medical Directory. The percentage was highest in 1931 with 83% in and lowest in 1941 with 18%. In other areas anaesthetists did not appear prior to 1939 (Withington Hospital, Manchester), 1947 (Crumpsall Infirmary, Manchester) or 1949 (Scunthorpe and District War Memorial Hospital, North Lincolnshire). When present in these rural hospitals the anaesthetists only performed 3% to 13% of the anaesthetic interventions. If there was no anaesthetist involved, anaesthetics were administered by an amorphous group of administrators. Their qualifications could not always be retrieved. Some were members of the surgical house staff; most were general practitioners. For good reason George Edwards (1901-1989), anaesthetist to St. George's Hospital, London addressed medical students in 1938 and said that they too would have to administer anaesthetics

<sup>95</sup> Snow, *Operations without Pain* (2006) 177.

with all its hazards once.<sup>96</sup> Simultaneously the Association of Anaesthetists tried to maintain control of the whole field of the administration of anaesthetics by the establishment of a diploma in anaesthetics.

A discussion about this diploma was begun by James Ross Mackenzie (1879-1963), an anaesthetist from Aberdeen, directly after the Association was founded. The reason given was the subordinate status of the administration of anaesthetics in the medical curriculum. A diploma had to stop the increasing number of general practitioners who administered general anaesthesia without adequate training in the countryside and in industrial areas where there was a relative shortage of anaesthetists.<sup>97</sup> The Diploma in Anaesthetics, abbreviated DA, should also become a sine qua non for the post of honorary anaesthetist and hasten recognition of anaesthetics as a separate entity.<sup>98</sup> The main goal of the diploma in anaesthetics however was stated in its welcome by an editorial in the *British Journal of Anaesthesia* in July 1935: it was to improve the status of the administration of anaesthetics, leading to better rewards for its practitioners.<sup>99</sup> Extensive negotiations with the Royal College of Surgeons and the Royal College of Physicians in their Conjoint Board, that regulated postgraduate training, had preceded the realization of this first formal certification for anaesthetists in the world.<sup>100</sup> Candidates had to have a medical qualification and had to have been resident for one year in a recognized general hospital, of which at least six months as resident anaesthetist, or they had to have administered anaesthetics on at least 1,000 occasions. The examination itself was theoretical and included knowledge of the various types of anaesthetic apparatus. In the context of this thesis it is important to note that intravenous fluid therapy was not an explicit part of the exam; neither did it mention endotracheal intubation. In a transition phase of three years the diploma in anaesthetics could be given without examination to anaesthetists who had been appointed to a hospital or medical school for at least ten years.<sup>101</sup> It was given to 66 anaesthetists in 1936 including Magill, Boyle and Daly.<sup>102</sup>

The creation of the first chair for anaesthesia in Britain could easily be considered as the ultimate reward for the professional anaesthetists as they strove to establish an anaesthetic specialty equal to surgery, gynaecology and internal medicine. This chair was held by Robert Reynolds Macintosh (1897-1989) of the Nuffield Department of Anaesthesia in Oxford from February 1<sup>st</sup> 1937. His personal importance for the growth to maturity of the anaesthetic specialty cannot be overestimated. His trademark was the elegantly shaped laryngoscope blade. He produced several textbooks on endotracheal

96 Edwards, 'Death on the table' (1938) 103.

97 Mackenzie, 'Modern anaesthetics' (1932) 175-177. Stevens, *Medical Practice in Modern England* (1966) 41.

98 Mackenzie, 'A Diploma in Anaesthetics' (1935) 147-8.

99 Anonymous, 'Improving the status of Anaesthetics' (1935) 149-150.

100 Beinart, *Nuffield Department of Anaesthetics* (1987) 16.

101 Examining Board in England, 'Regulations' (1935) 184-187.

102 Announcement, 'The Diploma in Anaesthetics' (1937) 83-84.

intubation. Nevertheless it is important to realize that his appointment as professor was a strictly private initiative by the car manufacturer and philanthropist William Richard Morris, later Viscount Nuffield. The idea of an anaesthetic chair in Oxford was suggested to him by Macintosh himself on the golf course at Huntercombe. It was not a coordinated action of a group of practitioners, anaesthetists, scientists, surgeons or healthcare administrators.<sup>103</sup>

#### 4.6.3. An anaesthetic specialty is just about established

Considering the position of the anaesthetists in Britain in the interwar years against the phases of medical specialization from Chapter 1 it can be concluded that almost every criterion had been met. They had their 'special thing' with the administration of anaesthetics, cooperation with a supporting industry, a journal, a chair, an interest organization, efficient marketing that had resulted in the establishment of their own tariffs and a certification. There were almost no objections. Only once in a while did somebody raise a question about the division of responsibilities to the surgical patient and conclude that everything depended on the close cooperation of two specialists.<sup>104</sup> A real specialty was just around the corner. But the anaesthetists did not want to be responsible for all anaesthetics around the clock. This would be a completely impossible task for the select club of specialists.

### 4.7. Chapter Review

The Great War had not led to anaesthetic specialization. The immediate effect of the war had even led in the opposite direction. The keywords for anaesthetic management had been simplicity, flexibility and maximum availability in time and place. It has been shown that this effect of the Great War was most pronounced for Germany.

In 1918 Britain had more or less won the war. Its colonial empire, the source of raw materials for its industry, had been saved. It was a time of prosperity. The financial crisis at the end of the 1920s largely passed Britain by. There was no need for a change. The professional anaesthetists continued to improve the status of their as yet unofficial specialty. Their first action after the war was to sidetrack the nurse anaesthetists who had become a part of military anaesthetic practice. The next step was the foundation of the *British Journal of Anaesthesia* in 1923. As before the war the initiators of these scientific manifestations, like Buxton and Blomfield, were mainly based in London. The anaesthetists did not want to take part in all the anaesthetic procedures in all hospitals. They wanted to teach and supervise the doctors, often general practitioners, who administered the anaesthetics. In 1932 they founded the Association of Anaesthetists, meant as a select club of professional anaesthetists. Their first initiative was to establish

103 Sykes, 'Robert Reynolds Macintosh' (1989) 816.

104 Gray, 'Discussion on Anaesthetics' (1923) 791-796.

a diploma in anaesthetics, not to create more professional anaesthetists but to dispense knowledge about anaesthetics and anaesthetic apparatus among general practitioners. The administration of anaesthetics became further mechanized in this period. Pressurized and regulated gas flows delivered accurate levels of volatile anaesthetics to the patient. The famous endotracheal intubation with a rubber wide-bore tube was developed by Rowbotham and Magill. Not the idea but the material, rubber, was new. Pliable rubber enabled close contact between the device and the patient. This mechanization was clearly enabled by a flourishing medical industry in Britain, fed by an abundance of rubber. Three kinds of industry were now involved in anaesthetic devices: steel, compressed gas and rubber. The intravenous induction of general anaesthesia by barbiturates replaced induction by chloroform.

Whereas Britain experienced relative prosperity, Germany was hit by the interwar financial crisis like no other country, and the money and assurance crisis was not the only problem. Germany, deprived of its few colonies after the Great War, was excluded from the international rubber trade. At the end of this period an effective blockade definitively isolated Germany. Social tensions grew and Jews were blamed. National Socialism reigned and had its consequences for the medical world. Jewish doctors went into exile, leading to a drain of one-fifth of the medical potential in Germany. German surgeons remained the rulers of anaesthesia. They incorporated the emergency measure of 'Narkoseschwestern' in their practice. These nurses were charged with the minor anaesthesia and had their own anaesthetic bible: *das Kleines Narkosebuch*, written by surgeons. The administration of anaesthetics was still principally carried out by medical students and surgical assistants. But it would be too limited to consider only the simplification of anaesthesia in Germany. A movement courtesy of German surgeons like Killian and Schmidt deployed initiatives to provide anaesthesia with a scientific foundation. Its forum was the journal *Schmerz Narkose-Anaesthesie*.

The administration of volatile anaesthetics lagged behind in Germany compared to Britain. The application of 'Gas- or Apparatnarkose' especially decreased, due not only to the absence of sufficiently trained anaesthetists but also to the industrial crisis in Germany. Lack of rubber, lack of orders and political limitations led to the stagnation of the German instruments industry around 1930. In fact it was a kind of vicious circle. Nevertheless intravenous anaesthesia was introduced in Germany as in Britain and ended the widespread use of chloroform. Local anaesthesia remained popular although it was not applicable in all types of surgery. Moreover the higher mortality rates for surgery under local anaesthesia that were sometimes reported caused concern.

At the end of this period, at the dawn of the next world war, anaesthetists in Britain still constituted a select club of teachers and writers who were trying to control the field around them by the provision of a diploma in anaesthetics. In Germany anaesthesia continued to be part of surgery. The 'Narkoseschwestern' were under the control of the surgeons. Laid along the phases of specialization the British anaesthetists, on a favourable economic tide, grew to the start of the third phase of medical specialization with an interest association and a diploma. But it is important to realize that this did not mean

that the routine administration of anaesthetics was monopolized; rather, it was all about teaching and supervising. In Germany the slow progress towards the second phase of specialization with a journal had been noticeable. But that was the extent of the progress, and it was not aimed at establishing a professional grouping, only at scientific exchange.



## 5. The Second World War 1939-1945

‘This was their finest hour’.

Winston Churchill in the House of Commons, June 18<sup>th</sup> 1940.

### 5.1. Preview

During the interwar years Britain and Germany still differed in the organization of anaesthetic care. In Germany anaesthesia was a part of surgery as it had been from the beginning. Germany had had only a whiff of a second phase of anaesthetic specialization with a journal and support for professional anaesthetists. Due to the economic depression, a slackening anaesthetic industry and a continuing shortage of doctors, however, anaesthetic practice was captured in a vicious circle of a lack of training and the delay of new techniques. In Britain, anaesthesia was not part of an existing specialty but was claimed by anaesthetists. They had set up a journal, an association and a post-graduate examination in the administration of anaesthetics. Behind them they had a worldwide shipping industry offering everything an up-to-date anaesthetist needed. These anaesthetists had monopolized the teaching of anaesthetics and some advanced anaesthetic techniques. The routine administration of anaesthetics was still carried out by general practitioners, surgical assistants and dentists. The anaesthetists, although in their second phase of specialization, were not equal to recognized specialists like surgeons and internists. They had only a postgraduate diploma. At this point escalating international tensions led to a new world war with new demands on the army medical services.

This chapter will tell the story of how the new war turned into a replay of the Great War for the German army medical services. Within three years the war had run out of control for Germany and shortages of everything as in the Great War were once again experienced. Britain however, due to its traditional island security and by avoiding large-scale land operations at first, used this period to prepare their medical services for the home front and for the inevitable battle. During this preparatory period the Emergency Medical Service for civilian tasks and the Royal Army Medical Corps for military tasks started to employ anaesthetists, preferably with a diploma in anaesthetics, not only as teachers but also as routine administrators of anaesthetics.

## 5.2. Toward a new war

Many causes have been given for the Second World War, as for the Great War, from now on referred to as the First World War. Decades after the defeat of Germany in 1945 new theories are still being put forward. Was it just a one-man action by Hitler or was it a more systemic flaw in world organization that plunged the world into a new war? How far back in time do we need to go to discover the origins of these wars? From afar the discussion resembles the question posed by this thesis. Was it just a one-man action by Sauerbruch that halted the anaesthetic specialty in Germany or was it a more systemic difference? Considering the previous chapters it can be no surprise that the author's inclination is toward the systemic approach. Such a systemic approach was taken to the Second World War by Allan Taylor in 1961 in his *Origins of the Second World War*. Although he has been criticized heavily, he gained support for his view that the Second World War was the continuation and completion of the Great War that had not been ended but rather halted by an armistice. Because of this the First World War had not solved the German problem, that of the biggest nation in Europe not having access to world power and to the world trade in raw materials.<sup>1</sup>

Despite the armistice Britain had considered itself to be the victor and experienced all of the drawbacks accompanying the complacency that tends to affect victors. Like other victors Britain ignored the signs of new international tensions, saved on defence efforts, underrated the chances of a new war and would eventually be caught up in that new war at an awkward time.<sup>2</sup> In that way Britain was actually ill-prepared for the new war. Germany had lost the first war without being defeated. In the armistice treaties Germany had been humiliated and was kept far from the world's stage; the allies had planned to return it to an agrarian state. But no state is more dangerous than a state that has lost a war. Rearmament was the creed in Germany from 1918 on. After the world financial crisis at the end of the 1920s Germany was not able to withstand the populist ideas of national socialism. This led to an acceleration of rearmament, the training of a new army and eventually to a new war in 1939. By that time German armament was far ahead of Britain, which had realized the danger only in 1934 and had started to prepare.

The new kind of war would be different from the First World War. It would be characterized by mechanized mobility through the massive employment of tanks and airplanes, both developed during the First World War. As during the First World War there was a difference in involvement between both countries. Britain mobilized 13% of its inhabitants for war, Germany mobilized 27% of its inhabitants. For Germany the Blitzkrieg soon turned into a First World War-like bloody mess in the mud and snow of Russia with enormous numbers of casualties and widespread illness. Germany's reserves and supplies were too slight for a longer lasting strategic war. When the acquisition of new territory and new sources of raw materials in the east had once and for all failed

<sup>1</sup> Henig, *Origins of the Second World War* (1985) 4. Taylor, *Origins of the Second World War* (1961) 10.

<sup>2</sup> Taylor, *Origins of the Second World War* (1961) 30-31.



with the defeat at Stalingrad in February 1943 and the Russian counteroffensive during the battle of Kursk in August 1943 the war was lost for Germany. As usual the lack of manpower and raw materials such as oil and rubber had incapacitated its armed forces.

While Germany had stretched its resources to their limit in 1943, the Allied forces considered 1943 to be only the end of the beginning. During the first years Britain had limited its participation in the war to naval and aerial operations to be able to equip and train its army for a new kind of war. This was the old-time advantage of the expeditionary military power, which can choose the moment of intervention. The large battlefield in France was avoided as long as possible, with its reminders of the slaughter in the trenches during the First World War. Churchill, who was now a wartime leader, preferred more remote actions in North-Africa, Italy and the south of France.<sup>3</sup> The story reads that in 1944 just a few weeks before D-day he asked his Chief of the Imperial General Staff, Sir Alan Brooke, to consider landing in Portugal instead of Normandy. The difference in levels of participation between Britain and Germany in the Second World War explains the big differences in the percentages of wounded and killed servicemen (Table 5).

**Table 5. Approximate inhabitants, military servicemen, their deaths and wounded in the Second World War from 1939-1945**

	Inhabitants	Served (percentage of population)	Deaths (percentage of population)	Wounded (percentage of population)
Britain	47.000.000	5.896.000 (13%)	264.443 (0.6%)	277.077 (0.6%)
Germany	67.000.000	18.200.000 (27%)	5.318.000 (8%)	6.035.000 (9%)

Sources: Mellor WF. *Casualties and Medical Statistics*. 1972. p 829 and 836; Rüdiger Overmans. *Deutsche militärische Verluste im Zweiten Weltkrieg*. Oldenbourg 2000 p. 333-35; G. I. Krivosheev. *Soviet Casualties and Combat Losses*. Greenhill 1997 ISBN 1-85367-280-7.

Note: This table shows a lower rate of involvement in the war for Britain, as in the First World War. Remarkable is the much lower number of casualties for the British forces compared to the German forces, caused by the postponement of large-scale land operations by Britain and the slaughter of German forces at the Russian front.

<sup>3</sup> Haffner, *Churchill* (2002) 121.

### 5.2.1. Army Medical Services

When the new war seemed inevitable the army medical services started to prepare. Their frame of reference was the experiences of the First World War, and they had numerous published reports to refer to.

#### *'Heeressanitätsdienst', Army Medical Service*

For Germany it was 'Generalstabarzt der Armee' Otto von Schjerning (1853-1921) who had edited *Ärztliche Erfahrungen im Weltkrieg 1914-1918* in 1922. Remarkably, the 'Heeressanitätsdienst' itself published its report on the Great War not earlier than in 1935 after the assumption of power by the national socialists in Germany. The first new military surgical textbooks also started to appear in 1935. Although the authors wrote the books on their own account they were closely related to the army and to law enforcement. They were doctors like Heinrich Schum, 'Oberstarzt der Landespolizei', Lieutenant-Colonel Doctor of the State Police, and 'Direktor des Staatskrankenhauses der Landespolizei Berlin', Director of the Hospital of the State Police in Berlin, and Carl Franz, who was still a professor of military surgery in Berlin. The latter had written his first *Kriegschirurgie* in 1920 and resumed the thread in 1936 with his *Lehrbuch der Kriegschirurgie*.

In the 1930s the doctrine governing the assignment of personnel and tasks within facilities in the line of evacuation was unchanged since the First World War (Figure 22). The line of evacuation still started with the 'Truppenverbandplatz', Troop Dressing Station. In this facility with medical officers only the most urgent surgery was performed: tracheotomy, external bleeding control and emergency amputation. Next in line was the 'Hauptverbandplatz', Main Dressing Station. In this facility full surgical treatment was available, including laparotomy and skull surgery. The next station was the 'Feldlazarett', Field Hospital, usually housed in a pre-existing building, preferably a local hospital. Its function could change from clearing station, when the 'Hauptverbandplätze' were overloaded, to extended stay hospital, when the battle was in a quieter phase.<sup>4</sup> The main lesson from the First World War had been the need for quick transport between the lines of evacuation. Motorized transport played an important role in this.

Well-trained administrators of anaesthetics were known to be scarce – that was the experience in the First World War and more importantly was experienced in civilian life. Administrators had to be trained on the spot. 'Es war Sache sämtlicher Ärzte, sich das Personal an Narkotiseuren, Instrumenteuren und so weiter, selbst heranzubilden.'<sup>5</sup> If necessary this part of surgical care could be taught in a few days to low-ranking health personnel or 'Sanitäts-Untersonen', nursing staff.<sup>6</sup>

At the outbreak of the war the German army medical service was readily prepared, based on the lessons of the previous war. A new factor, which applied to warfare as a

4 Schum, *Einführung in die Wehrchirurgie* (1935) 54-57.

5 'It was the task of all doctors themselves to train personnel as administrators of anaesthetics, instrumental assistants and so on.' Ibid 61

6 Ibid 77

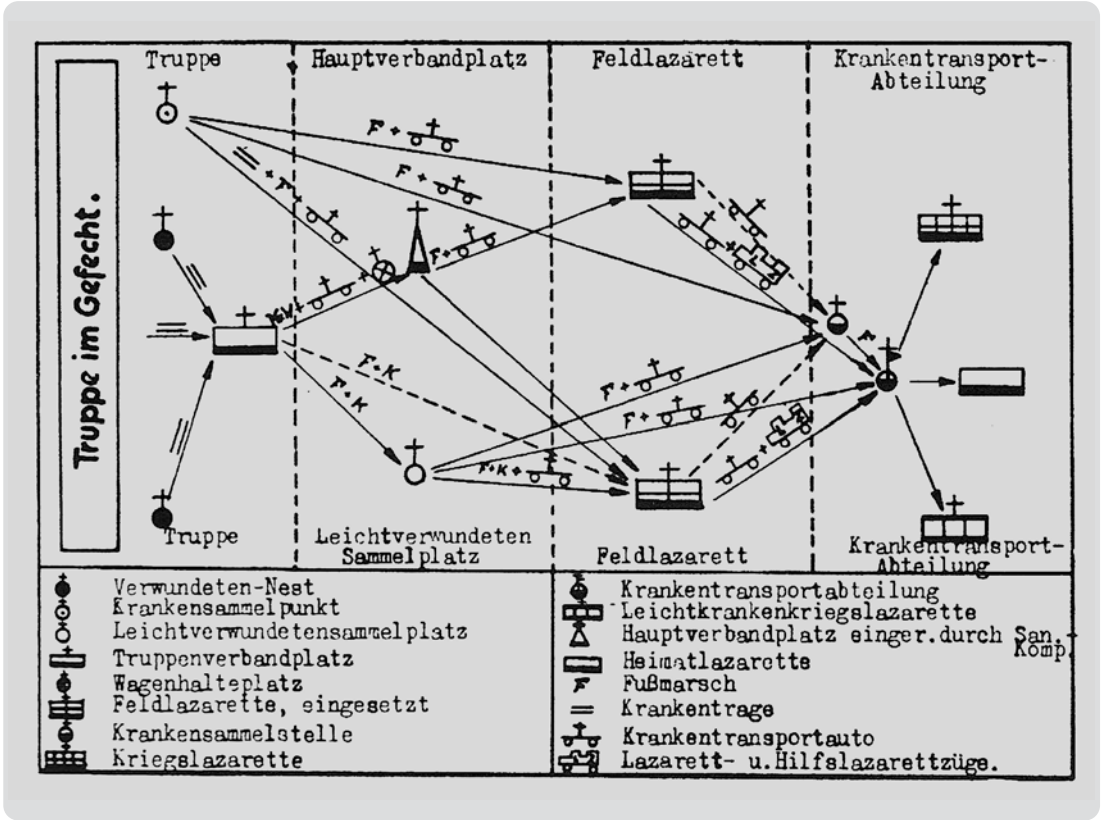


Figure 22. 'Schema des Verwundetentransportes', transport of wounded scheme, according to Schum, *Einführung in die Wehrmedizin* (1935) 59. Note the prominent role of the 'Krankentransportauto', motorized ambulance. Also note the flexibility/complexity of the evacuation lines from left to right.

whole, was the wider implementation of mechanized means of transport. Unknown as yet was the scale of the coming war and hence the extent to which the medical service had to grow.

*The Royal Army Medical Corps (RAMC)*

In Britain the medical experiences of the First World War had been collected and edited by Major-General Sir William Grant Macpherson (1858-1927), who had served in the First World War as deputy Director-General Medical Services and later became commander of the Royal Army Medical Corps.

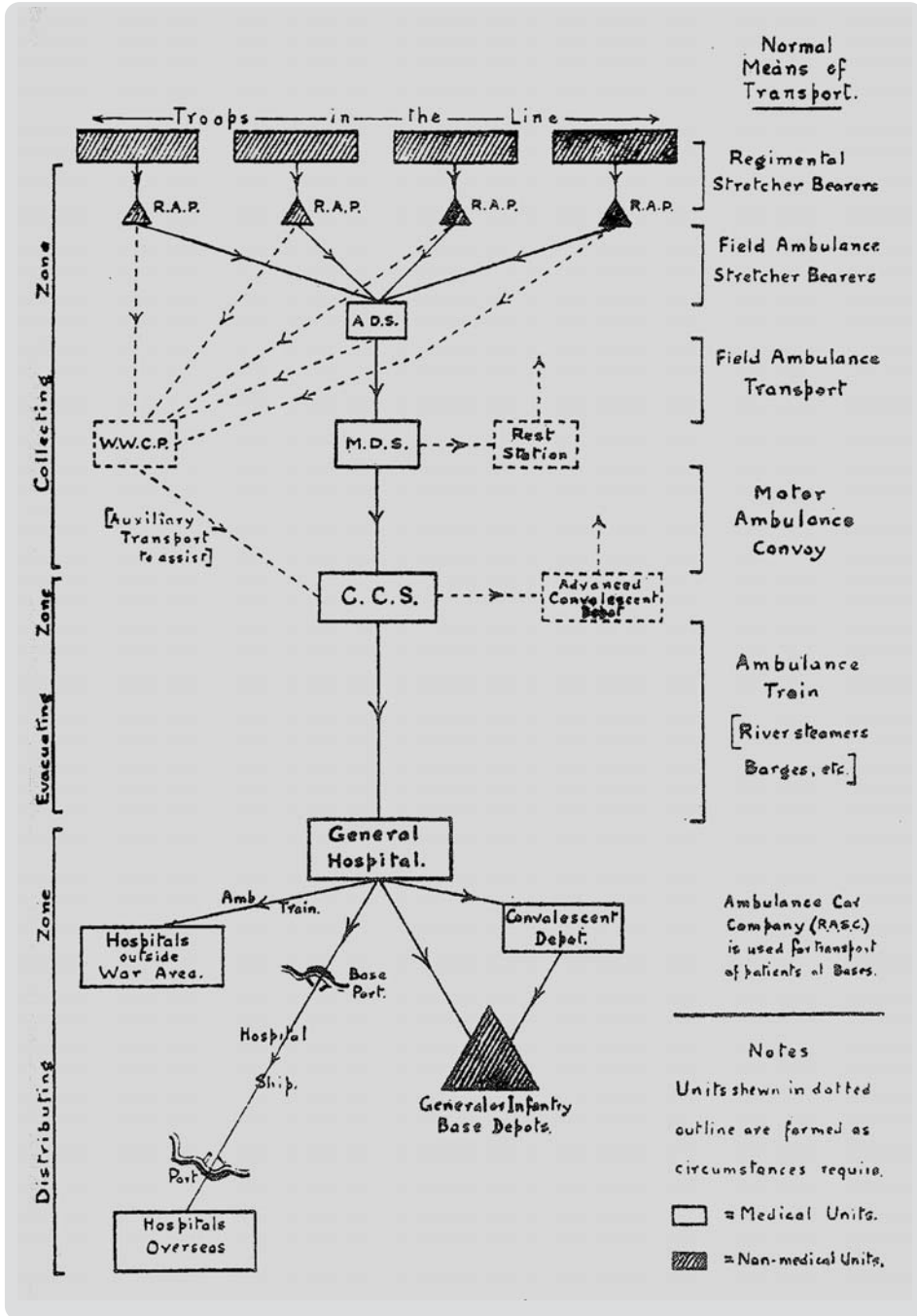


Figure 23. Diagram showing the chain of evacuation according to the War Office RAMC training manual (1935) 103. Note the resemblance to the German scheme in Figure 22.

The doctrine for the organization of the British army medical services was laid down by the War Office in 1935 in the *Royal Army Medical Corps Training Manual*. In 1935 the division into collecting, evacuating and distributing zones was the same as during the First World War (Figure 23). But in parallel with the higher degree of mechanization and mobility of the armed forces, the more widespread means of transport by motor ambulances, ambulance trains and hospital ships meant that quicker transport between the zones was possible. In this multi-stage system there was a spirit of concentration and specialization. The transport possibilities were supposed to bring the patient to the specialized doctor in a suitable facility instead of bringing large numbers of untrained doctors to the patient anywhere in the theatre of operations as had happened during the First World War. Because of this an experienced surgeon, if one was available, could be feasibly assigned to the facility in the collecting zone, for example in an Advanced Dressing Station. He was there for triage, directing the wounded to the most applicable facility for treatment. In the dressing station itself the surgeon performed only very urgent surgical procedures. Complete surgical teams for full surgical treatment including an anaesthetist were assigned to the Casualty Clearing Stations.<sup>7</sup> It is characteristic that the presence of an anaesthetist was considered to be a matter of course, unlike in the German medical services. How the anaesthetist was trained or what he had to do was not defined. In general, the way specialists or medical officers practised their craftsmanship was not defined in military training manuals. The expertise was left to the individual specialist who would be recruited from civilian healthcare services during wartime. He could base his treatment on specific war surgical textbooks written by surgeons. Newer versions of such textbooks had not been published in Britain since the *Manual of War Surgery* by Barling in 1919. In that respect Britain was less prepared than Germany, where newer books had appeared. A new line of textbooks would appear only after the beginning of the war, written by Henry Hamilton Bailey.

#### *Lower deployment of medical personnel*

Reviewing the preparations made by the British and German army medical services shows they were much the same and were based on experiences in the First World War. Transport and logistics were the main new features in the new, mechanized war. Remarkably there would be a lower overall deployment of military medical personnel on both sides compared to the First World War. Britain mobilized 11,421 medical officers or 20% of all medical men in the United Kingdom.<sup>8</sup> This meant one medical officer for every 516 mobilized servicemen, while in peacetime civil practice the relation was one doctor for 1,000 inhabitants. In the First World War this ratio had been one medical officer for every 354 servicemen. Germany mobilized 21,723 doctors or approximately one-third of all doctors in Germany at that time. As during the First World War the training time for doctors in military medical schools was shortened, as it was for all medical personnel.<sup>9</sup>

<sup>7</sup> War Office, *Royal Army Medical Corps Training* (1935).

<sup>8</sup> Crew, *The Army Medical Services 1* (1953) 197.

<sup>9</sup> Buchner, *The German Army Medical Corps* (1999) 7.

This meant one medical officer for every 837 mobilized servicemen, while in peacetime civil practice the relation was one doctor for 1,200 inhabitants. In the First World War this ratio had been one medical officer for every 502 servicemen.

The explanation for this reduced military medical density is twofold. First, naval and aerial warfare played a larger role during the Second World War than during the First. In the navy and air force a system of echelons of medical services with doctors over the entire line of battle does not make sense. A ship has only one echelon, the sickbay with one or two doctors; a plane carries no doctor at all. The high mobility of ships and planes makes it unfeasible to create an evacuation zone facility. Also, during the classic infantry and mechanized cavalry war that was fought by Germany and to a lesser degree by Britain the lower number of mobilized doctors was due to the enhanced transport by train and ship available from the front to medical facilities and to the homeland. Thereupon medical personnel could be employed in a more efficient and targeted way.

### 5.2.2. Different approach to civilian medical care

Britain and Germany realized that a new war could be a total war, fought not only on the battlefield but also at home. Strategic air bombardments would be part of it. The reality of this view was strongly accelerated by the German air attack on Guernica during the Spanish Civil War in 1937. Sovereign territory was no longer safe behind defence lines.

For Germany this was not new. Located in the centre of the continent they were acquainted with battles on their own territory. Civilian casualties and the medical care needed for them were familiar to them. With their state and university hospitals the German authorities had enough medical facilities to assure civilian medical care. In this respect Martin Kirschner, a surgeon in Heidelberg, gave a lecture during the war at the university entitled, 'Surgical clinic with regard to accident and war surgery'. His colleague Karl Heinrich Bauer gave a similar talk, 'Surgery clinic – especially accident and military surgery'.<sup>10</sup>

For Britain these circumstances were completely new. Britain had never fought wars on its own territory in the modern era, only expeditionary wars. A home front had never existed. After Guernica British policymakers realized that this would change and would also have consequences for medical care at home. Because of the largely private character of British hospitals the British government would not have enough civil hospital beds and specialists at its disposal to guarantee the necessary emergency medical care for citizens at home in case of aerial bombardment. This was still a consequence of the widespread private enterprise character of British healthcare and medical education. Providing healthcare and the training of doctors were not governmental tasks.<sup>11</sup> Besides, a recent report by Political and Economic Planning, a British think tank, had revealed a total lack of coordination between the 4,000 hospitals and their medical staff.<sup>12</sup> What numerous committees on the structure of hospital management failed to

10 Taken from Remy, *The Heidelberg Myth* (2002) 95.

11 Bonner, *Becoming a Physician* (1995) 8.

12 Political and Economic Planning, *The British Health Services* (1937) 230-270.

do in Britain in half a century was managed by the threat of the German Luftwaffe within two years. The Ministry of Health set up the Emergency Medical Service (EMS) in September 1939 by organizing a network of existing hospitals and medical staff.

### 5.2.3. The spark

The beginning of the new war fulfilled all forecasts. On September 1<sup>st</sup> 1939, after a series of skirmishes and territorial acquisitions in which Britain tried to stay at peace in order to win time, Nazi Germany took the initiative and tested its renewed armed forces with an attack on Poland. The new Blitzkrieg, characterized by rapid, mobile and concentrated warfare combining sea, land and air forces, proved to be highly successful. Strengthened by this success, Germany on May 10<sup>th</sup> 1940 commenced hostilities on the Western Front with France, this time not in a trench war but in a mechanized and mobile war. As in 1914 British Expeditionary Forces were sent out to help the French and to keep Germany from reaching the Atlantic coast. The result of the British intervention was disappointing and the forces had to be withdrawn. Withdrawals like this are an accepted part of expeditionary warfare. They are not considered to be a defeat but a tactical manoeuvre to safeguard and train the army for more favourable conditions. Prime Minister Churchill even considered it a small victory when he addressed the House of Commons on June 4<sup>th</sup> 1940 after the evacuation of the British Expeditionary Forces from the beaches of Dunkirk and said: 'We must be very careful not to assign to this deliverance the attributes of a victory. Wars are not won by evacuations. But there was a victory inside this deliverance, which should be noted ... We got the army away.'<sup>13</sup> The planners had been right. The army had to be trained and equipped for the modern mobile war first. In the meantime bombs from the Luftwaffe in 1940 on England brought the war home and caused tens of thousands of civil casualties. The establishment of the Emergency Medical Service had proved to be justified.

### 5.3. Resuscitation, a renewed concept in war surgery

Military medicine including surgery was as important in the Second World War as it had been in the First World War. While the military manuals described organizational issues like the echeloning and staffing of facilities, the content of the care was largely left to the medical professionals. These professionals came from civilian medical care, as they had in the First World War, and applied their civilian experiences to the military situation. As before, there were some differences between civil and military medicine. One of them was the incidence of circulatory instability in the wounded patient.

From previous wars, in particular the First World War, it was known that serious war wounds, in addition to causing damage at the site of the wound, had a general deregulating effect on the human body leading to a complex situation called shock. Both British and

<sup>13</sup> Churchill, *The Second World War 2* (1949) 102.

German war surgical textbooks paid attention to it in their opening chapters. Surgery without control over shock was considered useless. 'Operative Eingriffe sollen, soweit irgend möglich, verschoben werden, bis die bedenklichsten Erscheinungen des Shocks abgeklungen sind'.<sup>14</sup> The understanding and treatment of this severe clinical entity had not changed during the interwar years. Even in 1941 Bailey in his *Surgery of Modern Warfare* still assumed the concept defined by a committee that had been appointed by the Medical Research Council in 1917 to investigate traumatic shock. The pathological mechanism was thought to be multifactorial, ranging from psychic paralysis to nervous deregulation to haemorrhage to toxæmia. The treatment consisted of supportive measures like the application of warmth, sympathicomimetics and above all restoration of circulating volume. The war surgical doctrines in Britain and Germany did not differ in their treatment of shock and their focus on blood loss. Loss of blood was the main cause of circulatory failure and hence restoration of circulating volume was the main goal of fluid treatment.

The ongoing experience with blood grouping, matching and storage and the distribution of blood products in the interwar years had made blood transfusion safer than it had ever been before. The dip in blood transfusions from before the Great War was definitively over.<sup>15</sup> Technically the transfusion was performed with infusion systems, varying from super direct (the Crile anastomosis) to direct and indirect; these systems had been developed in the interwar years. Thanks to the typing and screening of blood groups blood banks could provide matching transfusion blood in bottles.<sup>16</sup> With the improved availability of transfusion blood, the administration of various sympatico-mimetics to stimulate the circulation, common in elective surgery in civilian practice was only scarcely advised and in later editions of war surgical textbooks it was even advised against. Restoration of fluid losses was the principle treatment for shock.<sup>17</sup>

The transfusion of human plasma, isolated from donor blood, was new during the Second World War. In 1941 it was still in an experimental stage, but its use grew during the war, especially for treatment of burns and trauma with extensive tissue damage. Plasma or 'Mischserum' had several advantages. With plasma there was no need for blood grouping, it could be stored more easily than whole blood and if stored in dried form the logistical advantages were even greater.<sup>18</sup>

14 'Surgical procedures should if possible be postponed until the most severe symptoms of shock have disappeared'. Schum, *Einführung in die Wehrchirurgie* (1935) 75.

15 Lexer, *Lehrbuch der allgemeinen Chirurgie* (1920) 15-17. Lexer, *Lehrbuch der allgemeinen Chirurgie* (1928) 16. Rose, *A Manual of Surgery* (1924) 56.

16 Surgical Manufacturing, *Catalogue of Surgical Instruments* (1925) 117. Weiss, *Catalogue of Instruments* (1925) 374-375. Mayer, *Catalogue of surgical instruments* (1931) 95-100. Aktiengesellschaft, *Chirurgie-Instrumente Aesculap B* (1938) 428.

17 Ogilvie, *Forward Surgery in Modern War* (1944) 88. Zillmer, *Kriegschirurgie im Reservelazarett* (1943) 38. Franz, *Kriegschirurgie* (1942) 29. Finch, 'Shock and its treatment' (1944) 78.

18 Finch, 'Shock and its treatment' (1941) 24. Edwards, 'Infusion of blood substitutes' (1942) 56-59. Zimmer, *Wehrmedizin* (1944) 156. Edwards, 'Infusion of blood substitutes' (1944) 90-100.



The indication to use electrolyte solutions resulted in a shift to the ‘Dauertropfinfusion’ or intravenous drip over a longer period to enable the physiological mechanisms of the human body to restore circulation.<sup>19</sup> This continuous infusion had to be done while the patient’s fluid balance was strictly controlled, or the patient could drown internally from all the fluids that were administered.<sup>20</sup> A German innovation in transfusion management came about because of the shortage of blood available to its forces during the war. As was the case with rubber and oil, synthetic substitutions were sought for blood and plasma. German pharmaceutical companies like Bayer, a leader in synthetics, developed polymeric solutions like Periston® in 1942.<sup>21</sup> Like plasma they were supposed to raise the colloid osmotic pressure in the circulation, preserving the circulatory volume.

The venous access device for circulatory management was still the steel cannula inserted via surgical cut down. Bailey became immortalized in circulatory management with the gold-plated cannula bearing his name.<sup>22</sup> Needles, available only in steel, were considered less appropriate because they could displace easily and perforate the wall of the vein.<sup>23</sup>

### 5.3.1. Fluid resuscitation

When the war broke out shock treatment was not a task for an administrator of anaesthetics. Although British anaesthetic textbooks in the interwar years included intravenous fluid therapy in cases of circulatory instability, restrictions were placed on it. John Stuart Ross, in his *Handbook of Anaesthetics* for students and practitioners, believed that the complicated theories about shock by Crile were too far-reaching to be dealt with in an anaesthetic textbook.<sup>24</sup> Hadfield excluded intravenous therapy completely because his book was meant for students and general practitioners. For the same reason he did not include intratracheal anaesthetic techniques.<sup>25</sup> The few German interwar anaesthetic textbooks had not included intravenous therapy either. Only Killian said that the administrators of anaesthetics should not deal with intravenous replacements, that instead they should concentrate on control over the airway.<sup>26</sup> It is therefore no surprise that the aforementioned *Kleines Narkosebuch* did not include intravenous fluid administration at all. If a British or German surgical textbook discussed intravenous therapy it was included in a separate chapter and not in the chapter on anaesthesia.

During the war the conviction grew that when a wounded soldier survived the initial phase on the battlefield having sufficient circulation was the main determinant of his outcome. The restoration of the circulation was extended further than shock treatment.

19 Läden, *Zur Kriegschirurgie* (1943) 27-28.

20 Bailey, ‘Transfusion and infusion’ (1941) 46-51

21 Orator, *Leitfaden der Feldchirurgie im Bewegungskrieg* (1943) 51.

22 Bailey, ‘Cannulization for infusion and transfusion’ (1942) 48-53

23 Bailey, ‘Transfusion and infusion’ (1941) 33; Finch, ‘Shock and its treatment’ (1944) 80.

24 Ross, *Handbook of Anaesthetics* (1919) 5.

25 Hadfield, *Practical Anaesthetics* (1923) Foreword.

26 Killian, *Narkose zu operativen Zwecken* (1934) 248.

Bailey included it in his discussion of resuscitation. Resuscitation had been known from the treatment for drowning, which focussed on the restoration of ventilation. Bailey extended resuscitation to encompass fluid therapy in surgical patients. It comprised more than the administration of blood. The goal was to balance the patient's fluid status with appropriate fluids extending over the whole perioperative period. But when the surgeon was busy with a surgical procedure he was not able to pay attention to perioperative care. Therefore this part was allotted to other medical personnel. In the British forces special resuscitation wards were advised, manned by physicians and transfusion officers.<sup>27</sup> In the German forces physicians or 'Internisten' were added to surgical teams for triage, logistics and shock treatment. There had to be one internal medicine officer for every surgeon.<sup>28</sup> This meant that at last the German surgeon would admit another specialist on his territory, not for the administration of anaesthetics but for circulatory management. Whether this staffing and functioning of surgical facilities could always be realized remained uncertain. Overall the decisive factor for the German Army Medical Services was the shortage of men and material.

#### 5.4. Anaesthesia in modern warfare

As described in Chapter 3 anaesthetic developments during the First World War had in principle been the same for Britain and Germany. The difference in extent to which things changed was not fundamental. With the Second World War this would change. Germany would enlarge upon the experiences of the First World War. British medical services would implement the achievements of the 1930s with regard to anaesthetic techniques and staffing.

##### 5.4.1. Anaesthesia in the German forces

In the period before and during the Second World War authoritative surgeons, who also held military ranks as 'Beratender Chirurg der Armee', army consulting surgeon, based the anaesthetic chapters in their war surgical textbooks on their experiences from the First World War.

The anaesthetic techniques were adopted from civilian use, but were determined by the expected shortage of sufficiently trained administrators of anaesthetics. Simplicity, as in the First World War, was the keyword. The agents and the necessary apparatus had to be simple and safe enough that every doctor and if necessary also trained non-medical personnel would be able to administer anaesthetics.<sup>29</sup> More complex techniques

27 Director General of Army Medical Services, *A field surgery pocket book* (1944) 26, 58; Whitby, 'The transfusion of blood' (1953) 54.

28 Orator, *Leitfaden der Feldchirurgie im Bewegungskrieg* (1943) 43; Buchner, *The German Army Medical Corps* (1999) 17.

29 Härtel, *Anleitung zur Schmerzbetäubung* (1936) 13.

like the overpressure administration of anaesthetics, 'Apparatnarkose', endotracheal intubation and intravenous anaesthesia required trained personnel and were therefore only used in the larger distributing zone facilities. At this point it must be kept in mind that even in peacetime these techniques had been only partially introduced in German anaesthesia. For management of an endangered airway the tracheotomy was still the technique of choice. The traditional role of local infiltration anaesthesia in German surgery had been reconfirmed and advocated by Schum before the war. As before lumbar or spinal anaesthesia were considered to be too complicated to use. Spinal anaesthesia required positioning for lumbar puncture, which in a patient with severe leg injuries could lead to a severe drop of blood pressure in an already hypovolaemic patient.<sup>30</sup> It is remarkable that the authors of German war surgical textbooks did not criticize this level of simplicity during the war.

With regard to the staffing of anaesthetic posts German surgeons were as split as they had been during the First World War. On one side the administrator of anaesthetics was judged to be decisive to the successful course of the anaesthesia. 'Man sah, dass ausschlaggebend für den Narkoseverlauf nicht das Narkosemittel allein, sondern auch der gut ausgebildete, erfahrene und vorsichtige Narkotiseur ist.'<sup>31</sup> On the other side this decisive role should not hamper maximum availability. One of the dressers, who had other tasks too, would do. 'Der unsterile Operationsgehilfe arbeitet als Verbandhelfer: Lagerung der Verwundeten, Entfernen des Verbände, Rasieren, Hilfe beim Verbandwechsel, Narkosen, Beaufsichtigung der Abfallbeseitigung, Spülen der gebrauchten Instrumente und Eiterschalen sind seine Aufgaben.'<sup>32</sup> But as during the 1914-1918 war this employment of lower ranking personnel for the administration of anaesthetics was a compromise because of the interwar situation at home. 'Die Anzeige zur Schmerzbetäubung und deren Durchführung im Einzelfall müssen beim Feldheer anders gestaltet werden als in der Heimat oder auch schon in den Reservelazaretten der besetzten Gebiete. Überall muss die Sicherheit aller Schmerzbetäubung erstes Ziel des Arztes bleiben; sie muss aber in der Anpassung an die gegebenen Möglichkeiten im Felde gegenüber der Heimat notgedrungen gradmässige Unterschiede aufweisen. Der Feldchirurg muss mit dem Sanitätsgrad als Narkotiseur vorliebnehmen; dessen Aus- wie Fortbildung wird daher zur besonderen ärztlichen Pflicht.'<sup>33</sup> Carl Franz too in his *Lehrbuch der Kriegschirurgie* in 1944 still justified the admitted compromise of employing less-trained healthcare personnel for the administration of general anaesthetics as he had done in 1920.

30 Schum, *Einführung in die Wehrchirurgie* (1935) 80-81; Franz, *Kriegschirurgie* (1942) 27; (1944) 27; Orator, *Leitfaden der Feldchirurgie im Bewegungskrieg* (1943) 22

31 'It was clear to see that not just the anaesthetic but also the well-trained, experienced and careful administrator of anaesthetics was decisive to the course of the anaesthesia.' Läwen, *Zur Kriegschirurgie* (1943) 13.

32 'The non-sterile operation assistant functions as a dresser: positioning the wounded, undressing, shaving, dressing them, anaesthesia, disposing of litter, cleaning of used instruments and cups are his tasks.' Orator, *Leitfaden der Feldchirurgie im Bewegungskrieg* (1943) 42.

#### 5.4.2. Anaesthesia in the British forces

In the British surgical body of thought anaesthesia as usual had a subordinate role. This is best illustrated by the story behind the aforementioned British war surgical bible published in 1941. Because there had not been a textbook on military surgery since Barling's *Manual of War Surgery* in 1919, an update addressing modern warfare was necessary. Henry Hamilton Bailey, a renowned writer of surgical textbooks and surgeon-lieutenant in the Royal Navy during the First World War, surgeon of the Royal Northern Hospital in London and by that time a surgeon in the Emergency Medical Service, accepted the challenge and gathered 66 contributors to record the state of the art of military and casualty surgery. The book, titled *Surgery of Modern Warfare*, had no official status. It was Bailey's initiative. His idea was not to present anything new but to collect all of the up-to-date surgical knowledge and experience, regardless of differing schools and traditions. Such a conjoint action was unusual in Britain and symbolized the solidarity enforced by the German threat.

The book was highly successful, was published three times during the war and became the bible of surgery for the allied forces, including the United States Army. The background of this first British war surgical textbook since the First World War is best illustrated by its preface. '*Surgery of Modern Warfare* has been written by a team which can claim to represent British Surgery. By this is meant that the members belong neither to a particular school nor are they drawn from any medical service. Reflected in its pages is teaching from London, the Provinces, Scotland, Wales and Ireland, and experience culled from the Navy, Army, Air Force and Emergency Medical Service. Some of the contributors base their views on observations made during the present conflict; others record ripe experience amassed during the eventful years 1914-18; not a few are able to contrast and compare the surgery of both campaigns.'

<sup>34</sup>

With regard to anaesthetics Bailey invited the inevitable Magill to write a two-page chapter on anaesthesia in thoracic surgery, in which Magill recommended local anaesthesia and stated that endotracheal intubation was not obligatory. For a more general consideration on anaesthetizing the wounded, William Elwyn Francis Evans, a young medical officer from the West Middlesex Hospital and voluntary reservist to the Royal Air Force Hospital in Ely, having obtained his Diploma in Anaesthetics in 1939 from Bart's, was introduced. This was almost an affront to the professional anaesthetists of these days. The only argument for Evans could have been his publication in January 1941 in the *British Journal of Anaesthesia* on the influence of anaesthetics on shock

33 'The assignment of anaesthesia and its management in a specific case in the army must be different from the situation at home and even in the hospitals in the occupied zones. Everywhere the safety of all anaesthesia must be the primary goal of the doctor; but in the adaptation to the given possibilities in the field against the homeland it will perforce show gradual differences. The surgeon in the field has to accept an orderly as administrator of anaesthetics; his continuous training therefore is the doctor's duty.' Zimmer, *Wehrmedizin* (1944) 128.

34 Bailey, *Surgery of Modern Warfare* (1941) Preface.

patients and the important role for the anaesthetist in this matter. His experiences were drawn from the recent months of bombing of the city of London.<sup>35</sup> This interest in shock probably fit Bailey's surgical emphasis on the treatment of shock in the book.

Despite his obscurity Evans acquitted himself well. In line with the striving of British anaesthetists to enter the army and emergency medical service he emphasized the versatile role that the anaesthetist could play in a surgical team. Interestingly he focussed on Bailey's topic of fluid resuscitation. Under the heading 'Suggestions for the war-time anaesthetist' he wrote: 'Versatility is an asset. It is possible that a blood transfusion or saline infusion may be required during the operation, and in the absence of a second assistant the anaesthetist must be prepared to carry out the major part of the procedure. A previously trained orderly or nurse can carry on the anaesthetic, report and ask for advice while the anaesthetist is otherwise occupied.'<sup>36</sup> In one small sentence in the chapter on surgery of the neck, advocating intravenous anaesthesia, Bailey himself also points to this possible new role in intravenous management for the anaesthetist. 'Evipan or pentothal is injected into the venous system via the vein-seeker, and a minimal dose need only be given in the first instance; with the vein-seeker in place, at any time, more of the anaesthetic can be injected. An additional advantage is that as blood, plasma or saline will assuredly be needed, this also can be injected via the vein-seeker. The anaesthetist, being comparatively free, can supervise all the intravenous injections – a further advantageous consideration.'<sup>37</sup> These asides, no matter how short, point to a new role in the surgical department for the anaesthetist, not only as an administrator of anaesthetics but also as a medical person responsible for fluid resuscitation.

#### *The anaesthetist in the surgical team*

From its second edition in 1942 the feasibility of the anaesthetist in a surgical team was further elaborated in the chapter on anaesthesia, now written by Evans with John Gillies (1895-1976), who had been a pupil of Magill in the 1930s and was appointed to the Royal Infirmary in Edinburgh.<sup>38</sup> It starts with the view 'It should be the aim of surgical units working under war conditions to bring to the treatment of casualties all that was best in pre-war procedure. This applies not only to surgical technique but also to the important ancillary service of anaesthetic administration.' In other words, compromises directed toward the situation at home, accepted in the German army, were not accepted in the British expeditionary army. The British people did not want to compromise the quality of their medical care at home for their expeditionary forces. 'In the zone of actual military operations the rapid movement of the modern battle must mean less equipment and simpler methods, but even there the anaesthetist may still employ endotracheal anaesthesia in a simplified form, or use up-to-date intravenous agents or

35 Chivers, 'Anaesthesia in surgical shock' (1941) 92-97.

36 Evans, 'Anaesthetizing the wounded' (1941) 59.

37 Bailey, 'Wounds of the neck' (1941) 673-674.

38 Helliwell, 'Obituary John Gillies' (1976) 1311-1313.

spinal block analgesia, in order to facilitate the surgeon's work and secure an approximation to home standards.'<sup>39</sup>

### *Anaesthetic techniques*

Although in Bailey's textbook Evans and Gillies paid much attention to the effects of anaesthetics on shock and to the versatility of the anaesthetist in this matter, their main interest was with the handling of anaesthetics.<sup>40</sup> The anaesthetist was not only charged with the administration of anaesthetics, he was also expected to pay attention to how anaesthetic drugs were stored and to the maintenance of equipment and the interior of the operating theatre under war conditions. He was also expected to keep abreast of recent advances in civilian anaesthetic care. Endotracheal intubation as the standard for airway control in the late 1930s, thanks to its enormous advantage over existing techniques, played an important role in this matter. Actually, endotracheal intubation spread through the British civilian anaesthetic and war surgical textbooks at the same time in the 1940s.<sup>41</sup> Intravenous barbiturate administration too had its place in military anaesthetic care. For short procedures and for situations in which an induction by mask would be difficult, as in patients with burned faces, intravenous barbiturates would prove to be useful.<sup>42</sup>

If necessary this mixture was applied with overpressure.<sup>43</sup> Completely in accordance with British tradition local and spinal anaesthesia were seldom used, or used in combination with general anaesthesia. Spinal anaesthesia was advised against for the same reasons given in German war surgical textbooks. Worsening of shock symptoms due to the vasodilatation of spinal anaesthesia and infectious complications in the spinal canal were dangers that were noted in particular.<sup>44</sup> Local infiltration anaesthesia was only advised in combination with light general anaesthesia. As during the First World War British surgeons were not accustomed to using it. In the 1944 edition of Bailey's book the pros and cons of local anaesthesia were discussed in more detail because advantages had been reported from other armed forces. Yet, the disadvantages prohibited widespread use in the British Army. The amount of local anaesthetic that could be injected was limited due to its toxicity and the threat that it would add to a deterioration in the condition of the wounded. Also, it was considered uncomfortable for a wounded soldier

39 Evans, 'Anaesthetizing the wounded' (1942) 483.

40 Evans, 'Anaesthetizing the wounded' (1942) 490; Gillies, 'Anaesthetizing the wounded' (1944) 222.

41 Minnitt, *Handbook of Anaesthetics* (1940) 172-177; *Textbook of anaesthetics* (1944) 225-254; Macintosh, *Essentials of general anaesthesia* (1940) 221-236; (1941) 221-236; (1943) 221-236; Goldman, *Aids to anaesthesia* (1941) 109-111; Evans, 'Anaesthetizing the wounded' (1941) 54-55; Evans, 'Anaesthetizing the wounded' (1942) 485; Gillies, 'Anaesthetizing the wounded' (1944) 223; Rose, *A Manual of Surgery* (1943) 1601.

42 Evans, 'Anaesthetizing the wounded' (1941) 57; Gillies, 'Anaesthetizing the wounded' (1944) 227-228.

43 Magill, 'Anaesthesia in thoracic injuries' (1941) 196.

44 Finch, 'Shock and its treatment' (1941) 22; Bailey, 'Transfusion and infusion' (1941) 54.

who was in shock to witness his own emergency amputation. In combination with light general anaesthesia these limitations could be overcome.<sup>45</sup> In practice local infiltration would be applied in only 3-7% of cases and spinal in 4%. As at home, the technique of choice was the administration of gaseous anaesthesia with oxygen, nitrous oxide and ether. Overall, general anaesthesia would be used in over 90% of cases.<sup>46</sup>

#### *The Epstein-Macintosh-Oxford vaporizer*

To apply gaseous anaesthesia Evans and Gillies first advised using Boyle's machine, manufactured by Charles King and later by Coxeter, and a continuous flow apparatus manufactured by Medical & Industrial Equipment. These manufacturers were described in earlier chapters as the leading anaesthesia-oriented companies in Britain. The use of compressed oxygen and nitrous oxide that had begun before the First World War and provided a much more precise dosing of general anaesthetics had become the standard in Britain. But cylinders with oxygen were not always available and were highly dangerous to transport in military ships and planes. This limitation brought about the Oxford vaporizer. It was developed in 1942 in the laboratory run by R. R. Macintosh in the Nuffield department of anaesthetics in Oxford. The fact that Macintosh was an Air Commodore in the Royal Air Force explains his interest in an apparatus that provided precise dosing without a compressed gas cylinder and could be safely transported in planes. Much of the work was done by his technical engineer Hans Georg Epstein (1909-2002). The Oxford vaporizer, later known as the Epstein-Macintosh-Oxford (EMO) vaporizer could be used without a supply of compressed air or oxygen. The patient simply drew ambient air over the vapour. Calcium chloride crystals were used in the vaporizer to prevent cool-down during the evaporation of ether using. With that compensation a calibrated, constant amount of anaesthetic could be administered to the patient.<sup>47</sup> The apparatus was so safe and reliable that, in Macintosh's view, one anaesthetist with some less-experienced helpers could provide general anaesthesia to a number of patients at the same time. In the 1944 edition of his book Bailey granted Macintosh a separate chapter on his EMO. During the war Viscount Nuffield, the benefactor who had endowed the chair Macintosh held in 1937, presented a thousand EMO's to the army medical services.<sup>48</sup>

### 5.5. British medical services, advance toward a specialist-like status for anaesthetists

Apart from the above-mentioned developments that meant a possible extension of the duties of the anaesthetist, something else happened which would prove to be an essential step toward the establishment of an anaesthetic specialty in Britain. Basically it had to

45 Gillies, 'Anaesthetizing the wounded' (1944) 225-227; Daly, 'Anaesthesia in the Army' (1953) 222

46 Office of the surgeon. AFHQ. Report of Adviser in Anaesthetics for 3 months ending December 25<sup>th</sup> 1943. WO 222/1309, National Archives, London.

47 Macintosh, 'The Oxford vaporizer' (1944) 230-232.

48 Anonymous, 'Obituary Viscount Nuffield' (1963) 547.

do with market value and the laws of supply and demand, important mechanisms in medical specialization.

In 1939 the Emergency Medical Service, like the Royal Army Medical Corps, needed medical specialists and also anaesthetists in regular service. Obviously there was a feeling that trained administrators of anaesthetics would be scarce, as they had been in the First World War. This is clearly illustrated by the following story. On March 30<sup>th</sup> 1939 a request was sent from a hospital officer in Birmingham to the Ministry of Health at Whitehall, London. The Ministry of Health had split in 1919 from the Home Office, which had dealt with healthcare issues up to then. The request was for the ministry in London to approve the training of senior nurses to give anaesthetics in order that they would be capable of carrying out such duties in cases of emergency. The question was dealt with by W.A. Lethem, a deputy senior medical officer. He immediately realized the delicate nature of such a request and foresaw that similar questions would arise in wartime. He asked advice from Miss Puxley, who was a representative of the Ministry of Health in the General Nursing Council. He wrote to her saying that he thought that the administration of anaesthetics by unqualified persons was prohibited by the Anaesthetics Act. Obviously he did not know that this act had never been passed. Miss Puxley reported that she had consulted Dame Ellen Musson, chair of the General Nursing Council, and that they figured that the medical profession, represented by the British Medical Association, would be against anyone but a doctor administering anaesthetics. Because of this it would be impossible to train nurses for the administration of anaesthetics since it was the medical profession that was needed to give the training. On April 13<sup>th</sup> 1939 Lethem asked permission from the Chief Medical Officer of the Ministry of Health, Arthur Salusbury MacNalty, who later edited the medical history of the Second World War, to respond to the hospital officer saying that the ministry did not see any need to train nurses. A consultation with the British Medical Association was not necessary, he thought. On April 18<sup>th</sup> MacNalty agreed and asked Lethem to send an unofficial note to Birmingham stating their views.<sup>49</sup>

During the war the Royal Army Medical Corps as well as its civil equivalent the Emergency Medical Service expanded quickly and anaesthetists proved to be scarce indeed. Only a fraction of the anaesthetists needed in wartime were on active service in peacetime. Actually, there were only five medical officers with a Diploma in Anaesthetics in the Royal Army Medical Corps in 1939.<sup>50</sup> The shortage of anaesthetists remained the everyday reality. George Edwards, by now an adviser on anaesthetics to the Allied Forces Headquarters in the Mediterranean, reported one anaesthetist per general military hospital with 1200-2500 beds in 1944. Yet the trend was set. Every effort was made to train so-called 'graded anaesthetists', medical officers who had had brief postgraduate

49 Minutes and correspondence of the Ministry of Health regarding the training of nurses to give anaesthetics, No. 95001/1 (1939). HO 45/15558, National Archives, London.

50 Daly, 'Anaesthesia in the Army' (1953) 220-228.



training in the administration of anaesthetics.<sup>51</sup> The Emergency Medical Service and Royal Army Medical Corps became attractive employers for anaesthetists whose remuneration in civil practice was still relatively small.<sup>52</sup> From the obituaries published in *Anaesthesia*, the journal of the Association of Anaesthetists of Great Britain and Ireland, for members who were between 30 and 55 years old in 1939 it can be roughly deduced that over 50% of them would have an Emergency Medical Service or Royal Army Medical Corps career during the Second World War.

For the anaesthetists with their Diploma in Anaesthetics it was a relatively easy way to obtain a specialist-like status with a corresponding military rank, remuneration and pension. It also fit the ambitions of the Association of Anaesthetists for an improvement in the status of the anaesthetist. Much foresight must be attributed to Zebulon Mennell (1876-1959) who had been president of the Association at the outbreak of the war. He realized that the Association's council should have good connections with the armed forces now that so many anaesthetists were in the army.<sup>53</sup> It also meant a reform of the Association from a select and limited group of teaching anaesthetists into a growing interest organization for all anaesthetists.<sup>54</sup>

#### 5.5.1. The ranking of anaesthetists

The military ranking system suited the previously existing wish of professional anaesthetists to classify their community. Not all anaesthetists should be equal. The discussion resembled the one that was conducted during the foundation of the Association of Anaesthetists. The anaesthetists who entered the armed forces were in principle ranked as major. The rank of lieutenant-colonel was reserved for the so-called advisers in anaesthesia that were assigned to army sectors or specific theatres of operations. For example, H.J. Brennan was adviser to the Middle East, B.R.M. Johnson to the Mediterranean Forces, George Edwards to the Allied Forces Headquarters in the Mediterranean; R.E. Pleasance was adviser to the South India Command, T.A.B. Harris to the East India Command, H.E. Pooler was adviser to the Royal Air Force in the Middle East and E.H. Rink to Northwest Europe. The highest rank was reserved for the anaesthetist attached to each branch of military service. Daly, who had been a contributing anaesthetist for the *Manual of War Surgery* by Barling in 1919 was the highest adviser in anaesthetics to the war office and had held the rank of brigadier-general since February 1941. He started a series of improvements by training anaesthetists and introducing new equipment.<sup>55</sup> Macintosh was an Air Commodore in the Royal Air Force and H.K. Ashworth was an adviser in anaesthetics to the Indian Army, also with the rank of brigadier-general. It is no surprise that these advisers had a strong correlation with the council of the Association

51 Quarterly Report for Medical History of the War by Adviser in Anaesthetics AFHQ, BNAF for period ending March 31<sup>st</sup> 1944. WO 222/1320, National Archives, London.

52 Boulton, *The Association of Anaesthetists* (1999) 64.

53 Boulton, *The Association of Anaesthetists* (1999) 66.

54 Featherstone, 'The Association of Anaesthetists' (1946) 7-8.

55 Daly, 'Anaesthesia in the Army' (1953) 220-228.

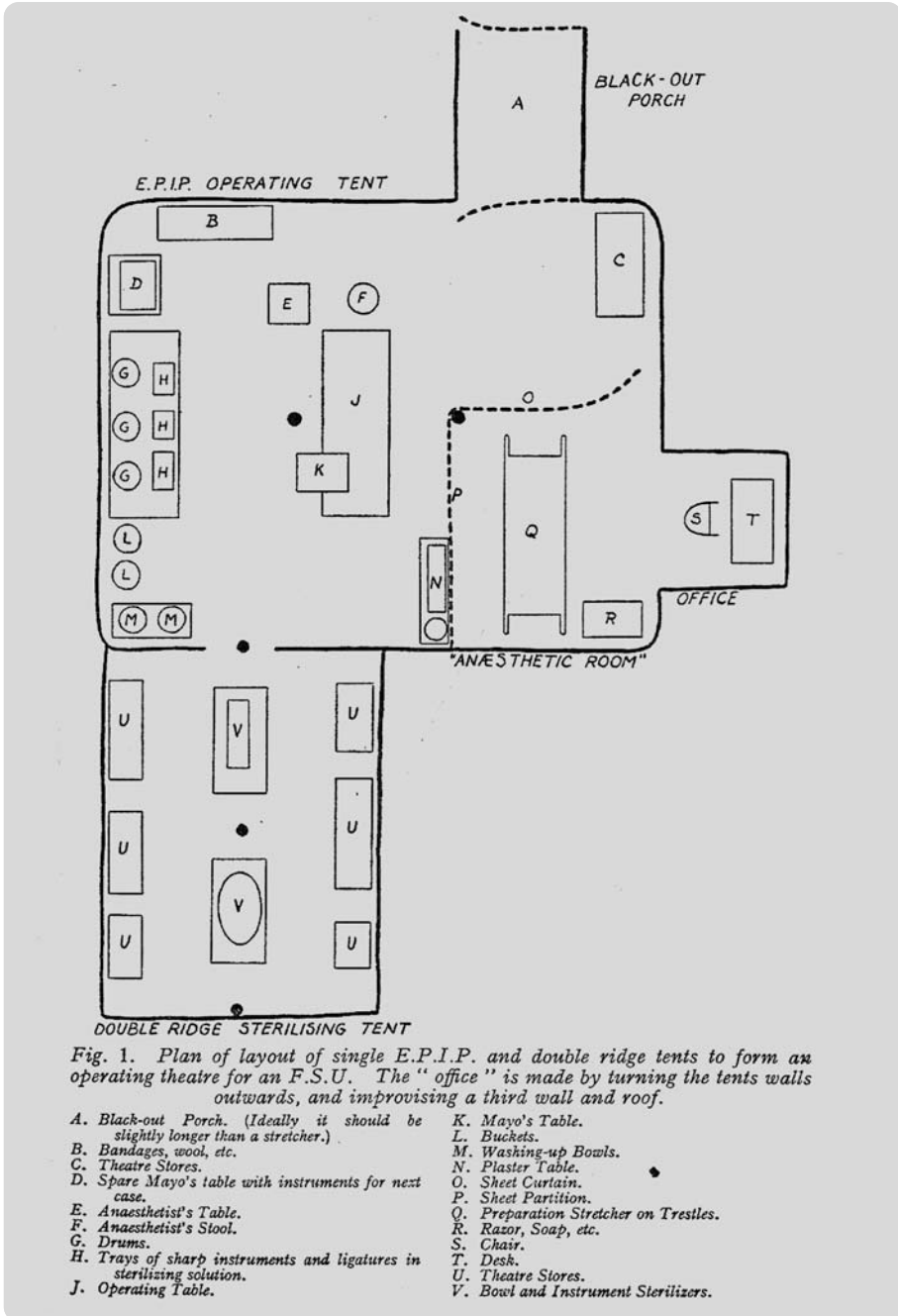


Figure 24. Floor plan of an operating theatre for a Field Surgical Unit according to Ogilvie, *Forward Surgery in Modern War* (1944) 21. Note the separate anaesthetic room, where the patient was anaesthetized before being brought into the operating theatre.

of Anaesthetists. Daly was President of the Association of Anaesthetists for Great Britain and Ireland from 1941 to 1943 and one of the promoters of an independent anaesthetic specialty. Macintosh and Ashworth were members of the Association's council.

### 5.5.2. International recognition of the British anaesthetist

On the whole the anaesthetist became a welcome member of the surgical team. As during the First World War the position of the anaesthetist, who now had up-to-date training, was settled: witness the floor plan of a military operating theatre with an anaesthetist's stool and table (Figure 24). The official instructions on field surgery, issued by the War Office in January 1944, adopted their approach from the books that had been written by authors on their own account. They showed the anaesthetist as a member of the surgical team and all anaesthetic innovations from intravenous anaesthesia to endotracheal intubation and Oxford vaporizer.<sup>56</sup>

British anaesthetic training programmes even became an export product. Doctors from the Allied forces were sent to Britain to receive training in anaesthesia. When the US army arrived in Britain in 1942 and 1943 to prepare for the invasion of the Continent it had a shortage of anaesthetists. Ralph Tovell, a colonel-anaesthetist in the US Army Medical Corps, therefore made arrangements to train his medical officers in this branch of medicine in British military hospitals under the direction of British anaesthetists. His new anaesthetists were also taken to discussions held in the Section of Anaesthetics of the Royal Society of Medicine.<sup>57</sup> Doctors from other Allied forces also received their first training in anaesthesia in preparation for the invasion of Europe. Three men who became leaders of the postwar anaesthetic specialty in France: Ernest Kern, Jean Lassner and Guy Vourc'h, all of whom were enlisted in the Free French Forces, trained in Britain and Canada.<sup>58</sup> In this teaching environment the Nuffield Department of Anaesthetics in Oxford was the centre of excellence as far as anaesthesia was concerned. It graduated 40-50 anaesthetists a year. The training of large numbers of anaesthetists concealed British anaesthetic dominance and spread the anaesthetic specialty to other countries in the European theatre of operations.<sup>59</sup>

## 5.6. The home fronts

At the beginning of the war in Germany anaesthetic care was still embedded in surgical care. Due to the interwar shortage of doctors, industrial development and the financial shortfalls listed in Chapter 4 an anaesthetic specialty did not get off the ground. The Second World War did not bring any improvement in this matter. On the contrary, the

56 Director General of Army Medical Services, *A field surgery pocket book* (1944) 15.

57 Tovell, 'Problems of training' (1947) 62-74.

58 Desmonts, *Yesterday's Anaesthesia* (2004) preface.

59 Beinart, *Nuffield Department of Anaesthetics* (1987) 49.

shortage of trained doctors worsened. The interwar surgical proponents of an anaesthetic specialty, Schmidt and Killian, went quiet. Schmidt made a last plea for the all importance of the administrator of anaesthetics in his review of the aforementioned book by Goldhahn about the state of the art in anaesthesia. During the discussion of different techniques Schmidt writes, in accordance with earlier conclusions: 'Ausschlaggebend bleibt immer der Narkotiseur.'<sup>60</sup> The final exhortation from Killian to create an anaesthetic specialty like in Britain sounded in 1941 in *Schmerz Narkose-Anaesthesie*.<sup>61</sup> He realized the moment was not too favourable; therefore he aimed at a period 'after victory'. Finally the voices grew silent. Their noble objectives were outrun by the shortages.

Also at home the Second World War turned into a replay of the First. The operation registers consulted tell the story. In Moabit Krankenhaus Berlin in 1945, where anaesthetics if noted had always been administered by members of the surgical staff, students and non-medical personnel were active as administrators of anaesthetics on a substantial scale. In Tübingen, where non-medical administrators of anaesthetics had been removed in the 1930s and doctors from the surgical staff had administered anaesthetics since, nurses or technicians were again in charge of the administration of anaesthetics in 1940 and 1945. These were persons named Rommel and Kunz. Their names had no prefix like Dr or Pflege and did not appear in the column of surgeons.

In Britain when the war began the fear of a shortage of anaesthetists had come true. To make more anaesthetists available, Macintosh and his first assistant Freda Bannister Pratt started a course in anaesthetics for dentists, retired general practitioners and laboratory technicians who had experience with the administration of anaesthetics in animals.<sup>62</sup> But the call for nurse anaesthetists was also revived. Birmingham was not alone in asking for nurses to act as anaesthetists. In 1940 the governors of Addenbrooke's Hospital in Cambridge placed an advertisement in the *Nursing Times* inviting nurses to be trained as nurse anaesthetists. The proposal was dictated by the prospect of a local shortage of anaesthetists due to war conditions. This led to an almost Pavlovian reaction in *The Lancet* by the council of the Association of Anaesthetists of Great Britain and Ireland, signed by the president and the secretary and mentioning the names of the 17 well-known anaesthetists who formed the council.<sup>63</sup> Anaesthesia should be administered by qualified medical anaesthetists, they insisted. The allergy for nurse anaesthetists was still present. A week later Macintosh explained his opinion separately.<sup>64</sup> Trained nurses could only assist the anaesthetist, enabling him to administer general anaesthesia to multiple patients at the same time under circumstances like mass casualties. In his view control over anaesthetic care in general was essential. Furthermore he believed that the whole discussion centred around money. The council of the Royal College of Nursing

60 'The decisive factor is always the administrator of anaesthetics.' Schmidt, 'Die Allgemeinbetäubung' (1940) 748-749.

61 Killian, 'Plan zur Neuordnung des Narkosewesens' (1941) 73-87.

62 Macintosh, 'Anaesthesia in wartime' (1939) 1077-1079.

63 Association of Anaesthetists, 'Nurse anaesthetists' (1940) 307.

64 Macintosh, 'Training in anaesthetics' (1940) 345.

supported this view, saying that nurses could only be trained to assist the doctor supervising the anaesthesia.<sup>65</sup>

With this denunciation of the employment of nurse anaesthetists, different solutions had to be created when the inevitable shortage of anaesthetists in Britain became clear. From the operation registers it can be confirmed that anaesthetists disappeared from civilian hospitals and that various members of the surgical house staff were charged with the administration of anaesthetics. In the operation registers of St. Bartholomew's Hospital, part of the Emergency Medical Service itself, this is clear to see. More surgical house staff was charged with the administration of anaesthetics and there was a slight and temporary rise in the use of local anaesthetics in 1945, up to 19%. In the London Hospital the same happened. In 1941 the contribution of anaesthetists was remarkably low. Nevertheless, anaesthetics were always administered by doctors. In 1941 local anaesthetics were applied in 9% of cases, which is high for the British surgical tradition. In Scunthorpe the same happened. As in the London Hospital an increase of members of the surgical house staff administering anaesthetics is noticeable during the Second World War. Here the application of local anaesthesia did not change. Interestingly enough, no objections were heard to this shift of anaesthetists to the Emergency Medical Service and Royal Army Medical Corps which led to de-specialization in civilian hospitals.

## 5.7. Chapter review

At the outbreak of the Second World War, in Germany anaesthesia was a part of surgery as it had been from the beginning. In Britain a select club of some 150 anaesthetists, united in their Association of Anaesthetists, strengthened their grip on the field of anaesthesia. But there was a distinction between anaesthetists, who were members of the Association, and simple administrators of anaesthetics, who were usually general practitioners with or without the Diploma in Anaesthetics.

Britain had learned from the First World War. In the Second World War it tried to delay a land battle as long as possible in order to build up sufficient military and political force. The justified fear of aerial bombardment of the homeland forced the government to nationalize emergency care for civilians in the Emergency Medical Service. In the meantime Britain conducted a naval and aerial war with a high level of mechanization. This mechanization also marked the large-scale land battles that began in North Africa. This had consequences for the Royal Army Medical Corps. Due to mechanization and the enhanced means of transport medical personnel could be employed more effectively and hence fewer doctors were withdrawn from civilian healthcare than in the First World War. The Emergency Medical Service and the Royal Army Medical Corps enlisted doctors for the administration of anaesthetics. The Diploma in Anaesthetics made them recognizable. These anaesthetists in the Royal Army Medical Corps and the

<sup>65</sup> Council of the Royal College of Nursing, 'Nurses' view of the nurse anaesthetist' (1940) 736.

Emergency Medical Service were not just teachers but also routine administrators of anaesthetics. They took on more tasks, such as the fluid resuscitation of the patient and postoperative care. Due to the mechanization of war the types of injuries had also changed. Resuscitation became pivotal in war surgery. The number of anaesthetists grew. A spider in this web was Ashley Daly, a pupil of Hewitt and president of the Association and the highest adviser in anaesthetics to the Army. The British anaesthetists, due to their early attempts to demarcate themselves as a specialty, became recognized and respected internationally. All techniques of administration of anaesthetics were used by the British anaesthetists. For mechanized administration a special airplane- and ship-proof apparatus, the Epstein-Macintosh-Oxford vaporizer, was developed. The British anaesthetic industry ruled the waves.

Germany had started the war and was only prepared for a Blitzkrieg, not a longer lasting strategic war. The Blitzkrieg had introduced the high level of mechanization, which had the same consequences for the 'Heeressanitätsdienst' as it did for British anaesthetists. Casualties could be transported rapidly all over the lines, reducing the number of medical personnel needed. Shock treatment was all-important. But for Germany the Blitzkrieg deadlocked in the trenches of Stalingrad and El Alamein. Shortages eventually prevailed just as they had in the First World War. German surgeons, still the guardians of anaesthesia at home and in the army, took the same measures they had taken 25 years earlier. Simplicity and versatility were the keywords. Non-medical administrators were employed once again in the field and at home. The techniques were adopted from civilian practice and hence did not include the latest innovations, like endotracheal intubation and sophisticated anaesthetic machines. Local anaesthesia still had its traditional, wide application. The anaesthetic industry in Germany collapsed like the whole of German industry.

At the end of the war German anaesthesia was back to 1918. Symbolically the issues of *Schmerz Narkose-Anaesthesie* became thinner through the war years and it ceased publication in 1944. British anaesthesia had its finest hour. The Emergency Medical Service and the Royal Army Medical Corps set the trend to employ anaesthetists not only as teachers but also as routine administrators. Laid along the phases of specialization the Second World War brought British anaesthesia to the beginning of the third phase. In Germany the second phase had ended and there was a regression to the first phase of specialization.

## 6. Postwar 1945-1960

‘Kurzum, wir stehen heute im Operationsaal vor der irreversiblen Tatsache der Arbeitsteilung’<sup>1</sup>

Karl Heinrich Bauer during the congress of the German Society of Surgery, 1955.

### 6.1. Preview

The Second World War had given British anaesthetists the opportunity to obtain a salaried job. The Emergency Medical Service and the Royal Army Medical Corps had been popular employers. The Diploma in Anaesthetics had made the anaesthetists recognizable.<sup>2</sup> It was not just the teaching and supervising of the administration of anaesthetics that was something special, but the administration itself, including fluid resuscitation, that had achieved this status. The anaesthetists had taught modern administration techniques to the Allies. British anaesthesia had become the gold standard. For German anaesthesia the Second World War had been a replay of the First and had brought its status back to 1918.

This chapter, which concludes around 1960, will describe the process by which anaesthesia became a medical specialty with a status equivalent to established specialties like internal medicine, surgery and gynaecology. The war experiences with anaesthetists as members of surgical teams and the introduction of muscle relaxants made anaesthesia special enough. In Britain the establishment of the specialty was quickly realized within the National Health Service. In Germany it took several more years to establish a division of labour in the operating theatre.

<sup>1</sup> ‘In brief, in the operation theatre we are now facing the irreversible fact of a division of labour’.

## 6.2. Aftermath of the Second World War

Britain had won the war after the unconditional surrender of the German Army. But like after the First World War it was an uneasy victory. It had been a 'victory at all costs', as Churchill had forecast and asked for in 1940. In fact the war had almost bankrupted the country. Despite all costs Britain had not been able to win the war on her own. Without the employment of the endless resources of the US and the enormous military power of Russia, which had done most of the fighting, it would have been impossible to defeat Italy, Germany and Japan. The people were discontent. In July 1945 Churchill, as the embodiment of the expenses of the war, was voted out of office. But the biggest price Britain had to pay evolved slowly in the years after the Second World War as a consequence of the foundation of the United Nations in 1945 to preserve world peace forever. The United Nations Security Council became the new world power with equal votes for the US, the USSR, China, France and Britain. This was a remarkable and ironic turn in history. Britain had fought and more or less won two wars, but in the end lost the stake of the wars: its status as the leading world power.<sup>3</sup>

Germany had lost the war. Its army had been defeated. Its economy had been ruined. Its leaders had fled the country, had been imprisoned or had committed suicide. The country was occupied and placed under a foreign military administration. The Allied Control Council, composed of American, British, Russian and later French military authorities, governed Germany. During 1945 and 1946 these allied powers were reasonably unified. Disarmament, the dismantling of the German arms industry and denazification were the keywords. During 1947 however a schism emerged between the Western allies and the Soviet government. The Soviet government made clear its intention to occupy or at least have a presence in the eastern part of Germany. They clearly supported the Socialist Unity Party of Germany, a combination of the socialist democratic and communist parties in the Soviet occupation zone.<sup>4</sup> This perturbed the Western allies. Besides denazification and disarmament they had planned to reanimate the non-military part of German industry in order to enable a future free and autonomous Germany to pay its war debts. With the emergence of communism and Churchill's concept of the Iron Curtain, ultimately embodied by the foundation in 1949 of the German Democratic Republic under Soviet control in eastern Germany, a subsidiary and more urgent goal was added to this policy. Germany was to be kept out of the potential grip of communism. Therefore the Marshall Plan was inaugurated in 1948 to accelerate economic recovery in Germany.<sup>5</sup> Whether this plan on its own led to the 'Wirtschaftswunder', economic miracle, in Germany is not clear. Probably it was the Korea crisis, which made the communist threat from

2 Featherstone, 'The Association of Anaesthetists' (1946) 7.

3 Darwin, *The End of the British Empire* (1991) 118-122.

4 Weber, *DDR Grundriss der Geschichte 1945-1976* (1976) 33, 152-158.

5 Biddiscombe, *The Denazification of Germany* (2007) 10-11, 74.



the People's Republic of China more realistic after 1949, which accelerated Germany's rebuilt. Restrictions regarding steel production were abolished.<sup>6</sup>

A sustaining driver behind the economic miracle was the restructuring of the German industrial infrastructure after the Second World War's destruction. New buildings with new machines, new production processes and new materials were better, more efficient and cheaper than the preserved pre-war ones in Britain. Moreover, Germany's economy did not rest that heavily on colonial interests and trade as did the British and the French and was consequently not hit by worldwide decolonization in the 1950s. And finally, Germany had no expensive army to maintain. The following paragraphs will show that these macroeconomic and political developments even influenced anaesthetic specialization in Germany.

### 6.3. The anaesthetic heritage of the war

For British anaesthesia the Second World War had been an important period, if not their finest hour. Innovations from just before the war, including endotracheal intubation and anaesthesia apparatus, had taken root and had been further elaborated. Moreover, British anaesthesia had become the gold standard. During preparations for the invasion of Europe, Britain had not only been the military centre of the crusade but also the anaesthetic centre. Doctors from all of the Allied forces received their anaesthetic training in Britain. For Germany, with regard to anaesthesia, the Second World War had been a replay of the First World War. The key concepts had once again been simplicity, versatility and using local infiltration anaesthesia as much as possible. The employment of non-medical personnel for the administration of anaesthetics had become an accepted compromise once again, as it had after the First World War. In addition to these organizational aspects three more practical consequences should be mentioned separately: the introduction of new materials, replacing traditional raw materials; the importance of fluid resuscitation and the introduction of muscular relaxants.

#### 6.3.1. New materials

The Second World War cannot be considered only as a clash of ideologies but must also be seen as a geopolitical conflict about spheres of influence, colonies, trade and raw materials. In that sense it was really a continuation of the First World War and rubber, along with oil, was the main stake of the war. In the run up to the Second World War the search for synthetic replacements had already been boosted in order to diminish dependence on international trade. Germany as the underdog in international trade had been the forerunner in synthetics. The results were products like IG-lit, a universal pliable or plastic material; Buna-S, a replacement of rubber for tyres; and synthetic fuels. These production processes had been too primitive to let Germany win the war

<sup>6</sup> Abelshausen, *Wirtschaftsgeschichte der Bundesrepublik Deutschland* (1983) 15, 41, 70.

but gave the German chemical and synthetic industry a crucial position in postwar Europe.

As Chapter 4 showed rubber had also been the raw material used in anaesthetic innovations in the interwar years. Its specific property and its advantage over steel was the combination of pliancy and strength enabling an air- and water-tight control over the airway. Plastics would fulfil these demands after the war. Plastics would form the third raw material phase, after steel and rubber, in the production of anaesthetic devices, and in enabling intravenous access plastics would change the world.

### 6.3.2. Fluid resuscitation

During the Second World War surgeons had acknowledged the importance of fluid resuscitation. Its purpose was to balance the loss of various fluids and blood components during and after an operation instead of waiting until the patient had deteriorated.<sup>7</sup> In the operating theatre the surgeons had focused on the anaesthetist at the head of the table as an expedient practitioner of this task. This was especially the case in Britain with its designated and recognizable anaesthetists. In the German operating theatres usually an internist or general medical officer was charged with intravenous fluid resuscitation.

Technically, doctors from different fields of medicine had long been looking for a needle or cannula which, once inserted into a vein, could handle successive injections or continuous infusions. They wanted a reliable device for continuous intermittent intravenous therapy. In this context the Swedish surgeon Olovson in 1940 developed a needle with a rubber diaphragm, drawn taut over the entrance of the needle, which could be punctured repeatedly for the administration of heparin to prevent postoperative thrombosis (Figure 25).<sup>8</sup> In cooperation with Torsten Gordh, an early Norwegian anaesthetist, a modification was introduced that made the needle suitable for continuous infusion and intermittent injections at the same time. The design proved to be ideal for intravenous anaesthesia.<sup>9</sup> Nevertheless the steel construction of the intravenous access devices was not satisfying. When a needle was left in a vein, the risk of perforation was always present. A blunt steel cannula was an alternative but it always required a venasection, definitively sacrificing the vein. Rubber was too thick to use as an intravenous catheter.

Plastics as a heritage from the war would bring about a revolution in the early 1950s. Plastics permitted the manufacture of catheters that had walls of a thinness never before seen. They opened the way to the invention of a soft and inert cannula that could stay in the vessel without damaging the wall of the vessel. They were useful for repeated administrations of intravenous anaesthetics and for continuous circulatory management. The combination of a needle and a plastic catheter led to the concept of 'through the needle cannulation' in 1945 and 'over the needle cannulation' in 1950.<sup>10</sup> It was B. Braun

7 Bailey, *A Short Practice of Surgery* (1941) 85-87.

8 Olovson, 'Heparinnadel' (1940) 316.

9 Lee, *A Synopsis of Anaesthesia* (1950) 148.

10 Zimmermann, 'Intravenous tubing for parenteral therapy' (1945) 567-568. Massa, 'A plastic needle' (1950) 413-415.

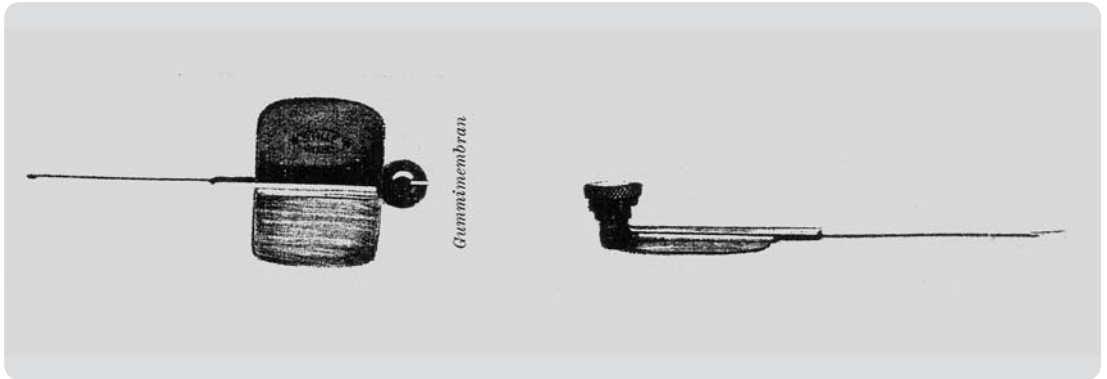


Figure 25. Olovson needle. 'Heparinnadel' *Der Chirurg* 12 (1940) 316. The steel needle, which was kept in a vein for days, had a port with a rubber membrane that could be punctured several times to administer heparin for thrombosis prophylaxis. The model was still recognizable at the end of the 20<sup>th</sup> century in plastic intravenous catheter systems by Viggo and Braun.

in Melsungen, the German company that had been previously involved in circulatory management with the production of ready-to-use intravenous solutions like Sterofundin® in the interwar years, that marketed the first version with the Venoflex® in 1955.<sup>11</sup> This was a through the needle system in which a plastic catheter was introduced through a venapuncture needle.<sup>12</sup> It was immediately promoted by the writers of German textbooks, including the first anaesthetic textbook in Germany.<sup>13</sup> Many other solutions would follow. In 1958 in cooperation with the German anaesthetist Otto-Heinrich Just the first commercially available over the needle intravenous catheters were brought to light: the Braunüle, again manufactured by B. Braun (Figure 26).<sup>14</sup> The central position of Germany in this innovation is confirmed by the fact that up to that time in Britain only a nylon intravenous catheter was available for application after venasection.<sup>15</sup>

### 6.3.3. Muscle relaxation

The main anaesthetic heritage of the war, one that would change the face of anaesthesia definitively, had nothing to do with warfare itself. It was the introduction of muscle relaxants like curare. Until the 1940s the only way to obtain a certain level of muscular relaxation had been to deepen the inhalational anaesthesia. A deep level of the surgical

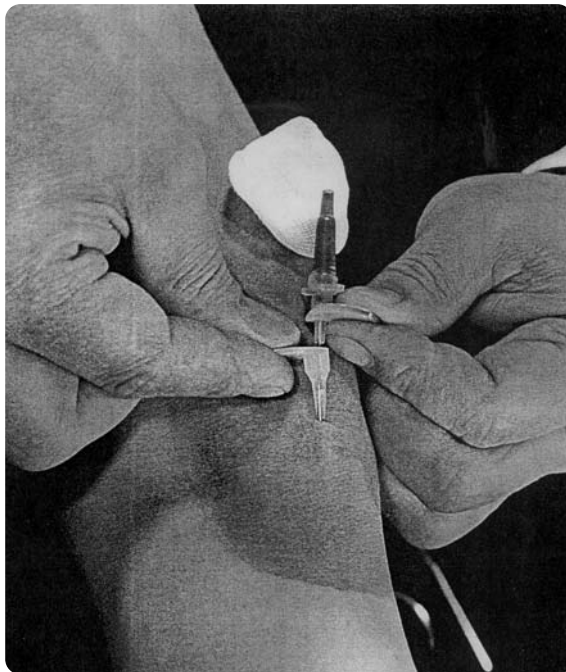
11 'From druggist to global player' B. Braun Melsungen, 2009, available at <http://www.bbraun.com/company/history>.

12 B. Braun, *Hauptliste* (1955) 74.

13 Frey, *Lehrbuch der Anästhesiologie* (1955) 177.

14 B. Braun, *Die Braunüle* (1964).

15 Down, *Surgical instruments* (1961) page N2.



*Figure 26.* The Braunüle offered by B. Braun Melsungen, *Die Braunüle*. (1964). This was the first plastic over the needle intravenous catheter. It was developed in cooperation between Otto-Heinrich Just, a German anaesthetist, and the B. Braun company.

stage of inhalational anaesthesia was tricky business, because due to the accompanying relaxation of respiratory musculature respiratory insufficiency was imminent. Moreover, deep inhalational anaesthesia depressed circulatory function. A meticulous dosing of the anaesthetic through a free airway and an accurate apparatus were hallmarks that distinguished a good anaesthetist from a bad one, in the surgeon's view.

Curare had been used in the treatment of tetanus at the beginning of the 20<sup>th</sup> century and, as mentioned earlier, the German surgeon Läden had recommended it for intrathoracic surgery with endotracheal intubation as early as 1910. But shortages of the substance used to make the drug, problems with purification and the lack of a suitable endotracheal device to take over respiratory function had halted further development of this technique. By the early 1940s these obstacles had been overcome. The pharmaceutical company E.R. Squibb & Sons had managed to purify the poison curare, native to South America. At first it was employed by psychiatrists in electroconvulsive therapy, which rose in popularity in the 1940s, in order to prevent muscle and skeletal damage during the convulsion. In 1942 Harold Randall Griffith (1894-1985), a Canadian anaesthetist, and his resident Enid Johnson saw the potential benefit for surgical anaesthesia and employed a synthetic form, Intocostrin, in 25 patients with great success. The surgeons were very satisfied although, because of its potential to depress respiration by paralyzing the respiratory musculature, they immediately warned that the promising substance should only be used by experienced anaesthetists and in well-equipped

operating rooms.<sup>16</sup> Yet, the surgical world was quickly convinced of the advantages of muscle relaxation. It ended 'the cause of more profanity by the surgeons and sweat and tears by the anaesthetist than any other occurrence in the operating room'.<sup>17</sup> After 1949 curare was mentioned in anaesthetic textbooks as the drug of choice to produce muscle relaxation. The German surgeon Killian considered it 'die bedeutendste Verbesserung auf dem Gebiet des Narkosewesens seit den letzten 30 Jahren'.<sup>18</sup> That was no surprise. Muscle relaxation provided a much better view of the abdominal and thoracic anatomy.

The other side of muscular relaxation was the increasing complexity of the administration of anaesthetics. The application of muscle relaxation required endotracheal intubation, controlled ventilation and intravenous access. More apparatus were needed to ventilate and monitor the patient. The administration of anaesthetics became mechanized, like much of society. These ingredients would boost anaesthetic specialization.

#### 6.4. British anaesthetists after the war

In 1945 much had been achieved by the professional anaesthetists in Britain. There was a postgraduate examination in the administration of anaesthetics, certification by diploma and an influential society with connections to the army and emergency medical service. Anaesthetists had been allowed by the British Medical Association to bill patients on their own, they had proven their value in army surgical teams during the invasion of Europe with endotracheal intubation and perioperative fluid management and they had made British anaesthesia an export product. Their superiority contrasted with the German situation where general anaesthetics were administered by nurses and where miserable patients were operated on under local anaesthesia.

On the other hand the training in anaesthetics was merely one year and did not equal the many years of residency required for surgery or internal medicine, under the control of the Royal Colleges. Moreover, there was still a motley collection of people administering anaesthetics. The top anaesthetists were teachers, writers of anaesthetic textbooks, and members of the Association and only administered anaesthetics in special cases, for special surgery, special surgeons or special patients at special prices. The routine work in the operating theatres was still done by all kinds of doctors, including former military anaesthetists, trainees for recognized specialties and above all general practitioners. British anaesthetists were neither flesh nor fowl. This was an uncomfortable starting point for the coming reorganization of British healthcare. In 1946 the editorial of the first issue of *Anaesthesia* set the tone. The new journal would primarily be a scientific one but it would also be the official organ of the Association. The Association's council

16 Griffith, 'Curare in general anesthesia' (1942) 418-420.

17 Anonymous, 'Curare in Anaesthesia' (1945) 82.

18 '...the most important improvement in the field of anaesthesia in 30 years'. Killian, 'Die Verwendung des Curare' (1950) 241.

was deeply involved in issues concerning all anaesthetists and therefore felt the need to be able to disseminate news to the members and fellows of the Association. The main issue was the implementation of the Health Bill resulting in a National Medical Service, which later became the National Health Service.<sup>19</sup> The editorial in the next issue of *Anaesthesia* stated the goal of the Association: that anaesthesia could no longer be practised by any medical man. The general practitioner had been of great help to his patients during the past 100 years, but the demands of anaesthesia had become too specialized.<sup>20</sup> Anaesthesia should be a medical specialty. How this goal should be reached was not mentioned; in fact it was the reforms to the British healthcare system in the postwar years that made it happen.

#### 6.4.1. General practitioners are out

From 1942 the British government had prepared for an increasing expenditure on medical schools and wanted to have more say on the medical curriculum. Experts from all corners of the medical world were asked to give their view of the curriculum. From 1947 the general idea would no longer be to train general practitioners as minor specialists in every branch of medicine and surgery, but to provide a solid foundation for specialization in any branch of practice. General practice should be a specialty on its own. The administration of anaesthetics had up to then been a part of the medical curriculum, varying per medical school. In the new curriculum it was reduced to simple anaesthesia for minor operations, more simplified than minor anaesthesia had been before. All this would be settled in the new Medical Act of 1950.<sup>21</sup> As a consequence general practitioners could no longer be occasional administrators of anaesthetics in hospitals because they could only administer anaesthetics in very simple cases. A staff of anaesthetists was needed. By then, the first appointed anaesthetists were appearing in rural hospitals in the country and in the suburbs. For instance, in 1947 the first anaesthetist was introduced in the Crumpsall Infirmary in Manchester.

#### 6.4.2. The National Health Service

The National Health Service was promised to the British people by the Labour Party during the elections in 1945. It was a reward for the common British subject: free healthcare or socialized medicine. According to Charles Webster, University Reader in the History of Medicine, it represented an enormous improvement on the ramshackle assemblage of health services it superseded.<sup>22</sup> It did not come out of the blue. The first national system of compulsory sickness insurance had been a German initiative in 1883.<sup>23</sup> In Britain the

19 Editorial, *Anaesthesia 1* (1946) 4.

20 Editorial, *Anaesthesia 2* (1947) 3.

21 Anonymous, 'The Curriculum' (1947) 599; BMA Committee, 'The Medical Curriculum' (1948) 839-842; Anonymous, 'The Medical Act, 1950' (1950) 337-338.

22 Webster, *The National Health Service* (1998) 215.

23 Starr, *Social transformation of American Medicine* (1982) 237.

Lloyd George Insurance Act had been in place since 1911, but had regulated outpatient care especially.<sup>24</sup> Just before the Second World War the Emergency Medical Service had covered emergency care.<sup>25</sup>

The National Health Service was to be the continuation and completion of the solidarity based system of free healthcare. The foundations had been outlined in the Beveridge Report on social insurance and allied services in 1942. A sine qua non was the contracting of medical specialists and consultants to work for the health authorities. This was a radical reform because as explained earlier British specialists traditionally worked separately from the hospitals. They visited the hospitals to provide consultations and to perform operations. They sent their bill directly to the patient. In 1947 Sir Will Spens (1882-1962), a hardened government official, was assigned to lead a committee advising the Ministry of Health about the hot potato of the remuneration of specialists within the National Health Service. His committee was named 'Interdepartmental Committee on the Remuneration of Consultants and Specialists'. The composition of the committee was a reflection of the British medical establishment in those days. Next to various arithmeticians and legal experts there were Lord Charles McMoran Wilson, the president of the Royal College of Physicians and Churchill's personal physician; Harry Platt, who represented the Royal College of Surgeons; Seymour Cochrane Shanks, the president of the faculty of radiologists; J.R.H Turton on behalf of the British Medical Association and D. Murray Lyon, the president of the Royal College of Physicians, Edinburgh.<sup>26</sup> The committee had to answer two questions: who is to be considered a specialist and what should he earn.

Because appointments and titles were not standardized in Britain, defining the specialist was a touchy subject. To avoid this minefield the Spens committee did not go into the content of this or that specialty, it simply compiled a list of all medical practitioners who were visiting staff members of local authority hospitals or selected voluntary hospitals in 1938 and 1939. Their incomes were analysed in order to determine the mean remuneration for a specialist. After several pages of statistics the committee advised an end salary for a specialist of £ 2,500 per annum. Specialists who performed outstanding professional work could be rewarded to a maximum of an extra £2,500. Remuneration for teaching could come on top of this. In its final advice in 1948 the committee added to the definition of a specialist that he should also have had at the least five years of postgraduate training. Remuneration in this training period was emphatically included in the advice to the minister. Trainees became an integral and cheaper part of specialist healthcare; their salary would grow from £600 in their first year of training to £1,200 in their fifth year.

As expected the specialists were reluctant to accept this arrangement. A settlement for their profitable private practices was necessary. In the end health minister Aneurin

24 Boulton, *The Association of Anaesthetists* (1999) 8.

25 Boulton, *The Association of Anaesthetists* (1999) 64.

26 Spens, *Remuneration of consultants and specialists* (1948) 18.

Bevan, the British minister of health, solved the problem by allowing them to keep their private patients in private hospitals and to work a limited number of hours for the health service. For the specialists it was a profitable deal. The realization of the National Health Service was too important a political issue to be frustrated by protests from medical specialists. Bevan therefore, in his own words, 'stuffed their mouths with gold'.

Luckily for them, the anaesthetists were taken into account too. The uncontrolled appointment of general practitioners to anaesthetic practice in hospitals since 1890 and the appointments in the Emergency Medical Service and Royal Army Medical Corps, not only as teachers but also as administrators of anaesthetics, had been rewarded. Because of their existing appointments the anaesthetists were considered to be specialists and their incomes were taken into account by the committee. The Association of Anaesthetists, in a list of specialties not recognized by the Royal Colleges, was given an opportunity to present written evidence of their members' incomes to the Spens committee. This list also contained other specialties, like pathology, urology, orthopaedics and paediatrics.

#### 6.4.3. Fellows in the Faculty of Anaesthetists of the Royal College of Surgeons

To be able to gain consultant status in the National Health Service the anaesthetists had to meet the requirements of the Spens committee. They had to upgrade the Diploma in Anaesthetics to a five-year specialist training course in anaesthesia. For this purpose the anaesthetists took shelter under the wing of the Royal College of Surgeons. The president of the Royal College of Surgeons, A.E. Webb-Johnson (1880-1958), was willing to support the idea of upgrading the status of anaesthetists to the level of fellow in a to-be formed Faculty of Anaesthetists of the Royal College of Surgeons, provided they would assume responsibility for pre- and postoperative care, resuscitation, blood transfusion and oxygen therapy. In his words the anaesthetists should become 'clinical physiologists'. In fact he was expressing the wish of surgeons in Britain to embroider upon the experiences with trained anaesthetists in the military and emergency context of the Second World War.

This would demand a higher level of training than the one-year Diploma in Anaesthetics. Webb-Johnson unfolded his plan for the council of the Association of Anaesthetists in April 1947 and time was of the essence because the National Health Service was slated to come into being in 1948.<sup>27</sup> Members of the Association of Anaesthetists in their general meeting of February 6<sup>th</sup> 1948 had their objections, because of a feared loss of control over the Diploma, but eventually realized the advantage of becoming a recognized medical specialist.<sup>28</sup> The scientific and educational matters that had been dealt with by the Section of Anaesthetics of the Royal Society of Medicine since 1908 were transferred to the Faculty of Anaesthetists of the Royal College of Surgeons (FFARCS) in 1948.<sup>29</sup>

<sup>27</sup> Association News, *Anaesthesia* 2 (1947) 122-123.

<sup>28</sup> Association News, *Anaesthesia* 3. (1948) 79-82.

<sup>29</sup> Boulton, *The Association of Anaesthetists* (1999) 5. Rushman, *History of Anaesthesia* (1996) 201-202.



The rapidity of this incorporation was striking.<sup>30</sup> Beinart, in her history of the Nuffield department of anaesthetics, suggested there had been some backroom dealings between Marston, the president of the Association of Anaesthetists and Webb-Johnson, the president of the Royal College of Surgeons, who were personal friends.<sup>31</sup> The rapidity of this change was also due to the fact that it was strongly in the surgeons' interest. Since general practitioners were not part of the deal with the National Health Service, every doctor in the hospital had to have a specialist or trainee specialist status. Therefore anaesthetists had to have a specialist training programme, otherwise there would be no anaesthesia in the hospital and hence no surgery.

In this way the third phase of anaesthetic specialization dawned. The modern administration of anaesthetics had become a specialty under the wing of the Royal College of Surgeons. A radical change in the nature of anaesthetic textbooks published at the time is noticeable. Anaesthetic textbooks were no longer written for students and general practitioners. The textbooks by Rolleston and Moncrieff in 1946 and by Mackenzie in 1946 had been the last to be written for general practitioners and students. *Modern Practice in Anaesthesia*, the first of a new series of anaesthetic textbooks edited in 1949 by Frankis T. Evans, an anaesthetist at St. Bartholomew's Hospital in London, was written for anaesthetists. The anaesthetist standing at the head of the table had to master the physiology of the patient. He needed to control ventilation, circulation, the intravenous administration of anaesthetics and intravenous fluid therapy.<sup>32</sup> More training was needed for the administrators of anaesthetics, not only with endotracheal intubation as a centre of interest.<sup>33</sup> The anaesthetic textbooks also paid attention to circulatory homeostasis. Previously short chapters about dehydration became elaborate treatises.<sup>34</sup>

#### 6.4.4. Anaesthetic specialization in Britain

Initially there were not enough anaesthetists to fill all the posts in all hospitals. They had to be trained first. The number of anaesthetists, derived from the membership numbers of the Association of Anaesthetists of Great Britain and Ireland, shows a natural growth from that moment on as shown in Graph 5. At first anaesthetists still performed only a part of the administration of anaesthetics. Much was done by general practitioners but they now held the rank of resident, registrar or senior house officer. The gradual change is confirmed in the operation registers studied. In large cities like London anaesthetists were already in place and they continued their work. The change at those hospitals, for instance at St Bartholomew's Hospital, was the end of the involvement of members of the surgical house staff in the administration of anaesthetics. In 1950 as far as can be

30 Boulton, *The Association of Anaesthetists* (1999) 95.

31 Beinart, *Nuffield Department of Anaesthetics* (1987) 63.

32 Evans, *Modern Practice in Anaesthesia* (1949) Introduction.

33 Lee, *A Synopsis of Anaesthesia* (1947) 94-95; (1950) 128-130; (1953) 165-168. Evans, *Modern Practice in Anaesthesia* (1949) 297; (1954) 322.

34 Lee, *A Synopsis of Anaesthesia* (1947) 19. Lee, *A Synopsis of Anaesthesia* (1953) 382-386. Goldman, *Aids to Anaesthesia* (1954) 161-162.

traced this surgical house staff no longer administered general anaesthetics, while their percentage of involvement had been 12% in 1945. Their place was taken over by anaesthetists in training. The anaesthetists themselves performed only one-third of the administrations of anaesthetics. A similar phenomenon can be traced for the London Hospital. At the Crumpsall Infirmary in Manchester in 1947 the first anaesthetist performed only 3 out of 100 administrations of anaesthetics in that year. The majority were still done by unspecified doctors. In Scunthorpe the situation appeared to be the same as in pre-war years. Only members of the surgical house staff and unspecified doctors were still mentioned as administrators of anaesthetics in the operation registers in 1949. The period in which administrations of anaesthetics were performed by personnel other than appointed anaesthetists would last for a long time, in London and in the provinces – even to the 1990s. As in 1893 the top tier of anaesthetists wanted to keep their circle limited in number. They were the teachers of anaesthetics and the consultants that shared private practices. They wanted to protect the yield of the private practices from being watered down too much. This basic economic principle explains the difference in numbers of anaesthetists between European countries. Britain has the lowest number of anaesthetists and the highest number of trainees.<sup>35</sup>

Now that anaesthetists had become a manageable and recognizable group of professionals, the medical supply industry became interested in them as a target group too. Up to then, anaesthetic devices had been included with surgical or general medical equipment in catalogues. Examples were catalogues from Allen & Hanburys, Thackray, the Medical Supply Association, Down Brothers and Holborn Surgical Instruments.<sup>36</sup> Rubber companies like Franklin, which specialized in antistatic rubber, and Warne had entered this scene too and although their products were at first sold via wholesalers, their success brought them to start their own line of catalogues.<sup>37</sup> Recognition of the independent anaesthetic specialty by industry was signalled by the introduction of specific anaesthetic subdivisions in the 1950s by the British Oxygen Company and Medical & Industrial Equipment. These not only sold endotracheal tubes but also breathing circuits, anaesthetic machines, laryngoscopes and other products an anaesthetist needed, down to an anaesthetic chart.<sup>38</sup>

As mentioned above, the shortage of trained anaesthetists lasted up to the 1960s. Even the discussion about the employment of nurse anaesthetists was revived from time to time. The same argument that was formerly heard returned: Why don't we employ nurses for the simple routine cases and anaesthetists for the more difficult cases? The counter-

35 Rolly, 'Anaesthesiological manpower in Europe' (1996) 327.

36 Allen, *Catalogue of Surgical Instruments* (1949) 36. Thackray, *Catalogue of surgical instruments* (1950) 1046; (1955) pp G25-27. Medical Supply Association, *Surgical instrument catalogue* (1950) 72. Down, *Surgical instruments* (1955) 1594-1596. Holborn Surgical Instruments, *General catalogue of surgical instruments* (1957) 121.

37 Franklin, *Antistatic rubber* (1953) 2. Warne, *Rubber Surgical Equipment* (1955).

38 British Oxygen Company, *Intubation instruments* (1957). Medical & Industrial Equipment, *Anaesthesia Equipment* 1960. British Oxygen Company, *Anaesthetic Sundries* (1961).

argument in turn was also the same: Why don't we employ nurses for routine surgical procedures like tonsillectomies and varicectomies and surgeons for complex cases?<sup>39</sup> The patient was presumed to always prefer the specialist or the supervised specialist in training. It would take until 1992 for the anaesthetists to have their own Royal College of Anaesthetists which ended the patronage of the Royal College of Surgeons. An equal specialist status had been achieved. Reviewing this whole process it could be stated that the chaos in the administration of anaesthetics, with administrators with or without Diploma in Anaesthetics, professional anaesthetists, dental surgeons and general practitioners was reorganized by a directive from the government, which declared that only graduated specialists could work in hospitals. The much-divided field, clearly sketched by Boulton in his history of the Association of Anaesthetists, would never have been able to implement such a reform itself.<sup>40</sup>

## 6.5. Anaesthetists in Germany

In the first postwar years German anaesthesia was back to square one. Nevertheless a remarkably rapid development into an independent medical specialty would take place in the next 15 years. This rapid evolution cannot be considered separately from the macroeconomic and political developments in West Germany (the Federal Republic of Germany), with its strong Western influences. As far as is known German anaesthetic specialization had its origins in this part of Germany and therefore the next paragraphs will focus on the developments in West Germany.

Directly after the war the western part of Germany was occupied by Anglo-American forces; they reigned this part of the country. This included a presence in healthcare. The military hospitals were the state-of-the-art hospitals of that time. In these hospitals, British anaesthesia together with its derivative American anaesthesia was the gold standard. The army medical services had brought with them a surplus of anaesthetic machines, drugs and devices. Figuratively Germany was drenched in British anaesthesia. This effect was enhanced when in the late 1940s a growing interest developed in rebuilding West German society as a counterweight to the communist threat. This interest was particularly strong in the US, which sent governmental but also non-governmental and religious-based medical teams to restore and update medical care in the devastated country. A perfect example of this phenomenon was Jean Henley, an American anaesthetist who visited several German hospitals in the American occupation zone by order of the US High Commissioner for Germany.<sup>41</sup> All of these Western influences filled a

39 Toner, 'Supplementary anaesthetists' (1961) 1452. Macintosh, 'Supplementary anaesthetists' (1962) 158.

40 Boulton, *The Association of Anaesthetists* (1999) 88-94.

41 Petermann, 'Development of anaesthesiology' (2005) 135. Zeitlin, 'American contribution to German Anaesthesia' (2003) 498-499.

relative vacuum. During the last years of the Second World War the German scientific and socio-medical life had gradually ceased. Scientific journals like *Archiv für Klinische Chirurgie*, *Berliner Klinische Wochenschrift*, *Der Chirurg*, *Klinische Wochenschrift* and as already mentioned *Schmerz Narkose-Anaesthesie* had slowly diminished in volume and had ceased publication in 1944. Professional societies like the 'Deutsche Gesellschaft für Chirurgie' had stopped meeting.

### 6.5.1. A new generation of anaesthetists

The year 1949 was a crucial year in the history of anaesthesia in Germany as it was around the world in more than one aspect. First, endotracheal anaesthesia and the application of muscular relaxation had become firmly established in surgical anaesthesia. German surgeons too became aware of the advantages of muscle relaxants, which had been introduced in the English-speaking world directly after the Second World War. Muscular relaxation and its consequences were discussed at congresses and in publications. Killian reported on the 66<sup>th</sup> German surgical congress in 1949, the first congress after the end of the war, on the use of curare. 'Die Einführung der echten Curarepräparate in die Technik der Narkose und Anästhesie ist tatsächlich ein grosser Fortschritt, aber man muss sich auf die Methode einarbeiten. Dies wirft erneut das Problem auf, ob es nicht ratsam sei, in Deutschland Spezialisten für Narkose und Anästhesie auszubilden.'<sup>42</sup> Rehn, the president of the congress, confirmed the importance of the use of curare and the need for extra training for administrators of anaesthetics. He added that he was considering creating a teaching post for anaesthesia in his surgical clinic in Freiburg, something he had openly declared himself against during the first anaesthesia congress in 1928 in Hamburg.<sup>43</sup> Other surgeons agreed that the combination of modern anaesthetic techniques could only be entrusted to an anaesthetist.<sup>44</sup>

Second, the introduction of the National Health Service in Britain in 1948 with anaesthetists in regular service had made it seem more likely that the practice of anaesthesia in Germany could be a profitable occupation. With this in mind a new generation of young surgeons and surgical residents from German university surgical clinics saw a hole in the market and went to Britain, the US, Canada, Sweden or Denmark to learn modern anaesthesia. In this way Rudolf Frey (1917-1982), from the surgical clinic in Heidelberg led by Bauer, studied anaesthesia in Basel, Paris, Rochester, Boston and Oxford.<sup>45</sup> Sverre Loenneken from Köln, led by Stich, travelled to Zürich, Stockholm and Malmö. Richard Heinz-Joachim Bark (1918-1963) from Tübingen was trained in

42 'The introduction of the pure curare preparation in anaesthetic technique is significant progress, but one has to become acquainted with the method. This raises the question again of whether it would be advisable to train specialists in anaesthesia in Germany.' Killian, 'Die Verwendung des Curare' (1950) 241-246.

43 Goerig, 'Helmut Schmidt' (1996): 621-31.

44 Koch, 'Intubationsnarkose mit Curare' (1950) 532-534.

45 Just, 'Zur Geschichte der Anästhesie' (1986) 56.

Oxford by Macintosh. Martin Zindler went from Munich to the US. Jean Henley, mentioned earlier, who was sent by the American government, worked in Giessen and Hans Matthes was sent to her by his chief Guleke in Jena to receive an update in anaesthesia. Otto-Heinrich Just, another surgical pupil of Bauer, also learned modern anaesthesia from Jean Henley, who was by then in Heidelberg. Considering the information available about these careers shows that almost all of these surgical residents came from hospitals and universities in the American and adjacent British occupation zones. This conforms to the fact that the Anglo-American allies were eager to westernize German society and hence even financially facilitated these trainings abroad. Otto-Heinrich Just, for instance, received his scholarship to Oxford from the British authorities.<sup>46</sup>

All of these surgical residents, who would become the first anaesthetists in Germany, returned to their surgical clinics with experience in the modern administration of anaesthetics, but also with the conviction that specialized doctors were needed, at least for the teaching of modern anaesthesia.<sup>47</sup> But the university surgical clinics they returned to were far from accepting such a new idea. Modern anaesthetic techniques were fine, muscular relaxation was wonderful, but reorganization with a new specialty was denounced. The surgical clinics, like the entire medical faculties in fact, were bastions of traditional German professors. They had withstood the postwar investigations for denazification by the American Central Intelligence Council. Medical faculties belonged to the institutions that were spared in order to restore a sufficient healthcare system in Germany as quickly as possible.<sup>48</sup>

### 6.5.2. Anaesthetic teaching posts ‘under one roof’ in surgical clinics

Nevertheless German surgeons felt they had to find a place for modern anaesthesia within their traditional idea of surgical care. From May 31<sup>st</sup> to June 3<sup>rd</sup> 1950 the 67<sup>th</sup> meeting of the ‘Deutsche Gesellschaft für Chirurgie’, the second meeting after the war, was partially dedicated to the issue of ‘modern’ anaesthesia. During the meeting international figures like Macintosh from Oxford presented their views. To a question from the audience about which anaesthetic was best for gastric surgery, Macintosh set the tone and answered: ‘There are no bad anaesthetics, just bad anaesthetists’. A committee of the surgical society prepared an advisory statement on the feasibility of an anaesthetic specialty in Germany. The committee’s final compromise proposal was presented by the congress chairman E. von Redwitz from Berlin during the general meeting. It was stated that a situation similar to Britain’s with a separate specialty could not be transplanted all at once into the German medical system. The proposal was to institute teaching posts for anaesthesia in the surgical clinics of the universities. Their assignment would be to teach the administration of anaesthetics not only to the assistants and students of the

46 Stoeckel, ‘Otto-Heinrich Just 60 Jahre’ (1982) 45-46.

47 This is gathered from the obituaries of German anaesthetists. The complete list is given in the Archives section of this book.

48 Remy, *The Heidelberg Myth* (2002) 130-134.

clinic but also to doctors from outside the clinic. This would lead to better trained doctors and the question of a separate specialty would be considered later; for this purpose a new committee was appointed.<sup>49</sup> In all, a compromise with anaesthetists, primarily to teach the administration of anaesthetics, was agreed upon. An underlying plea for anaesthetic specialization had at last surfaced. This undercurrent had existed in Germany since 1894 when Schleich and Dumont suggested a chair for anaesthesia; it had been continued in 1913 by Von Brunn in the last German textbook on anaesthesia before the First World War when he proposed appointing professional teaching anaesthetists; it had been continued between the wars by Killian, Schmidt and anaesthesia-minded German physicians, whose solid initiatives had failed due to economic depression and a new war. But now the first phase of anaesthetic specialization had been resumed; this time not by interested surgeons but by a new generation of professional anaesthetists.

In fact the statement by von Redwitz was a confirmation of what had already been happening in surgical clinics since the end of the war. Most leading German surgeons realized the importance of special training in modern anaesthesia and had created teaching posts for anaesthesia in their university clinics. Ironically many of these surgeons, like W. Felix, E.K. Frey, Krauss and Zukschwerdt, were pupils of Sauerbruch. But none of them looked back. For them it was a new situation with new techniques that called for this renewed first phase of specialization. The surgical pupils who had been trained in modern anaesthesia in the US, Britain, Canada and in the Scandinavian countries were the first to occupy the teaching posts. Some of them were even recognized simultaneously as surgeons and anaesthetists.

Training in anaesthetics was welcomed but detachment from surgery was still considered to be impossible. This was not due to unwillingness, for the opponents had noble objectives. Actually it was again the holistic view of patient care, which German surgeons had promulgated from the 19<sup>th</sup> century on. A free-standing anaesthetic specialty would be contrary to this. Bauer, the president of the German Surgical Society, put it like this in his speech at the opening of the 69<sup>th</sup> congress in 1952:

Die Einrichtung einer eigenen Anästhesieabteilung an meiner Klinik und Neueinrichtung einer eigenen Sektion 'Moderne Anästhesie' auf diesem Kongress zeigen wohl zur Genüge, dass ich für meine Person dem Problem 'Anästhesist' aufgeschlossen und positiv gegenüberstehe. Der Operateur kann den Kranken nie selber narkotisieren und der Anaesthesist kann ihn nicht operieren. Aber Operateur und Anaesthesist arbeiten im gleichen Haus, im gleichen Raum, zur gleichen Zeit, am gleichen Kranken. Ernste Zusammenarbeit ist also die einzig mögliche Folgerung.

Actually Bauer proposed the construction of anaesthesia departments within surgical departments as a means for dealing with specialization. Specialists should work together

49 Verhandlungen der Deutschen Gesellschaft für Chirurgie 67. Tagung vom 31. Mai bis 3. Juni 1950. *Langenbeck's Archiv für Klinische Chirurgie* 267 (1951) 58-60.

‘Unter einem Dach’, under one roof. In the case of surgery and anaesthesia this was quite simple because the one cannot work without the other. More complicated was the way how to deal with other surgical specialties like urology, plastic surgery, orthopaedics and so on. In particular the detachment of trauma surgery from general surgery was feared, since once they were detached they could go their own way.<sup>50</sup> As a consequence, in the early 1950s anaesthesia was still under the wing of surgery. It was not anaesthetists but surgeons who wrote treatises on anaesthetic issues like muscular relaxation by curare and endotracheal intubation according to Magill. They were still surgeons, judging anaesthetic innovations. In the continuation of Kirschner’s *Chirurgische Operationslehre* ‘ausserordentliche grosse Vorteile’, exceptional great advantages, were attributed especially to endotracheal intubation.<sup>51</sup> All other techniques, from the underpressure cabinet to intratracheal insufflation, would pass into oblivion.<sup>52</sup>

### 6.5.3. The independent organization of professional anaesthetists

The new generation of young professional anaesthetists realized they had to organize in order to withstand the traditional grip of surgical professors on anaesthesia and to be able to make their own policy. As a result in 1952 the ‘Deutsche Arbeitsgemeinschaft für Anaesthesiologie’, German Association for Anaesthesia, was founded. Its goal besides scientific activities was to establish training for anaesthetists. On April 10<sup>th</sup> 1953 for private law reasons the ‘Arbeitsgemeinschaft’ was transformed into the ‘Deutsche Gesellschaft für Anaesthesie’, German Society for Anaesthesia, as the German scientific association for anaesthetists. The bylaws were signed by an impressive list of 45, most of whom were anaesthetists. From, but not for, the surgical specialty only the old-time proponent of an anaesthetic specialty Hans Killian signed. The first president of the association was Richard Heinz-Joachim Bark, who had been one of the first foreign-trained anaesthetists.<sup>53</sup> In 1953 the journal *Der Anaesthetist*, which had been established in Austria as the journal of the ‘Österreichische Gesellschaft für Anaesthesie’ in 1952, became the journal of the ‘Deutsche Gesellschaft für Anästhesie’ too. Its board consisted of anaesthetists; surgeons and pharmacologists were only advisers. The first certification of anaesthetists by a German ‘Ärztammer’, Medical Association, was also realized in 1953.<sup>54</sup>

50 ‘The institution of an anaesthetic department in my clinic and the new institution of a section on ‘Modern Anaesthesia’ during this congress indicate sufficiently that I myself encounter the ‘Anaesthetist’ problem openly and positively. The surgeon cannot anaesthetize the patient himself and the anaesthetist cannot perform the operation. But the surgeon and anaesthetist work in the same house, in the same room, at the same time on the same patient. Hence, sincere cooperation is the only possible consequence.’ Bauer, ‘Zur geistigen Situation unseres Faches’ (1952) 9-14.

51 Kirschner, *Chirurgische Operationslehre* (1951) 31-43. Irmer, *Grundlinien der endotrachealen Narkose* (1951) 73. Schön, *Theorie und Praxis* (1952) 182.

52 Killian, *Die Narkose* (1954) 570.

53 Lehman, ‘Die Deutsche Gesellschaft für Anaesthesie’ (1967) 259-268.

54 Petermann, ‘Development of anaesthesiology’ (2005) 140.

The new German anaesthetic society could immediately join societies in other industrialized countries like Britain, France, Italy, the Netherlands, Sweden and Norway which had been formed directly before or after the war. Since 1951 these societies had been preparing initiatives to form a worldwide society for anaesthesia. To stay on the sidelines was impossible for a country like Germany, busy putting itself and its industry on the map again. This was the process by which specialization spreads itself. When one country has a specialty in a part of medicine, other countries will follow. It was necessary to have a society of anaesthetists in order to be modern. Eventually in 1955 the German society was a founding member of the World Federation of Societies of Anaesthesiologists. The second phase of anaesthetic specialization was completed in a race to catch up with the rest of the Western world.

#### 6.5.4. The division of labour in the operating theatre

But German surgeons did not give in immediately. In 1955 during the 72nd congress of surgery the state of the art of anaesthesia was described by Bauer in his lecture titled 'Wandlungen der Anaesthesie', changes in anaesthesia. He started with the content of the practice of anaesthesia and how much emphasis was on the physiological and homeostatic approach to the surgical patient, which had already been propagated by Rehn before the war. Monitoring vital organ functions could lead to an attenuation of postoperative complications.<sup>55</sup> As a consequence circulatory and biochemical homeostasis drew a steadily amount of attention in the postwar textbooks.<sup>56</sup> The anaesthetist at the head of the table was the logical person to perform this control. Bauer stated:

Kurzum, wir stehen heute im Operationssaal vor der irreversiblen Tatsache der Arbeitsteilung: der Operateur widmet sich ganz und nur seiner Operation, während der Anaesthesist alle vitalen Funktionen des kranken steuert und überwacht.<sup>57</sup>

The importance of this statement cannot be overestimated in the context of this book. The description of the new specialty was there, just as Webb-Johnson had defined it in Britain seven years earlier.

In Bauer's view this new role for the administrator of anaesthetics should be considered apart from the discussion of whether anaesthetics should be a separate specialty. 'Dagegen müsste man – für Deutschland wenigstens – von Tendenzen, die Anästhesie aus der Chirurgie herauszulösen und sie als Sonderfach über alle operierenden Fächer

55 Nordmann, 'Vorbehandlung und Nachbehandlung in der Chirurgie' (1940) 571-650.

56 Kirschner, *Chirurgische Operationslehre* (1951) 292-304.

57 'In brief, in the operation theatre we are now facing the irreversible fact of a division of labour: the surgeon devotes himself fully and only to the operation, while the anaesthetist controls all the vital functions of the patient.' Bauer, 'Wandlungen der Anaesthesie' (1955) 171.



auszudehnen, abraten.<sup>58</sup> Bauer was convinced that a surgical patient could not be separated into anaesthetic and surgical parts, each with its own specialist. ‘Anaesthetist und Operateur können sich nicht in den Kranken teilen, denn der Kranke ist ein Individuum, das heisst ein Unteilbares, und wenn Zwischenfälle sich ereignen, so sind Narkose, Alter, Krankheit, Konstitution, Begleitschäden und Operation wechselseitig miteinander verfilzt. Die Verantwortung ist also nicht teilbar, sie kann nur gemeinsam getragen werden.’<sup>59</sup> Bauer argued against the separation of anaesthesia from surgery, especially because he considered the cooperation important and thought that specialization would hamper it: ‘Richtschnur für beide kann nur sein: Zusammenarbeit durch Arbeitsteilung, beides als Voraussetzung höherer Leistung bei geringeren Gefahren!’<sup>60</sup> In later days this point of view on the part of surgeons would be interpreted as a fear of the loss of control in their territory, the operating theatres. Whether this emotional argument is true or not, they never recorded it that way. Even Sauerbruch, who is often depicted as an opponent of anaesthetic specialization, did not mention this motive.<sup>61</sup> In his memoirs *Das war mein Leben* in 1951 Sauerbruch indeed fiercely objected to the splitting up of surgery, a profession he depicted as almost mythical, into subspecialties like orthopaedics, urology and neurosurgery. However, he did not write similar things about anaesthesia. He too wrote about the important cooperation between surgeon and anaesthetist.

In fact Bauer’s plea was a confirmation of what had already been effected on the floor. In the same year, 1955, Rudolf Frey with Hügin from Switzerland and Mayrhofer from Austria covering the German-speaking world edited the first *Lehrbuch der Anästhesiologie* with a large section devoted to homeostatic management. The changing position of anaesthesia in surgical textbooks was evident in 1958 when the chapter on anaesthesia in Garrè’s *Lehrbuch der Chirurgie* was written by the same Rudolf Frey.<sup>62</sup> The real first chair in anaesthesia in Germany was founded in 1960 in Mainz. Again, Rudolf Frey was the first anaesthetist to hold it.<sup>63</sup>

### 6.5.5. Anaesthetic specialization in Germany

The division of labour was a fact, and the evolution went on. In one big catch-up phase things changed in operating theatres in Germany. The introduction of trained and

58 ‘On the other hand one has to advise against – at least for Germany – tendencies towards taking anaesthesia from surgery and expanding it as a separate specialty across all surgical specialties.’ Bauer, ‘Wandlungen der Anaesthetie’ (1955) 173.

59 ‘Anaesthetist and surgeon cannot divide themselves in the patient, because the patient is an individual, that means something indivisible, and when disasters happen anaesthesia, age, illness, constitution, collateral damage and the operation are mutually interrelated. The responsibility is also indivisible, it can only be borne together.’ Ibid

60 ‘the guideline for both is just: Cooperation by division of labour, both as a requirement for a better outcome with less danger.’ Ibid 176

61 Nissen, ‘Development of pulmonary surgery’ (1955) 9-15.

62 Garrè, *Lehrbuch der Chirurgie* (1958) 237-280.

63 Killian, ‘The First German Anesthesia Congress’ (1985) 283. Just, ‘Zur Geschichte der Anästhetie’ (1986) 56.

dedicated anaesthetists was as successful as in Britain in the Emergency Medical Service and Royal Army Medical Corps. Anaesthetic specialization was unstoppable. The registers tell the story. First the percentage of anaesthetics administered by members of the surgical staff decreased: at Charité from 38% in 1949 to 1% in 1959; at Tübingen from 59% in 1955 to 14% in 1960. They were replaced by doctors who were not involved in surgery. Whether these were anaesthetists or anaesthetists in training could be the subject of further research. Second, the percentage of procedures under local anaesthesia diminished considerably. At Charité the use of local anaesthesia diminished from 49% in 1949 to 14% in 1959; at Tübingen from 45% in 1950 to 17% in 1960. The decrease is a reverse proof of the thesis that when the surgeon is responsible for the anaesthesia in a surgical case, he will weigh the pros and cons of local and general anaesthesia. Given that responsibility he will be inclined to use local anaesthesia when possible. This mechanism was noticed earlier in Chapter 2. When the task to anaesthetize the patient is taken over by an anaesthetist he will not apply local infiltration anaesthesia because in that case he would enter the terrain of the surgeon; so he will apply general or regional anaesthesia. Third, the percentage of anaesthetics administered by non-medical staff decreased: at Charité from 6% in 1949 to 1% in 1959; at Tübingen from 46% in 1950 to 1% in 1955. It was the nurses' interest organization itself that had started the discussion about this. Confirming what was happening in daily life in 1959 the 'Deutsche Schwesterngemeinschaft', German Nurses Association, decided that the administration of anaesthetics could not be the responsibility of nurses. The newer anaesthetic machines especially were considered to be too complex for them. The surgeon A.W. Fischer protested against this in his words ridiculous argument in *Der Chirurg*. Anaesthetic nurses were doing their job perfectly and the machines were not that complicated. On the other hand he realized that more complex techniques like muscle relaxation, artificial hypotension and endotracheal intubation were the anaesthetist's area of expertise. But the loss of the experience of the anaesthetic nurses should be prevented. W. Hügin, an anaesthetist in Basel, Switzerland, entered the discussion and argued that surgical knives were even simpler than anaesthetic machines but surgeons guarded against their use by nurses. The administration of anaesthetics was a medical occupation as was surgery on human beings. Fischer felt misunderstood and amended his statement, saying that anaesthesia could only be doctor-based but that assistance from well-trained nurses or technicians was indispensable. Hügin agreed and the discussion was closed for the time being.<sup>64</sup>

But not all areas in Germany could keep pace. In smaller and rural hospitals nurses still administered the old mask and drop bottle general anaesthesia.<sup>65</sup> This is clearly illustrated by the situation in Meiningen, located in economically backward East Germany. According to its operation registers in 1960 30% of the anaesthetic procedures were still

64 Fischer, 'Schwestern oder Pfleger an Narkosen' (1959) 535-536; Hügin, 'Schwestern oder Pfleger an Narkosen' (1960) 200-201; Hohmann, 'Schwestern oder Pfleger an Narkosen' (1960) 502.

65 Börger, 'Zum Anaesthesieproblem am Allgemeinkrankenhaus' (1961) 80-83.

performed by nurses or by non-medical staff. This would not disappear before 1970. During the 43<sup>rd</sup> meeting of the 'Bayerische Chirurgen-Vereinigung' in 1966 it was reported that in Bavaria general anaesthesia was administered by doctors in only 42 of 145 hospitals.<sup>66</sup> It is therefore no wonder that the *Kleines Narkosebuch; eine Anleitung zur Erlernung der Allgemeinnarkose für Schwestern und Heilgehilfen* by the surgeon Fritz Hesse would be published until 1967, mentioning in its preface that it still had a right to exist because 'Narkoseschwestern' were still temporarily necessary in smaller hospitals.<sup>67</sup>

The goal of the anaesthetists remained to attract enough young doctors into the specialty. The specialty should be attractive to them and the remuneration had to be settled. For this purpose the 'Berufsverband Deutscher Anästhesisten', Association of German Anaesthetists, was founded in 1961 as an organized interest group related to the scientific 'Deutsche Gesellschaft für Anaesthetie'. Cooperation between the two anaesthetist's organizations and the surgical society was necessary to create an equal position for the anaesthetist. Like the second phase, the third phase of anaesthetic specialization was completed in a rush. In 1964 the pact was signed. The presidents of the 'Deutsche Gesellschaft für Chirurgie' Hermann Krauss, and the 'Deutsche Gesellschaft für Anaesthetie' Kurt Wiemers, both from the University Hospital in Freiburg, published a guideline for the post of lead anaesthetist in German university and general hospitals. Every hospital should have an autonomous anaesthesia department. The lead anaesthetist's position should be equal to the chiefs of surgical departments. Again much emphasis was laid on the level of cooperation between the two departments. At the same time the problem was recognized that anaesthetists could not earn a reasonable fee in smaller hospitals. Negotiations with health insurance companies would be conducted by both societies in order to solve this problem.<sup>68</sup>

#### 6.5.6. Evaluation of the remarkable U-turn in Germany

In some 15 years an anaesthetic specialty had been established, something that had failed in Germany in the interwar years. Why? What had changed? At this point it is necessary to reconsider the circumstances under which anaesthetic specialization failed before the Second World War, given in Chapter 4.

The first circumstance was the holistic attitude of the surgeons. As explained above it is not likely that this had changed after the Second World War. The traditional professors were still there. It can only be expected that in 1961 the old generation of surgeons, including Bauer, had almost completely died out. Their power had been broken by the emergence of more specific surgical techniques, with cardiac surgery in front, more specialties and similar international developments.

The second circumstance was the surgeons' quality control of the relatively simple anaesthesia procedures in Germany in the interwar years. This really changed after the

66 Röllinger, 'Bayerischen Krankenhäusern ohne Anaesthesieabteilung' (1967) 83.

67 Hesse, *Kleines Narkosebuch* (1953) 3.

68 Krauss, 'Stellung des leitenden Anaesthesisten' (1965) 48.

war. The introduction of muscular relaxation, but also the passing of the buck of circulatory management from surgery to anaesthesia enlarged the responsibility of the anaesthetist. The division of labour, defined by German surgeons after the British example, interfered with an integral responsibility. Young doctors, triggered by the success of the anaesthetists in the British National Health Service, became aware of this potential specialty for Germany after the example of Britain.

The third circumstance was the standstill of the German anaesthetic industry in the interwar years. In Germany during the interwar years the surgical instruments industry had declined because of the lack of rubber. Proof is found in the catalogues printed by Hänni-Verlag in Nuremberg. The anaesthetic section in the catalogue called *Humanmedizin* published in 1945 for an unnamed company was an exact reprint of the anaesthetic chapter in the 1923 catalogue printed for Windler and an Austrian company called Odelga.<sup>69</sup> Steel was still predominant. This picture changed 180 degrees. After the Second World War German industries were able to re-enter the growing and profitable anaesthetic market. They could do so because of the general revival of the German industry and because of their more extensive experiences with synthetic materials, the new material for all anaesthetic devices. Directly after the war the Rüscher company, as the sole survivor of the German interwar rubber crisis, resumed the production of its well-known urethral and stomach catheters and manufactured endotracheal tubes from the Magill design that had never been patented. Heinz Rüscher, who would later start the anaesthetic branch of his father's company, remembered delivering rubber endotracheal tubes to American military hospitals in 1945. Rüscher used rubber or its synthetic replacement Rüscherlit (the same as the earlier mentioned IG-lit) for these tubes. In 1953, like British companies, Rüscher started its specific anaesthetic branch. This year coincided with the founding of the German Society for Anaesthesia: the market was there. Heinz Rüscher was acquainted with all of the German anaesthetists of the first hour, with Rudolf Frey in front. Within a few years the company produced a catalogue with a complete assortment of endotracheal devices.<sup>70</sup> This revived industry profited from the by-now recognizable and manageable group of professionals to whom it could market its products. As in Britain, a society of anaesthetists made it possible for the industry to impose their product on a group instead of being forced to satisfy every solo designer-practitioner.

Fourth, the economic tide had been unfavourable in the interwar years. This changed fundamentally after the Second World War. Graph 6 in the graphs section clearly shows the German economic revival, which even bypassed the British Gross Domestic Product in the 1950s. The same goes for the final circumstance. In the interwar years Germany lost a substantial number of its doctors due to the number of Jewish doctors who were forced into exile. After the war this changed. Graph 1 shows that the number of doctors in

69 Windler, *Der moderne Chirurg* (1923). *Humanmedizin Band I* (1945).

70 Personal interview with Heinz Rüscher. See the company story in Appendix 3. Rüscher, *Catalogus* (1956).

Germany ultimately equalled the number in Britain. Lacking the possibility of an army career, more students were inclined to enlist for one of the most popular studies: medicine.

## 6.6. Chapter review

At the end of the Second World War half of British anaesthetists had obtained regular appointments in the Army and Emergency Medical Services, not only as teachers and supervisors but also as routine administrators of anaesthetics. German anaesthesia was still a part of surgery, underdeveloped and actually back to the same circumstances that had prevailed in 1918. The anaesthetic gap between the two countries had never been wider.

Although Britain was one of the victorious allied countries, the home situation was far from celebratory. The war had almost bankrupted the country. The preservation of the colonial empire would prove to be only temporary. The people were discontented and social reforms were necessary. One of them would be the remodelling of the outdated hospital structure in the National Health Service with medical specialists under permanent contract. Hospital specialists had to have completed five years of postgraduate training. General practitioners were banned from the hospital. The general practitioners who administered anaesthetics as a sideline had to make a choice between general practice or anaesthesia. To be appointed to the hospital the anaesthetists had to have completed extended postgraduate training. For this a collaboration was offered by the Royal College of Surgeons. But the surgical college had its own demands. Anaesthetists would not only render the patient unconscious; their tasks would also include perioperative management, and muscular relaxation, the main anaesthetic novelty directly after the war and a divine gift for all kinds of surgery. Anaesthesia had to be an academic specialty. The president of the Association, A. Marston, was the negotiator for the College of Surgeons. This eventually led to the establishment of the Faculty of Anaesthetists in the Royal College of Surgeons. The Association had to be reformed from a club into a representative organization for all anaesthetists. John Gillies, president of the Association from 1947-1950, was the anchor for this process. The British anaesthetic industry accommodated the maturation of the anaesthetic specialty and was leading directly after the war but would prove to suffer from the dialectics of progress when German industry boomed in the 'Wirtschaftswunder' and the application of plastics for access devices.

The Western allies had learned from the First World War that a weakened Germany at the centre of Europe would lead to a new war within decades. For this reason they enabled economic rebuilding which, because of the separation of East Germany under Soviet rule, would be restricted to West Germany. When at the end of the 1940s the communist threat increased all over the world, the westernization of West Germany was accelerated, especially by the US government. Impressed by the position of the anaesthetist in Western countries, Britain and its National Health Service in front, young

German doctors saw the hole in the market and were encouraged to learn modern anaesthesia techniques abroad. On their return they proved that anaesthesia could entail more than just keeping a patient asleep. Perioperative management and the blessing of muscular relaxation were what they had offer. But the international reorientation also made a separate specialty a topic. The traditional German surgeons tried to keep everything under one roof. But the division of labour, the installation of university departments of anaesthesia that were equal to surgical departments and the international organization of anaesthesia made an anaesthetic specialty unstoppable. It became a self-fulfilling prophecy. Formerly established surgical influences like the application of local anaesthesia and 'Rauschnarkose' vanished from the operating theatres. The anaesthetist was to become the perioperative manager, the physiologist for ventilation and circulation in the operating theatre. Plastic tubes and catheters became indispensable attributes for the modern anaesthetist. In this process the booming German anaesthetic industry played a key role. The experience with the application of plastics gave it a giant leap forward.

Towards 1960 both Britain and Germany considered anaesthesia as a specialty that required postgraduate competence, each according to their own standards of specialist training. This regarded not only the teaching of anaesthesia but every administration of anaesthetics. The market was very large because by that time every hospital wanted to have its own anaesthetists, as many as possible. It became a seller's market. It is however no surprise that there were not enough anaesthetists to fulfil all the posts. In fact anaesthesia spread only slowly from large hospitals to rural hospitals in the succeeding decades. Laid along the phases of specialization in both countries, the third phase had been reached.

## 7. Summary and conclusion

The anaesthetist 1890-1960

A historical comparative study between Britain and Germany

‘Anaesthetists, to be or not to be. That was the question.’

Medical specialization is one of the most prominent medical developments in the second half of the 19<sup>th</sup> century in the Western world. Up to that time there had been only physicians, surgeons and obstetricians. From the 1850s on special branches sprouted from the family tree of medicine. Most of them still exist today and provide the medical world with internists, ophthalmologists, paediatricians, psychiatrists, ear, nose and throat specialists, radiologists and many more. Each specialty has its own story.

Britain was, around 1885, the first western European country that had doctors that made the administration of anaesthetics their livelihood and called themselves anaesthetists. In 1953 Germany was one of the last. That remarkable contrast, unknown in other specialties, was the starting point of this historical research. Contrary to the existing historiography on this subject the question would not primarily be why anaesthetic specialization was delayed in Germany but why it was begun in Britain. To answer this question a 360-degree view of circumstances was taken into account. These circumstances included the relations in the operating theatres and the hospitals, the anaesthetic industry, knowledge development with regard to anaesthetic techniques, economic and political influences, regulations and finally warfare. Because medical historians specialized in specialization like Rosen and Weisz have emphasized that medical specialization evolves in phases, the author of this book has defined three cumulative phases. The first phase is the phase of the individual specialist who is interested in a particular area of medicine. The second phase is the phase of grouping of individual specialists in scientific societies and journal editorial staffs; it is the transitional phase from specialist to specialty. The third phase is marked by training programmes, examinations, certifications and eventually by an exclusive domain within medicine.

## 7.1. The first phase of anaesthetic specialization

To understand why some British doctors at the end of the 19<sup>th</sup> century called themselves ‘anaesthetists’ at that moment, in that place, one has to imagine the surgical and hospital world in Britain. At that time British surgery was a world apart. British surgery had not merged with medicine in the 18<sup>th</sup> century as it had done on the European continent. Surgeons did not call themselves ‘doctors’ but prized their original title, ‘Mister’. Surgeons were at the top of the medical pecking order. Surgeons were highly respected and fit the mechanical approach to the human body that was taken in Britain as a consequence of the industrial revolution. Surgeons embodied the manipulability of the human machine. The surgeons had their own Royal College of Surgeons, like the physicians had their Royal College of Physicians. Because the surgeons considered anything beyond the cutting, cauterizing and stitching they did to be below their standards, they were not committed to administering anaesthetics themselves; that would be a task for somebody else. At a time when most surgery was performed at the patient’s or surgeon’s house, usually the patient’s general practitioner or (even lower in the medical pecking order) a dentist was charged with the administration of anaesthetics.

Toward the end of the 19<sup>th</sup> century surgery changed. Its complexity increased due to antisepsis, anaesthesia and perioperative care; anaesthesia was no longer a luxury but became indispensable to modern surgery. Hygienic conditions, sterilizers and compressed gases for anaesthesia became necessary to perform surgery. Surgical and anaesthetic equipment became less portable. This change moved surgery to modern hospitals with operating theatres and nursing wards. Here the division of labour between surgery and anaesthesia could in principle be continued because British hospitals were a melting pot of the private practices of general practitioners, physicians and surgeons. These doctors and specialists worked separately from the hospital and from each other. Most hospitals were open markets, where every doctor could enter and perform his task. British hospitals were based on charity, church and private enterprise; university hospitals were scarce. Britain, geographically separate from Europe, had known freedom and a sense of individual responsibility going back to the Magna Carta. The government was restrained and only meant to wage wars to protect the economic interests of its subjects. Science and healthcare were not governmental tasks.

In large cities, especially in London with its surplus of patients, surgeons, doctors and hospitals, the concentration of surgical patients made it feasible for some general practitioners to make the administration of anaesthetics their livelihood. In order to distinguish themselves from the average administrator they called themselves ‘anaesthetists’. In fact they started a de novo specialty out of general practice. Their sphere was practice, not science. Beginning in 1890 these professional anaesthetists were appointed to hospitals and started to publish similar compact anaesthetic textbooks for students and general practitioners. In the process of specialization these professional anaesthetists should be considered the individual specialists of the first phase. This backdrop of hospitalization and specialization in large cities is in line with Rosen’s theory that urbanization and a



concentration of patients in hospitals is one of the prerequisites for medical specialization. The professional anaesthetists did not want to make the practical administration of anaesthetics their exclusive medical specialty. They wanted to be teachers, writers of anaesthetic books and inventors of anaesthetic apparatus bearing their names. They wanted to be special anaesthetists for special surgeons, special hospitals and special patients at special prices. The routine administration of anaesthetics by day and by night was done by general practitioners and, due to a lack of regulation, a motley collection of other people.

Assuming that this was the process by which the first professional anaesthetists emerged in Britain makes it challenging to explain why it did not happen in Germany at the same time. It is even more challenging because this study has shown that at around the turn of the century most technical developments in the administration of anaesthetics were the same in both countries. The oft-cited chloroform-ether difference between Britain and Germany has even been shown to be false. Two circumstances however were basically different and were decisive in the contrast in anaesthetic specialization between Britain and Germany.

First, German surgeons were indeed different from British surgeons. German surgeons became academic specialists beginning in the 18<sup>th</sup> century. Contrary to Britain German surgery and medicine had merged in the 18<sup>th</sup> century. The German universities, like all continental universities a heritage of the Holy Roman Empire, housed all medical specialties, including surgery, in their medical faculties. This role of the universities is in line with Weisz's theory that continental universities played an important role in the development of medical specialization. German surgeons, like all the other specialists, formed departments within university hospitals. Rooted deeply in a culture of primal and humoral medicine, German medicine and surgery took a holistic view of the human body. The patient could not be divided into a surgical part and a medical part. When anaesthesia entered this scene halfway through the 19<sup>th</sup> century it was given a place in the surgical department. In that way, from its introduction, the administration of anaesthetics was a part of the surgical specialty. Every German textbook of surgery contained complete chapters on the administration of anaesthetics. Every surgical resident, trainee or student was expected to be able to administer anaesthetics. In that sense anaesthesia was a general medical competence as it was in Britain, but under the wing of surgery, unlike in Britain where anaesthesia was born as a foundling.

Second, German hospitals were different from British hospitals. German hospitals, in accordance with the strict organization of German society and its ubiquitous government, were structured like the university hospitals with medical departments arranged by specialty, including doctors and specialists, in a hierarchical military structure. The difference can be clearly seen in the operation registers. In the London Hospital the operation registers were assigned to individual surgeons; at the Charité Krankenhaus they were assigned to surgical departments. In that structure anaesthesia was under the control of the surgeons. An administrator of anaesthetics detached from surgery was not necessary and was in fact unwanted. The patient could not be divided into a surgical

object and an anaesthetic object. The application of 'Rauschnarkose', flush anaesthesia, and the extensive use of local anaesthesia were typical manifestations of the commitment of German surgeons to anaesthesia. The surgeon weighed the pros and cons for the individual patient and the particular procedure needed, resulting in tailor-made anaesthesia. In this sense the wider use of local anaesthesia in Germany was a deliberate and positive choice by the surgeons and not imposed by the lack of anaesthetists. Notwithstanding the obvious relationship, the explanation 'no anaesthetists hence local anaesthesia' is not supported by this study. From the operation registers it is clear that local anaesthesia was used even when general anaesthesia, of every variety, was also on hand.

## 7.2. The second phase of anaesthetic specialization

In Britain the highly competitive wilderness of anaesthesia forced professional anaesthetists from the very beginning to distinguish themselves from occasional administrators. They had to make themselves recognizable. In order to do so they had begun organizing in 1893 with the founding of the Society of Anaesthetists, an exclusive group of professional anaesthetists who were limited in number. Illustrative of the disorder in the field around them was the campaign for legislation by Frederic Hewitt, one of the founders of the society, from 1908 to 1911. Meant to ensure that by law only trained medical personnel could administer anaesthetics, it failed because of well-organized opposition by a group of occasional administrators of anaesthetics.

Temporarily stagnated by the First World War, the second phase of specialization unfolded into the interwar years. Its manifestations were the *British Journal of Anaesthesia*, founded in 1923 as a scientific forum and eventually the Association of Anaesthetists founded in 1932 as an interest organization. All of these initiatives were meant to keep the administration of anaesthetics a medical occupation and to improve the status of the professional anaesthetists. After all, they were still not equal to the only specialties recognized in Britain, surgery and internal medicine. Their drive for recognition was enabled by the further mechanization of the administration of anaesthetics. The flourishing anaesthetic industry in the interwar years in Britain, with the abundant availability of rubber, played a leading role in this mechanization. Of these innovations the rubber endotracheal tube became the most easily identifiable trademark of the anaesthetist.

In Germany a second phase of anaesthetic specialization would be only temporarily in effect in the interwar years. The reason was that from the beginning anaesthesia was in safe hands inside the academic surgical specialty. Some surgeons demonstrated a special interest in anaesthesia. Individual surgeons designed anaesthetic apparatus and gave their name to them. In a way these surgeons functioned as first-phase specialists in anaesthesia. In contrast to the British anaesthetists their sphere was science, not practice. Gurlt, editor of *Archiv für Klinische Chirurgie* that had begun publication in 1861, performed the first

multi-centre long-term study on anaesthetic mortality in the 1890s. The Kuhn tube, the Roth-Dräger anaesthetic apparatus and especially Sauerbruch's underpressure cabinet were thorough experiments based on applied physiology. After the First World War pharmacological innovations like intravenous barbiturates originated in the German-speaking world. In the interwar years a group of German surgeons, pharmacologists and physiologists would draw attention to anaesthesia as a separate field of interest. Their scientific approach to anaesthesia led to a German congress on anaesthesia in 1928 and the first anaesthetic journal in the German-speaking world. The journal *Schmerz Narkose-Anästhesie* first appeared in 1929 and had a multidisciplinary and internationally composed editorial board; it was a brief glimpse of the second phase of specialization.

However, for German practice the embedment of anaesthesia in surgery had from the beginning offered an important advantage over specialization: maximum flexibility. That had meant that the demands on the German army medical services during the First World War, with a number of casualties that surpassed the imagination, could be met by allowing more doctors, medical students and eventually non-medical personnel to administer anaesthetics under the authority of the surgeon in the army and at home. At home the widespread employment of 'Narkoseschwester' was acceptable within the hierarchical structure of surgical departments. The price the German surgeons had to pay for this flexibility was simplicity. In the interbellum period this was not a significant problem because industrial support for the mechanized administration of anaesthetics had failed in Germany. The interwar financial and economic crisis hit German industry hard. In particular the banning of Germany from the rubber market caused a serious disadvantage for it. Eventually the Second World War would be a replay of the First World War. Simplicity, versatility and flexibility were the keywords for anaesthesia. The pleas for anaesthetic specialization were silenced and anaesthesia returned to a first phase specialty within an existing specialty, surgery.

### 7.3. The third phase of anaesthetic specialization

In Britain the transition to the third phase of specialization was marked by the advent of the Diploma in Anaesthetics in 1935. Although the diploma was created by the newly formed Association of Anaesthetists it was not meant to create more professional anaesthetists or to create an exclusive specialty. The goal was to offer recognition to occasional administrators of anaesthetics, especially to general practitioners. The Association of Anaesthetists itself was to remain a select club of anaesthetists, who had to have the Diploma in Anaesthetics, but who also had a teaching appointment to one or more hospitals. This balance between professional anaesthetists and occasional anaesthetists was disturbed by the run up to the Second World War. After the intense bombing of Guernica, Spain, in 1937 and considering the growing aggression of Nazi Germany the British government realized that the outdated structure of British hospitals, which

lacked an organized medical staff, would be unable to manage the mass casualties associated with air attacks on Britain. The answer was the creation of the Emergency Medical Service in 1939, taking specialists and anaesthetists into regular service. The possession of a Diploma in Anaesthetics was a recommendation for such an appointment. During the war the Emergency Medical Service and the Royal Army Medical Corps would provide attractive jobs for anaesthetists. These anaesthetists not only taught the administration of anaesthetics, they administered anaesthetics themselves.

The anaesthetists were an undisputed success in the services. Their tasks extended to perioperative care, including circulatory homeostasis. Directly after the war their success grew further with the introduction of intravenous muscular relaxants like curare. The patient would no longer press out his bowels, blocking the surgeon's view of the anatomy. But even simple procedures like fracture repositionings were facilitated by muscular relaxants in an unprecedented way. From that moment on, every patient had to have muscle relaxants, every patient had to have an anaesthetist. Muscle relaxation also had a remarkable impact on the administration of anaesthetics itself. In fact it brought all of the innovations of the last 20 years together. Muscle relaxants were intravenous agents, therefore intravenous access was needed. Muscle relaxants paralysed the respiration, hence endotracheal intubation and artificial mechanic ventilation were needed. All these interventions had more impact on the circulation, hence a careful control over the circulation was needed. Anaesthesia with muscle relaxation became a special anaesthesia and not only for special surgery. The administration of anaesthetics itself was now special enough to become a medical specialty. Textbooks were no longer written for students and general practitioners. The compact textbooks vanished and were replaced by new series of comprehensive books by Lee and Evans, written for anaesthetists.

The ultimate catalyst for the third phase of anaesthetic specialization in Britain was the advent of the National Health Service in 1948, which was shaped after the Emergency Medical Service. It meant a revolutionary reform of the medical staff in public hospitals and led to hospital departments with consultants, registrars, residents and trainees. These departments had a hierarchical structure, as in the army and in Germany. Anaesthesia too became organized in hospital departments. The anaesthetists, strongly encouraged, enabled and in fact even compelled by the British Royal College of Surgeons through its president Webb-Johnson, entered the ranks of specialists under the wings of the Faculty of Anaesthetists of the Royal College of Surgeons. The anaesthetist should be the physiologist of the operating theatre. Their training was upgraded to a five-year period. From that moment on the select and limited group of professional anaesthetists in Britain was surpassed by its own success. The Association of Anaesthetists changed from an exclusive club into an interest organization for a growing number of anaesthetists. It would take until 1992 for the anaesthetists to be granted their own Royal College of Anaesthetists, at a time when most specialties acquired their own college. The hegemony of the Royal College of Surgeons had ended.

In Germany, from 1949, a new generation of young doctors from surgical clinics saw the hole in the market and travelled abroad to study modern anaesthesia. In Britain they witnessed the comfortable position of the anaesthetists within the National Health Service. On their return to Germany they mastered endotracheal intubation, muscle relaxation and circulatory management. But they had also decided to start an anaesthetic specialty in Germany. The surgeons interested in anaesthesia, the first-phase specialists in anaesthesia, were replaced by a new generation of professional anaesthetists who were appointed to teaching posts. The year 1953 marked the second phase of anaesthetic specialization with the establishment of a society and a journal, now with only anaesthetists on the boards. The first certification for anaesthesia was given in the same year. By then, anaesthesia and its supporting industry had exploded in Germany, like a long-compressed spring. The supporting industry revived in the 'Wirtschaftswunder' with, among other things, plastic devices especially for intravenous access. At first the traditional surgeons tried to keep everything under one roof but in 1955 the president of the 'Deutsche Gesellschaft für Chirurgie' Bauer, reluctantly acknowledged the division of labour between surgery and anaesthesia. Like Webb-Johnson in Britain in 1947 he spoke about the anaesthetists as vital function managers. He had no choice: the internationalization of anaesthesia became a fact with the establishment of the World Federation of Societies of Anaesthesiologists in the same year in Scheveningen, the Netherlands, during the first World Congress of Anaesthesiologists.

In the absence of a radical change in remuneration like the National Health Service, the third phase of specialization deployed more slowly in Germany than it had in Britain. The actual detachment from surgery and the dispersion of modern anaesthetists did not take place until the anaesthetic staff was positioned and remunerated at the same level as the surgical staff. This did not happen until the anaesthetists' interest organization was founded in 1961 and the equality of surgeons and anaesthetists was agreed upon in 1964.

## 7.4. Epilogue

We have seen the evolution of the administration of anaesthetics into a medical specialty in two different ways. The contrast is deeply rooted in differing surgical and hospital traditions in Britain and Germany. British surgeons considered the administration of anaesthetics to be beneath their station. German surgeons considered the patient as a whole that could not be divided into a surgical and an anaesthetic part. Therefore in Britain, anaesthesia was embedded in general practice from the beginning; in Germany anaesthesia was embedded in the surgical specialty. In both countries there had always been an undercurrent of anaesthetic specialization. In Britain this movement was formed by a small and select group of professional anaesthetists. In Germany interested surgeons led the debate. Knowledge developments and new technologies, like the application of compressed gases, the mechanized administration of anaesthetics, intravenous anaes-

thetia, endotracheal intubation and muscle relaxation boosted this current from time to time but were never decisive factors in creating a real third-phase anaesthetic specialty. External circumstances like warfare, financial and raw material crises from time to time attenuated the debate. Knowledge, technology and industrial support in Britain and Germany were quite comparable apart from a period before and during the Second World War.

The moment of the irreversible transition towards a recognized medical specialty, equal to the traditional specialties, was closer in each case than expected. In fact in Britain it was in 1948 with the establishment of the Faculty of Anaesthetists of the Royal College of Surgeons. In Germany anaesthetic specialization evolved more gradually between 1953 and 1964. In Britain the decisive cause was a revolution outside the circle of anaesthetists; the National Health Service with specialists in regular service made it happen. In Germany a revolution of young doctors inside the surgical establishment was necessary to boost the anaesthetic specialty. After the example of Britain and in the sphere of the westernization of West German society these young surgeons saw the hole in the market and profited from the new techniques of muscle relaxation and endotracheal intubation. In both countries the acknowledgment by the surgeons of the expedience of a vital function manager or operation theatre physiologist and the attribution of this capacity to the anaesthetist at the head of the table was needed to confirm the anaesthetic specialty. This almost simultaneous definition of the content of the new specialty made the anaesthetist's tasks similar in both countries and in fact around the world.

Was anaesthesia ready in 1960? In fact it was. Its domain had been defined: to keep the patient comfortable during and after the surgical procedure, in other words to form a bridge over troubled water. Worldwide the new specialty was highly successful; its number of practitioners exceeded the numbers of traditional specialties. Not only the number of anaesthetists expanded: the specialty itself evolved further in the second half of the 20<sup>th</sup> century. New kinds of surgery involving very young to very old patients and involving hugely reconstructive to minimally invasive procedures would lead to new challenges for the administrator of anaesthetics. New techniques like electronic monitoring and long-term artificial ventilation, as well as a thorough understanding of pharmacology, intensive care and pain management would be developed or adopted by the specialty. At the turn of the 20<sup>th</sup> century, the extent of the domain of anaesthesia approached a critical point where new (sub)specialties begin to emerge. At this point the old question of whether a patient and his care can be divided even further surfaces once again. In the end history repeats itself.

# 8. Zusammenfassung und Schlussfolgerung

Der Anästhesist 1890-1960

Eine historische vergleichende Untersuchung zwischen Britannien und Deutschland

‘Anästhesisten, sein oder nicht sein. Das war die Frage.’

Eine der bemerkenswertesten medizinischen Entwicklungen der westlichen Welt während der zweiten Hälfte des 19. Jahrhunderts war die ärztliche Spezialisierung. Bis dahin hatte es lediglich Ärzte, Chirurgen oder Geburtshelfer gegeben. Seit 1850 sprossen spezielle Verzweigungen vom medizinischen Stammbaum. Die meisten von ihnen existieren noch heute und versorgen die medizinische Welt mit Internisten, Augenärzten, Pädiatern, Psychiatern, Hals-Nasen-Ohren-Ärzte, Radiologen und zahlreichen weiteren. Jede Fachrichtung hat seine eigene Geschichte.

Britannien war um 1885 das erste westeuropäische Land mit Ärzten, die das Verabreichen von Anästhetika zu ihrem Lebensunterhalt machten und sich selbst Anästhesisten nannten. Deutschland war 1953 eines der letzten Länder. Dieser bemerkenswerte Unterschied wurde für andere Fachrichtungen nicht beobachtet und war der Ausgangspunkt der vorliegenden historischen Dissertation. Im Kontrast zur bestehenden Geschichtsschreibung über dieses Thema soll die primäre Frage nicht lauten, warum die anästhesiologische Spezialisierung in Deutschland verzögert wurde, sondern warum sie in Britannien anfang. Um dieser Frage nachzugehen wurden die Umstände aus den unterschiedlichsten Blickwinkeln studiert. Berücksichtigt wurden insbesondere die interkollegialen Beziehungen in Operationssälen und Krankenhäusern, die Rolle der unterstützenden anästhesiologischen Industrie, die Wissensentwicklung auf dem Gebiet der Anästhesietechniken, ökonomische und politische Einflüsse, die jeweilige Gesetzgebung und letztendlich der Einfluss des ersten und zweiten Weltkrieges. Medizinhistoriker, die wie Rosen und Weisz als Experten auf dem Gebiet der Facharztspezialisierung gelten, zeigen, dass sich medizinische Spezialisierungen in Phasen entwickeln. In Analogie hat der Autor der vorliegenden Schrift drei aufeinanderfolgende Phasen definiert. Die erste Phase beschreibt die Entwicklung des individuellen Spezialisten, der an einem Teilgebiet

der Medizin interessiert ist. Die zweite Phase befasst sich mit der Gruppierung dieser individuellen Spezialisten in wissenschaftlichen Gesellschaften und der Herausgabe von Fachzeitschriften. Die dritte Phase wird markiert durch Weiterbildungsprogramme, Prüfungen, Zertifikate und letztendlich der Abgrenzung eines Teilgebietes der Medizin.

### 8.1. Die erste Phase der Spezialisierung für Anästhesie

Um zu verstehen, warum einige britische Ärzte am Ende des 19. Jahrhunderts sich selbst zu diesem Zeitpunkt und an diesem Ort als Anästhesisten bezeichneten, muss man sich die chirurgische Welt und Krankhauslandschaft in Britannien vor Augen halten. Zu jener Zeit war die britische Chirurgie eine Welt für sich. Die britische Chirurgie war im 18. Jahrhundert noch nicht mit der Medizin fusioniert, wie es auf dem europäischen Kontinent bereits geschehen war. Chirurgen bezeichneten sich selbst nicht als Ärzte, sondern hielten ihren ursprünglichen Titel 'Mister' in Ehren und sahen sich selbst an der Spitze der medizinischen Rangordnung. Sie waren in der Tat ausgesprochen angesehen und passten gut zum britischen mechanistischen Weltbild des menschlichen Körpers vor dem Hintergrund der stürmischen industriellen Revolution. Die Chirurgen demonstrierten gleichwohl die Manipulierbarkeit der menschlichen Maschine. Sie hatten ihre eigene königliche Akademie für Chirurgie, ähnlich wie die Internisten ihre königliche Akademie für Innere Medizin hatten. Da Chirurgen alles bis auf Schneiden, Kautern und Nähen unterhalb ihres Standards betrachteten, waren sie auch nicht kommittiert, selbst Anästhetika zu verabreichen. Ein anderer musste es tun. Zu jener Zeit, als die meisten Eingriffe im Hause des Patienten oder des Chirurgen stattfanden, wurde üblicherweise der Allgemeinarzt des Patienten oder, noch niedriger in der medizinischen Rangordnung, ein Zahnarzt mit der Verabreichung von Narkotika beauftragt.

Gegen Ende des 19. Jahrhunderts veränderte sich die Chirurgie. Ihre Komplexität nahm durch die Einführung von Antisepsis, Anästhesie und perioperativer Medizin zu. Anästhesie war kein Luxus mehr, sondern wurde für die moderne Chirurgie unverzichtbar. Zusätzliche Einrichtungen und hygienische Bedingungen, Sterilisatoren und komprimierte Gase für Anästhesie wurden nötig, um zu operieren. Die chirurgische und anästhesiologische Ausrüstung wurde weniger beweglich. Diese Veränderung bewegte die Chirurgie in Richtung moderner Krankenhäuser mit Operationssälen und Pflegestationen. Hier wurde die Arbeitsteilung zwischen Chirurgie und Anästhesie im Prinzip fortgesetzt. Britische Krankenhäuser waren damals ein Schmelztiegel von Allgemeinärzten, Internisten und Chirurgen. Ärzte und Spezialisten arbeiteten unabhängig vom Krankenhaus und unabhängig von einander. Die meisten Krankenhäuser waren somit offene Marktplätze, den jeder Doktor betreten konnte, um seine Kunst auszuüben. Britische Krankenhäuser wurden getragen durch Wohlfahrtsverbände, Kirchen und private Unternehmen; Universitätskliniken waren eine Seltenheit. Britannien, geographisch abgetrennt von Europa, kannte die Freiheit und Eigenverantwortlichkeit ihrer Bürgern seit der Magna Carta. Die Regierung hielt sich weitgehend zurück und be-



schränkte sich auf Kriegsführung zur Wahrung ökonomischer Interessen. Wissenschaft und Gesundheitsfürsorge waren keine staatlichen Aufgaben.

In großen Städten, insbesondere in London, mit einem Überangebot an Patienten, Chirurgen, Ärzten und Krankenhäusern, konnten einige Allgemeinärzte die Verabreichung von Anästhetika zu ihrer Existenzgrundlage machen. Um sich vom durchschnittlichen Verabreicher zu unterscheiden nannten sie sich 'Anästhesisten'. Im Grunde initiierten sie damit eine neue Fachrichtung aus der Allgemeinmedizin. Ihr Interessensbereich war primär die Praxis, nicht die Wissenschaft. Ab dem Jahre 1890 wurden diese professionellen Anästhesisten an Krankenhäusern beschäftigt und fingen an, kompakte Anästhesielehrbücher für Studenten und Allgemeinärzte zu publizieren. Im Prozess der ärztlichen Spezialisierung konnten diese professionellen Anästhesisten als die individuellen Spezialisten der ersten Phase betrachtet werden. Die Landschaft der Hospitalisierung und Spezialisierung in großen Städten stimmt mit der Theorie von Rosen überein, dass Urbanisierung und Konzentration von Patienten in Krankenhäusern eine Voraussetzung für medizinische Spezialisierung war. Die professionellen Anästhesisten wollten die praktische Verabreichung jedoch nicht ihre exklusive Spezialität sein lassen. Sie wollten Lehrer sein, Herausgeber von Lehrbüchern und Erfinder von Anästhesieapparaten, die ihren Namen trugen und sie damit bekanntmachten. Sie wollten besondere Anästhesisten für besondere Chirurgen sein, für spezielle Krankenhäuser und für spezielle Patienten zu einem besonderen Preis. Die routinemäßige alltägliche und -nächtliche Verabreichung von Anästhetika wurde weiterhin mangels Regelung durch Allgemeinärzte und einer buntgemischten Ansammlung anderer Leute durchgeführt.

Unter der Annahme, dass dies der Entwicklungsprozess war, aus dem die ersten professionellen Anästhesisten in Britannien hervorgingen, ist es interessant zu erklären, warum dies nicht in Deutschland zur selben Zeit passierte. Dies ist insbesondere vor dem Hintergrund faszinierend, dass zur Jahrhundertwende die meisten technischen Entwicklungen in Hinblick auf die Verabreichung von Anästhetika in beiden Ländern vergleichbar vorhanden waren. Der vielfältig zitierte Chloroform-Ether-Unterschied stellte sich als falsch heraus. Einzig die Allgemeinumstände waren grundsätzlich verschieden und daher ausschlaggebend für den Gegensatz in der anästhesiologischen Spezialisierung zwischen Britannien und Deutschland.

Erstens, deutsche Chirurgen unterschieden sich wesentlich von britischen Chirurgen. Deutsche Chirurgen waren bereits im 18. Jahrhundert akademische Spezialisten. Im Gegensatz zur Entwicklung in Britannien hatten sich die deutsche Chirurgie und Medizin bereits im 18. Jahrhundert zusammengeschlossen. Die deutschen Universitäten, wie alle kontinentalen Universitäten ein Erbe des Römischen Reiches, nahmen alle medizinischen Fachrichtungen einschließlich der Chirurgie in ihre medizinischen Fakultäten auf. Diese Rolle der Universitäten stimmt mit der Theorie von Weisz überein, dass die kontinentalen Universitäten eine wichtige Rolle in der medizinischen Spezialisierung gespielt haben. Deutsche Chirurgen gründeten Abteilungen innerhalb von Universitätskliniken ebenso wie alle anderen Fachrichtungen. Tief verwurzelt in einer Kultur von

ursprünglicher ‚humoraler‘ Medizin kannten die deutsche Medizin und Chirurgie eine mehr ganzheitliche Betrachtungsweise des menschlichen Körpers. Der Patient wurde nicht in einen chirurgischen und medizinischen Teil unterteilt. Als die junge Anästhesie diese Bühne in der Mitte des 19. Jahrhunderts betrat, wurde sie unter die Führung der chirurgischen Abteilungen gestellt. Somit war die Verabreichung von Anästhetika seit ihrer Einführung eine Aufgabe der chirurgischen Fachrichtung. Jedes deutsche Lehrbuch für Chirurgie enthielt umfangreiche Kapitel über die Verabreichung von Anaesthetie. Von jedem chirurgischen Assistenten, Lehrling oder Student wurde erwartet, dass er in der Lage ist, um Anästhesie zu geben. Somit gab es vergleichbar mit Britannien zwar eine allgemeine medizinische Kompetenz, allerdings unter den Flügeln der Chirurgie. Diese Entwicklung war im deutlichen Gegensatz zur Entwicklung in Britannien, wo die Anästhesie gleichsam als Findelkind geboren wurde.

Zweitens, deutsche Krankenhäuser unterschieden sich grundsätzlich von britischen Krankenhäusern. Deutsche Krankenhäuser kannten in Übereinstimmung mit der strikten Organisation der deutschen Gesellschaft mit ihrer allgegenwärtigen Regierung eine ähnliche Struktur wie die Universitätskrankenhäuser. Diese hatten eigene medizinische Fachabteilungen einschließlich Ärzte und Spezialisten in einer hierarchischen militärischen Struktur. Dieser Unterschied ist deutlich in den Operationsbüchern dokumentiert. Während im Londoner Krankenhaus die Operationsregister einzelnen Chirurgen zugeordnet wurden, wurden sie in der Charité den chirurgischen Abteilungen zugeordnet. Auch in dieser Struktur war die Anästhesie unter der Kontrolle der Chirurgen. Ein Verabreicher von Anästhetika losgelöst von der Chirurgie war weder nötig und noch erwünscht. Der Patient sollte nicht in ein chirurgisches und anästhetisches Objekt unterteilt werden. Das Verabreichen einer ‚Rauschnarkose‘ und der ausgedehnte Gebrauch von Lokalanästhetika waren typische Manifestationen des Engagements deutscher Chirurgen mit der Anästhesie. Der Chirurg wog die Vor- und Nachteile dieser Verfahren für den jeweiligen Patienten mit seiner Krankheit ab, was zu einer maßgeschneiderten Anästhesie führte. In dieser Hinsicht war der weitverbreitete Gebrauch von Lokalanästhetika in Deutschland eine bewusste und positive Wahl der Chirurgen und nicht erzwungen durch einen Mangel an Anästhesisten. Abweichend vom häufig gehörten Statement ‚kein Anästhesist, also Lokalanästhesie‘ wird diese Kausalität in der vorliegenden Studie nicht unterstützt. Aus den Operationsregistern geht deutlich hervor, dass Lokalanästhesie auch dann angewandt wurde, wenn andere Formen der Anästhesie verfügbar waren.

## 8.2. Die zweite Phase der Spezialisierung für Anästhesie

In Britannien zwang die weitverbreitete Ödnis innerhalb der Anästhesie die professionellen Anästhesisten, sich sofort ab Beginn von den ‚Gelegenheitsverabreichern‘ zu unterscheiden. Sie mussten sich also erkennbar machen. Vor diesem Hintergrund haben sie sich bereits im Jahre 1893 organisiert und eine Gesellschaft für Anästhesisten ge-

gründet, eine exklusive und zahlenmäßig limitierte Gruppe professioneller Anästhesisten. Illustrativ für die Unordnung auf dem sie umgebenden Feld war der Kreuzzug für eine gesetzliche Grundlage von einem der Gründer der Gesellschaft, Frederic Hewitt von 1908 bis 1911. Das Ziel einer gesetzlichen Regelung, dass nur medizinisch geschultes Personal Anästhesie verabreichen darf, scheiterte an einer gut organisierten Opposition von Gelegenheitsverabreichern von Anästhesie.

Vorübergehend unterbrochen durch den Ersten Weltkrieg entwickelte sich die zweite Phase der Spezialisierung in den Jahren zwischen den Kriegen. Manifestationen waren die Gründung der *British Journal of Anaesthesia* im Jahre 1923 als wissenschaftliches Forum und schliesslich die Gründung einer Gesellschaft für Anästhesie als Interessenorganisation im Jahre 1932. All diese Initiativen beabsichtigten, die Verabreichung von Anästhesie als medizinische Profession zu erhalten und den Status von professionellen Anästhesisten zu verbessern. Nach wie vor waren sie immer noch nicht gleichwertig mit den einzigen anerkannten britischen Fachrichtungen, nämlich der Chirurgie und Inneren Medizin. Ihr Streben nach Anerkennung wurde durch eine weitgehende Mechanisierung der Verabreichung von Anästhetika unterstützt. Die florierende Anästhesieindustrie in Britannien in den Jahren zwischen den Kriegen mit der reichlichen Verfügbarkeit von Gummi spielte eine führende Rolle in dieser Mechanisierung der Verabreichung von Anästhetika. Von diesen Innovationen war der endotracheale Gummitubus der bedeutendste Meilenstein der Anästhesie.

In Deutschland war die zweite Phase der anästhesiologischen Spezialisierung lediglich vorübergehend in den Jahren zwischen den Kriegen nachweisbar. Der Grund war, dass von Anfang an die Anästhesie in sicheren Händen innerhalb der akademischen chirurgischen Fachrichtung war. Einige Chirurgen entwickelten ein besonderes Interesse an der Anästhesie. Einige entwickelten Anästhesieapparate und gaben diesen ihren Namen. Gewissermassen fungierten diese Chirurgen als Spezialisten der ersten Phase in der Anästhesie. Im Gegensatz zu den britischen Anästhesisten war ihre Sphäre die Wissenschaft, nicht die Praxis. Gurlt, der Herausgeber des *Archiv für klinische Chirurgie*, das zum seit dem Jahre 1861 erschien, führte die erste multizentrische Langzeitstudie zur anästhesiebedingten Sterblichkeit in den neunziger Jahren des 19. Jahrhunderts durch. Der Kuhn-Tubus, der Roth-Dräger-Anästhesieapparat und insbesondere Sauerbruchs Unterdruckkammer waren wohldurchdachte Experimente basiert auf angewandter Physiologie. Nach dem ersten Weltkrieg wurden pharmakologische Innovationen wie intravenöse Barbiturate in der deutschsprachigen Welt entwickelt. In den Jahren zwischen den Kriegen machten eine Gruppe von deutschen Chirurgen, Pharmakologen und Physiologen auf die Anästhesie als ein selbständiges Interessensgebiet aufmerksam. Ihre wissenschaftliche Betrachtungsweise der Anästhesie resultierte in einem deutschen Anästhesiekongress im Jahre 1928 und dem ersten Anästhesiejournal in der deutschsprachigen Welt. Die Zeitschrift *Schmerz-Narkose-Anästhesie* erschien seit dem Jahre 1929 unter multidisziplinärer und internationaler Herausgeberschaft. Es war ein Hauch von einer zweiten Phase-Spezialisierung.

Dennoch hatte für die deutsche Praxis die Einbettung der Anästhesie in die Chirurgie einen entscheidenden Vorteil gegenüber der Spezialisierung: maximale Flexibilität. Nur in dieser Art und Weise waren die Anforderungen an die deutschen Medizindienste der Armee während des ersten Weltkrieges, mit seinen unzähligen Opfern, die jegliche Vorstellungskraft überstiegen, überhaupt zu erfüllen. Man gestattete Ärzten, Medizinstudenten und schließlich auch nicht-medizinischem Personal unter der Verantwortlichkeit der Chirurgen Anästhesie zu verabreichen, und zwar sowohl in der Armee als auch zu Hause. In den Heimatkrankenhäusern war die weitverbreitete Anstellung von Narkoseschwestern innerhalb der hierarchischen Strukturen der chirurgischen Abteilungen tragbar. Der Preis, den die deutschen Chirurgen für diese Flexibilität bezahlen mussten war die Simplizität. In den Jahren zwischen den Kriegen war dies kein größeres Problem, da für die automatisierte Verabreichung von Anästhesie die industrielle Unterstützung in Deutschland fehlte. Die finanzielle und ökonomische Krise traf die Deutsche Industrie besonders hart in diesen Jahren. Insbesondere der Ausschluss Deutschlands vom Gummimarkt verursachte einen ernsten Rückstand. Simplizität, Vielseitigkeit und Flexibilität waren die Schlüsselprinzipien. Die Plädoyers für die anästhesiologische Spezialisierung mit ihrem Gipfel in 1928 verstummten und die Anästhesie kehrte zurück zur einer Ersthilfs-Fachrichtung innerhalb einer bestehenden Fachrichtung, nämlich der Chirurgie.

### 8.3. Die dritte Phase der Spezialisierung für Anästhesie

In Britannien war der Übergang zur dritten Phase der Spezialisierung gekennzeichnet durch das Diplom in Anaesthesia im Jahre 1935. Obwohl das Diplom durch die junge Gesellschaft von Anästhesisten eingeführt wurde, war nicht beabsichtigt, mehr professionelle Anästhesisten auszubilden oder eine größere Fachrichtung zu etablieren. Das Ziel war einzig, einigen Gelegenheitsverabreichern von Anästhesie eine halbwegs anerkanntes Zertifikat zukommen zu lassen. Die Vereinigung von Anästhesisten selbst blieb ein elitärer Club von Anästhesisten, die sowohl das Diplom in Anaesthesia haben mussten, als auch einen Lehrauftrag in einem oder mehreren Krankenhäusern. Das Gleichgewicht zwischen professionellen Anästhesisten und Gelegenheitsanästhesisten wurde durch den Ausbruch des zweiten Weltkrieges zerstört. Nach der intensiven Bombardierung von Guernica in Spanien im Jahre 1937 und angesichts der wachsenden Aggression von Nazideutschland realisierte sich die britische Regierung, dass die veralteten Strukturen der britischen Krankenhäuser ohne organisierten ärztlichen Dienst nicht in der Lage sein würden, um den Massenansturm an Verletzten bei den Luftangriffen auf Britannien zu versorgen. Die Antwort war die Einrichtung des Emergency Medical Service im Jahre 1939, der Spezialisten und Anästhesisten in festen Dienst anstellte. Der Besitz eines Diploms in Anästhesie war eine Empfehlung für eine derartige Position. Während des Krieges boten der Emergency Medical Service und der Royal Army Medical Corps attraktive Positionen für Anästhesisten. Diese Anästhesisten unterrichteten nicht nur die Verabreichung von Anästhetika, sondern verabreichten sie auch selber.

Die Anästhesisten waren ein unbestrittener Erfolg des Dienstes. Ihre Zuständigkeit wurde Richtung perioperativer Medizin einschließlich Kreislaufstabilisierung ausgedehnt. Unmittelbar nach dem Krieg nahm ihr Erfolg noch weiter zu mit der Einführung von intravenösen Muskelrelaxantien wie Curare. Der Patient presste nicht mehr seine Därme aus seinem Bauch, wobei er die Sicht des Chirurgen auf die Anatomie blockierte. Auch einfache Eingriffe wie die Repositionen eines Bruches wurden in einer unerwarteten Weise durch Muskelrelaxantien erleichtert. Von diesem Moment an mussten alle Patienten relaxiert werden, jeder Patient benötigte einen Anästhesisten. Auch für die Verabreichung von Anästhetika selber hatte die Muskelrelaxation einen bemerkenswerten Einfluss. Im Prinzip wurden alle Innovationen der vorangegangenen 20 Jahre zusammengebracht. Muskelrelaxantien waren intravenöse Mittel; daher wurde ein intravenöser Zugang benötigt. Muskelrelaxantien lähmten die Atmung; daher wurde eine endotracheale Intubation und künstliche mechanische Beatmung erforderlich. All diese Neuerungen hatten deutlichen Effekt auf den Kreislauf. Infolgedessen wurde eine sorgfältige Kreislaufüberwachung erforderlich. Anästhesie mit Muskelrelaxation wurde eine besondere Anästhesieform nicht nur für spezielle Operationen. Die Verabreichung von Anästhetika wurde jetzt komplex genug, um eine eigene Fachrichtung zu gründen. Die Lehrbücher wurden nicht mehr für Studenten und Allgemeinärzte geschrieben. Kurzlehrbücher verschwanden und wurden ersetzt durch neue Ausgaben von umfangreichen Lehrbüchern wie von Lee und Evans, die primär für Anästhesisten geschrieben waren.

Der endgültige Katalysator für die dritte Phase der anästhesiologischen Spezialisierung in Britannien war die Einführung des National Health Service im Jahre 1948, der nach dem Vorbild des Emergency Medical Service gegründet wurde. Er stellte eine revolutionäre Reform des ärztlichen Dienstes in öffentlichen Krankenhäusern dar und resultierte in Krankenhausabteilungen mit Consultants, Registrars, Residents und Trainees. Diese Abteilungen kannten eine hierarchische Struktur, vergleichbar mit der Armee und ähnlich wie in Deutschland. Auch Anästhesieabteilungen wurden in Krankenhäusern gegründet. Die Anästhesisten, gestärkt und unterstützt und sogar gezwungen durch die Royal College of Surgeons in der Person seines Präsidenten Webb-Johnson, betrat die Ränge der Spezialisten unter den Flügeln der Faculty of Anaesthetists of the Royal College of Surgeons. Der Anästhesist sollte der Physiologe des Operationssaals werden. Ihre Ausbildung wurde auf 5 Jahre ausgedehnt. In diesem Augenblick wurde die ausgewählte und limitierte Gruppe professioneller Anästhesisten in Britannien von ihrem eigenen Erfolg eingeholt. Die Vereinigung von Anästhesisten entwickelte sich von einem exklusiven Klub zu einer Interessenvertretung für eine wachsende Anzahl von Anästhesisten. Schließlich sollte es noch bis 1992 dauern bis die Anästhesisten ihre eigenes Royal College of Anaesthetists erhielten zu einem Zeitpunkt zu dem die meisten Fachrichtungen ihr eigenes College erwarben. Die Vormachtstellung des Royal College of Surgeons war hiermit endgültig vorbei.

In Deutschland erkannte seit dem Jahre 1949 eine neue Generation junger Ärzte aus chirurgischen Kliniken die Marktlücke und reiste ins Ausland, um dort die moderne Anästhesie zu erlernen. In Britannien wurden sie Zeugen von der komfortablen Position der Anästhesisten innerhalb des National Health Service. Nach ihrer Rückkehr nach Deutschland beherrschten sie die endotracheale Intubation, die Muskelrelaxierung und das Kreislaufmonitoring. Auch waren sie entschlossen eine anästhesiologische Spezialisierung in Deutschland zu beginnen. Die anästhesiologisch interessierten Chirurgen der ersten Phase wurden ersetzt durch eine neue Generation professioneller Anästhesisten, die auf Lehrpositionen berufen wurden. Das Jahr 1953 markierte die zweite Phase der anästhesiologischen Spezialisierung mit der Gründung einer Gesellschaft und einer Zeitschrift mit ausschließlich Anästhesisten im Beirat. Das erste Zertifikat für Anästhesie wurde bereits im selben Jahr verliehen. Zu dieser Zeit dehnten sich die Anästhesie und ihre unterstützende Industrie aus wie eine lange zusammengedrückte Feder. Die Anästhesie-unterstützende Industrie lebte wieder auf während des Wirtschaftswunders mit unter anderem Plastikhilfsmittel speziell für den intravenösen Zugang. Am Anfang probierten die traditionellen Chirurgen alles unter ihrem Dach zu halten, aber im Jahre 1955 verkündete der Präsident der Deutschen Gesellschaft für Chirurgie widerstrebend die Arbeitsteilung zwischen Chirurgie und Anästhesie. Ebenso wie Webb-Johnson in Britannien im Jahre 1947 sprach er über die Anästhesisten als Manager der vitalen Funktionen. Er hatte keine andere Wahl, die Internationalisierung der Anästhesie war im selben Jahr eine Tatsache geworden seit der Gründung der World Federation of Societies of Anaesthesiologists in Scheveningen, Niederlande, während des ersten Weltkongresses für Anästhesie.

Da eine tiefgreifende Veränderung der Vergütung wie im National Health Service ausblieb, entfaltete sich die dritte Phase der Spezialisierung in Deutschland langsamer als in Britannien. Die tatsächliche Loslösung von der Chirurgie und die Verbreitung moderner Anästhesisten fanden nicht statt bis Anästhesisten die gleiche Position und Bezahlung erhielten wie ihre chirurgischen Kollegen. Es dauerte noch bis ins Jahre 1961, bis eine rein anästhesiologische Interessensorganisation gegründet wurde. Erst im Jahre 1964 wurden gleiche Rechte für Chirurgen und Anästhesisten vereinbart.

#### 8.4. Epilog

Wir haben die Entwicklung der Verabreichung von Anästhetika in eine medizinische Fachrichtung in zwei unterschiedlichen Weisen gesehen. Der Kontrast war bedingt durch die unterschiedliche chirurgische Krankenhaustradition in Britannien im Vergleich zu Deutschland. Die britischen Chirurgen betrachteten das Verabreichen von Anästhetika als nicht standesgemäß. Deutsche Chirurgen hingegen betrachteten den Patienten als eine Einheit, die nicht in einen chirurgischen und anästhesiologischen Teil getrennt werden konnte. Daher war in Britannien die Anästhesie von Beginn an in der Allgemeinmedizin eingebettet, während in Deutschland die Anästhesie in der

Chirurgie eingebettet war. In beiden Ländern hatte es immer eine Unterströmung anästhesiologischer Spezialisierung gegeben. In Britannien wurde diese Bewegung durch eine kleine und ausgewählte Gruppe professioneller Anästhesisten getragen, während in Deutschland die Diskussion durch interessierte Chirurgen geführt wurde. Die Entwicklung von neuem Wissen und Technologien, wie die Verabreichung komprimierter Gase, die mechanische Applikation von Anästhetika, die intravenöse Anästhesie, die endotracheale Intubation und die Muskelrelaxation, gab dieser Bewegung neuen Schwung, war aber niemals ausschlaggebend für eine wirkliche dritte Phase der Anästhesiespezialisierung. Äußere Einflüsse wie Krieg, Geld oder Rohstoffkrisen dämpften die Debatte von Zeit zu Zeit. Der Wissensstand und die technische und industrielle Unterstützung waren in Britannien und Deutschland vergleichbar, abgesehen von einer Periode vor und während des zweiten Weltkrieges.

Der Moment der irreversiblen Überführung in eine anerkannte medizinische Fachrichtung, vergleichbar mit den traditionellen Spezialisierungen, lag in Britannien und Deutschland nicht weit auseinander. Tatsächlich war es in Britannien das Jahr 1948 mit der Gründung der Faculty of Anaesthetists of the Royal College of Surgeons. In Deutschland entwickelte sich die anästhesiologische Spezialisierung schrittweise zwischen 1953 und 1964. In Britannien war der entscheidende Anlass eine Revolution außerhalb des Kreises der Anästhesisten, nämlich die Einführung des National Health Service mit Anstellung von Spezialisten im regulären Dienst. In Deutschland war eine Revolution junger Ärzte innerhalb des chirurgischen Establishments erforderlich, um die anästhesiologische Spezialisierung voranzutreiben. Nach dem britischen Beispiel und einer Atmosphäre der Verwestlichung der westdeutschen Gesellschaft sahen junge chirurgische Ärzte die Marktlücke und profitierten von den neuen Techniken der Muskelrelaxierung und endotrachealen Intubation. In beiden Ländern erfolgte die Anerkennung durch die Chirurgen aufgrund der Zweckdienlichkeit eines Managers für die vitalen Funktionen oder eines Physiologen für den Operationsraum. Diese Fähigkeit wurde den Anästhesisten am Kopfende des Tisches zugeschrieben und war Voraussetzung für die Besiegelung der anästhesiologischen Spezialisierung. Diese nahezu identische Definition des Inhaltes der neuen Fachrichtung machten die Aufgaben der Anästhesisten in beiden Ländern und im Grunde rund um den Globus vergleichbar.

War die Anästhesie im Jahre 1963 fertig entwickelt? Im Grunde genommen ja. Ihr Arbeitsgebiet war definiert: Es galt, den Patienten zu beschützen während und nach einem chirurgischen Eingriff wie eine Brücke über aufgewühltes Wasser. Die neue Fachrichtung war weltweit ausgesprochen erfolgreich, die Anzahl ihrer Mitglieder übertraf die Anzahl der Mitglieder der traditionellen Spezialisten. Es nahm aber nicht nur die Anzahl der Anästhesisten zu, auch die Fachrichtung entwickelte sich rasant weiter, insbesondere in der zweiten Hälfte des zwanzigsten Jahrhunderts. Neue Formen operativer Eingriffe bei sehr jungen oder sehr alten Patienten, von großen rekonstruktiven bis minimal invasiven Prozeduren führten zu neuen Herausforderungen für die Anästhesie. Neue Techniken wie elektronisches Monitoring und Langzeitbeatmung, eine tiefgehendes Verständnis der Pharmakologie, Intensivmedizin und Schmerztherapie wurden entwickelt

oder adoptiert. Am Ende des zwanzigsten Jahrhunderts erreichte die Ausdehnung des anästhesiologischen Fachgebietes kritische Grenzen, sodass neue (Unter-)Spezialisierungen entstanden. An dieser Stelle taucht wieder die alte Frage auf, ob ein Patient und seine Versorgung in noch mehr Teile geteilt werden kann. Am Ende wiederholt sich die Geschichte selbst.



## 9. Samenvatting en conclusie

De Anesthesist 1890-1960

Een geschiedkundig vergelijkend onderzoek tussen Engeland en Duitsland

‘Anesthesisten, zijn of niet zijn. Dat was de vraag.’

Eén van de opvallende medische ontwikkelingen in de tweede helft van de 19<sup>e</sup> eeuw in de westerse wereld was de medische specialisatie. Tot die tijd bestonden er alleen internisten, chirurgen en obstetrici. Vanaf 1850 ontsproten er speciale takken uit de stamboom van de geneeskunde. De meeste bestaan tot op de dag van vandaag en voorzien de medische wereld van internisten, oogartsen, kinderartsen, psychiaters, KNO artsen, radiologen en nog veel meer. Ieder specialisme kent zijn eigen geschiedenis.

Engeland was rond 1885 het eerste Westeuropese land dat artsen kende die van de toediening van anesthesie hun dagelijks werk hadden gemaakt en zichzelf anesthesist noemden. In 1953 was Duitsland één van de laatste landen waar dit gebeurde. Dat opmerkelijke contrast, onbekend van andere specialismen, was het uitgangspunt van dit onderzoek. In tegenstelling tot de bestaande historiografie over dit onderwerp zou de onderzoeksvraag niet primair zijn waarom specialisatie in anesthesie vertraagd was in Duitsland, maar waarom het begon in Engeland. Om een antwoord op deze vraag te vinden werden de omstandigheden vanuit meerdere invalshoeken beschouwd. Deze omvatten de verhoudingen in de operatiekamer en de ziekenhuizen, de anesthesie ondersteunende industrie, de kennisontwikkeling met betrekking tot anesthesietechnieken, economische en politieke invloeden, regelgeving en tenslotte oorlogsomstandigheden.

Omdat medisch historici die gespecialiseerd zijn in medische specialisatie zoals Rosen en Weisz hebben benadrukt dat medische specialisatie zich in fasen ontwikkelt, heeft de auteur van dit boek drie cumulatieve fasen gedefinieerd. De eerste fase is de fase van de individuele specialist, geïnteresseerd in een bepaald gebied van de geneeskunde. De tweede fase is de fase waarin groepen individuele specialisten zich organiseren in wetenschappelijke verenigingen en redacties van tijdschriften; het is de overgangsfase van specialist naar

specialisme. De derde fase wordt gemarkeerd door de instelling van opleidingsprogramma's, examens, certificering en uiteindelijk een exclusief domein binnen de geneeskunde.

## 9.1. De eerste fase van specialisatie in anesthesie

Om te kunnen begrijpen waarom sommige Engelse artsen aan het eind van de 19<sup>e</sup> eeuw zichzelf anesthesist noemden op dat moment en op die plaats, moet men zich de chirurgische en ziekenhuis wereld in Engeland voorstellen. Toentertijd was de Engelse chirurgie een wereld apart. De Engelse chirurgie was niet opgegaan in de geneeskunde in de 18<sup>e</sup> eeuw zoals dat was gebeurd op het Europese Continent. Chirurgen noemden zich geen dokter, maar koesterden hun titel 'Mister'. Chirurgen stonden aan de top van de medische ladder. Chirurgen stonden hoog in achting en pasten goed in de Engelse mechanistische benadering van het menselijk lichaam als gevolg van de stormachtige industriële revolutie. De chirurgen belichaamden de maakbaarheid van de menselijke machine. De chirurgen hadden hun eigen Royal College of Surgeons zoals de internisten hun Royal College of Physicians hadden. Omdat de chirurgen alles buiten hun snijden, dichtbranden en hechten beneden hun waardigheid achtten, beschouwden zij het niet als hun taak om zelf anesthesie te geven; iemand anders moest dat doen. In een tijd waarin de meeste chirurgie bij de patiënt of chirurg thuis gebeurde, werd meestal de huisarts van de patiënt of nog lager in de medische ladder een tandarts belast met de toediening van anesthesie.

Tegen het eind van de 19<sup>e</sup> eeuw veranderde de chirurgie. De complexiteit nam toe ten gevolge van antisepsis, anesthesie en perioperatieve zorg; anesthesie was geen luxe meer maar werd onmisbaar voor moderne chirurgie. Meer faciliteiten zoals hygiënische omstandigheden, sterilisatoren en samengeperste gassen voor anesthesie waren nodig om chirurgie te kunnen bedrijven. Deze verandering verplaatste de chirurgie richting moderne ziekenhuizen met operatiekamers en verpleegafdelingen. De arbeidsdeling tussen chirurgie en anesthesie kon in principe gehandhaafd blijven omdat Engelse ziekenhuizen een smeltkroes van privé-praktijken van huisartsen, internisten en chirurgen waren. Deze dokters en specialisten werkten onafhankelijk van het ziekenhuis en onafhankelijk van elkaar. De meeste ziekenhuizen waren marktplaatsen waar iedere arts binnen kon komen en zijn specialiteit kon doen. Engelse ziekenhuizen waren gebaseerd op liefdadigheid, de kerk en private onderneming; universiteitsziekenhuizen waren schaars. Engeland, geografisch apart van het Continent, kende de vrijheid en de eigen verantwoordelijkheid van het volk, gebaseerd op de Magna Carta. De overheid was terughoudend en beperkte zich tot het voeren van oorlogen om de economische belangen van haar onderdanen te beschermen. Wetenschap en gezondheidszorg waren geen overheidstaken.

In grote steden, vooral Londen met zijn overmaat aan patiënten, chirurgen, artsen en ziekenhuizen, maakte de concentratie van chirurgische patiënten het voor sommige huisartsen haalbaar om van de toediening van anesthesie hun dagelijks werk te maken. Om zich te onderscheiden van de gemiddelde toediener van anesthesie noemden zij

zichzelf anesthesisten. In feite begonnen zij een de novo specialisme vanuit de algemene praktijk. Hun terrein was de praktijk, niet de wetenschap. Vanaf 1890 werden deze professionele anesthesisten benoemd in ziekenhuizen en gingen compacte tekstboeken over anesthesie voor studenten en huisartsen publiceren. In het proces van specialisatie zouden deze professionele anesthesisten beschouwd moeten worden als de individuele specialisten van de eerste fase. Dit hele landschap van hospitalisatie en specialisatie in grote steden stemt overeen met de theorie van Rosen dat urbanisatie en concentratie van patiënten één van de vereisten voor specialisatie is. De professionele anesthesisten waren er niet op uit om alle toediening van anesthesie tot een exclusief medisch specialisme te maken. Zij zagen zichzelf vooral als leermeesters, schrijvers van boeken over anesthesie en uitvinders van anesthesie apparaten, die naar hen genoemd werden en hun naam groot maakten. Zij wilden speciale anesthesisten zijn voor speciale chirurgen, speciale ziekenhuizen en speciale patiënten tegen speciale prijzen. De routinematige toediening van anesthesie overdag en 's nachts werd gedaan door huisartsen en bij gebrek aan regelgeving door een bonte verzameling van andere disciplines.

Aannemende dat dit het proces is geweest waarlangs de eerste professionele anesthesisten in Engeland verschenen, is het een uitdaging om te verklaren waarom dit niet op hetzelfde moment in Duitsland gebeurde. Deze uitdaging geldt eens te meer omdat dit onderzoek heeft getoond dat rond 1900 de meeste technologische ontwikkelingen ten aanzien van de toediening van anesthesie hetzelfde waren in beide landen. Het veelvuldig geciteerde chloroform versus ether verschil tussen Engeland en Duitsland is zelfs onjuist gebleken. Twee omstandigheden waren echter wezenlijk anders en zijn daardoor bepalend voor het contrast in specialisatie in anesthesie tussen Engeland en Duitsland.

In de eerste plaats waren Duitse chirurgen anders dan Engelse chirurgen. Duitse chirurgen waren al academische specialisten in de 18<sup>e</sup> eeuw. De Duitse universiteiten, zoals alle continentale universiteiten een erfenis van het Heilige Romeinse Rijk, gaven onderdak aan alle medische specialismen in hun medische faculteiten. Deze rol van de universiteiten bevestigt eens te meer de theorie van George Weisz dat continentale universiteiten een belangrijke rol speelden in medische specialisatie. Duitse chirurgen vormden afdelingen binnen universiteitsziekenhuizen net als alle andere specialismen. Diep geworteld in een cultuur van humorale oergeneeskunde kende de Duitse geneeskunde inclusief de chirurgie een meer holistische kijk op het menselijk lichaam. De patiënt kon niet gedeeld worden in een chirurgisch en een medisch gedeelte. Toen anesthesie dit krachtenveld betrad halfweg de 19<sup>e</sup> eeuw werd het ondergebracht bij de chirurgische afdeling. Op die manier was vanaf het begin de toediening van anesthesie een onderdeel van het chirurgisch specialisme. Ieder Duits chirurgisch tekstboek bevatte complete hoofdstukken over de toediening van anesthesie. Iedere chirurgische assistent, co-assistent en student werd geacht in staat te zijn om anesthesie toe te dienen. In die zin was het een algemeen medische competentie net als in Engeland maar dan wel binnen de chirurgie en niet als in Engeland, waar anesthesie ter wereld kwam als een vondeling.

In de tweede plaats verschilden Duitse ziekenhuizen van Engelse ziekenhuizen. Duitse ziekenhuizen, in overeenstemming met de strikte organisatie van de Duitse samenleving met zijn alom aanwezig bestuur, kenden een structuur als de universiteitsziekenhuizen met medische afdelingen rondom de medische specialismen inclusief artsen en specialisten in een hiërarchische militaire structuur. Het verschil is duidelijk te zien in de operatieregisters. In het London Hospital waren er operatieregisters per individuele chirurg; in het Charité Krankenhaus waren er operatieregisters per chirurgische afdeling. In die structuur stond anesthesie onder controle van de chirurgen. Een toediener van anesthesie los van de chirurgie was niet nodig en in feite ook ongewenst. De patiënt kon niet verdeeld worden in een chirurgisch en een anesthesie object. De toepassing van roesnarcose en de uitgebreide toepassing van lokale anesthesie waren typische uitingen van de betrokkenheid van de Duitse chirurgen bij de anesthesie. De chirurg woog de voors en tegens voor de individuele patiënt met zijn individuele aandoening resulterend in een op maat gesneden anesthesie. In die zin was het wijd verspreide gebruik van lokale anesthesie in Duitsland een weloverwogen positieve keus en niet het gevolg van het ontbreken van anesthesisten. Ondanks de voor de hand liggende relatie 'geen anesthesisten en dus lokale anesthesie' wordt deze verklaring niet gesteund in dit onderzoek. Uit de operatieregisters wordt duidelijk dat lokale anesthesie ook werd toegepast als algehele anesthesie, van wat voor soort dan ook, ook beschikbaar was.

## 9.2. De tweede fase van specialisatie in anesthesie

Door het zeer competitieve braakliggend terrein van de anesthesie in Engeland werden de professionele anesthesisten van begin af aan gedwongen zich te onderscheiden van de gelegenheden-anesthesisten. Zij moesten zich herkenbaar maken. Met deze gedachte begonnen zij zich al in 1893 te organiseren in de Society of Anaesthetists, een exclusieve en in ledental beperkte groep van professionele anesthesisten. Typerend voor de wanorde om hen heen was de kruistocht voor wetgeving door één van de oprichters van de vereniging, Frederic Hewitt, van 1908 tot 1911. Bedoeld om bij wet te regelen dat alleen opgeleid medisch personeel anesthesie mocht toedienen, faalde hij echter ten gevolge van een goed georganiseerde tegenstand van een groep gelegenheden-anesthesisten.

Tijdelijk opgehouden door de Eerste Wereldoorlog ontvouwde de tweede fase van de specialisatie in anesthesie zich in het interbellum. Uitingen waren het *British Journal of Anaesthesia* in 1923 als een wetenschappelijk forum en uiteindelijk in 1932 de Association of Anaesthetists als beroepsbelangenorganisatie. Al deze initiatieven waren bedoeld om de toediening van anesthesie een medische aangelegenheid te laten zijn en om de status van de professionele anesthesisten te verbeteren. Zij waren immers nog steeds niet gelijkwaardig aan de enige erkende specialismen in Engeland, chirurgie en interne geneeskunde. Hun streven naar erkenning werd ondersteund door de toenemende mechanisatie van de toediening van anestetica. De bloeiende anesthesie industrie in het interbellum in Engeland met zijn overvloed aan rubber en gummi speelde een leidende

rol in deze mechanisatie van de anesthesie. Van alle innovaties was de rubber endotracheale tube het meest tot de verbeelding sprekende handelsmerk van de anesthesist.

In Duitsland zou een tweede fase van specialisatie in anesthesie alleen tijdelijk waarneembaar zijn in het interbellum. Dit kwam doordat anesthesie vanaf het begin in veilige handen was binnen het academische chirurgisch specialisme. Sommige chirurgen toonden een speciale interesse voor anesthesie. Individuele chirurgen ontwierpen anesthesie apparaten en verbonden daar hun naam aan. Op hun manier functioneerden deze chirurgen als eerste fase specialisten in anesthesie. In tegenstelling tot de Engelse anesthesisten was hun terrein de wetenschap en niet de praktijk. Gurlt, redacteur van *Archiv für Klinische Chirurgie* dat verscheen sinds 1861, voerde de eerste multicenter lange termijn studie over anesthesie mortaliteit uit tussen 1891 en 1897. De Kuhn tube, het Roth-Dräger anesthesietoestel en vooral Sauerbruch's onderdrukkamer waren gedegen experimenten gebaseerd op toegepaste fysiologie. Na de Eerste Wereldoorlog vonden farmacologische innovaties als de intraveneuze barbituraten hun oorsprong in de Duitstalige wereld. In het interbellum vroeg een groep Duitse chirurgen, farmacologen en fysiologen aandacht voor anesthesie als een apart domein binnen de geneeskunde. Hun wetenschappelijke benadering van de anesthesie leidde tot een Duits anesthesiecongres in 1928 en het eerste anesthesietijdschrift in de Duitstalige wereld. Het tijdschrift *Schmerz-Narkose-Anästhesie* verscheen van 1929 onder een multidisciplinaire en internationaal samengestelde redactie. Het was een knipoog naar de tweede fase van specialisatie in anesthesie.

Voor de Duitse praktijk betekende inbedding van anesthesie in de chirurgie echter van begin af aan een belangrijk voordeel boven specialisatie: flexibiliteit. Alleen op die manier kon aan het beroep op de Duitse militaire gezondheidszorg tijdens de Eerste Wereldoorlog, met een aantal gewonden dat iedere voorstelling te boven ging, worden voldaan door meer artsen, studenten en uiteindelijk hulppersoneel toe te staan anesthesie toe te dienen onder verantwoordelijkheid van de chirurg in het leger of de burgerpraktijk. In de burgerpraktijk was de wijdverbreide inzet van narcosezusters acceptabel binnen de hiërarchische structuur van de chirurgische afdelingen. De prijs die de Duitse chirurgen moesten betalen voor deze flexibiliteit was eenvoudig. In het interbellum was dit niet zo een probleem omdat voor de gemechaniseerde toediening van anesthesie de industriële ondersteuning in Duitsland ontbrak. De financiële crisis in het interbellum raakte de Duitse industrie hard. Vooral de uitbanning van Duitsland van de internationale rubberhandel zette Duitsland op achterstand. Eenvoud, veelzijdigheid en flexibiliteit waren de sleutelwoorden. De pleidooien voor specialisatie in anesthesie met een piek in 1928 verstomden en anesthesie keerde terug naar een eerste fase specialisme binnen een bestaand specialisme, te weten chirurgie.

### 9.3. De derde fase van specialisatie in anesthesie

In Engeland werd de overgang naar de derde fase van specialisatie gemarkeerd door het Diploma in Anaesthetics in 1935. Hoewel het diploma ingesteld was door de verse Association of Anaesthetists was het niet de bedoeling dat er meer professionele anesthesisten of een exclusief specialisme zou ontstaan. Het doel was om enige erkenning te bieden aan gelegenheids-anesthesisten met de huisartsen voorop. De Association of Anaesthetists zelf moest een selecte club van anesthesisten blijven, die weliswaar het diploma moesten hebben, maar ook een aanstelling als opleider in één of meer ziekenhuizen moesten hebben. Deze balans tussen professionele en gelegenheids-anesthesisten werd verstoord door het voorspel van de Tweede Wereldoorlog. Na het intensieve bombardement van Guernica, Spanje, in 1937 en gezien de toenemende agressie van Nazi-Duitsland realiseerde de Engelse overheid zich dat de verouderde structuur van de Engelse ziekenhuizen zonder een georganiseerde medische staf de massa slachtoffers van luchtaanvallen op Engeland niet aan zou kunnen. Het antwoord was de Emergency Medical Service in 1939 die specialisten en ook anesthesisten in vaste dienst nam. Het bezit van een Diploma in Anaesthetics was een aanbeveling voor een dergelijke aanstelling. Gedurende de oorlog zouden de Emergency Medical Service en het Royal Army Medical Corps aantrekkelijke banen bieden voor anesthesisten. Deze anesthesisten onderwezen niet alleen de toediening van anesthesie, zij dienden zelf anesthesie toe.

De anesthesisten waren een algemeen erkend succes in de overheidsdiensten. Hun taken breidden zich uit richting perioperatieve zorg inclusief circulatoire homeostase. Direct na de oorlog nam hun succes nog verder toe met de introductie van intraveneuze spierverslappers zoals curare. De patiënt perste niet langer zijn buikinhoud naar buiten waarmee de chirurg het zicht over de anatomie werd ontnomen. Maar ook eenvoudige procedures als fractuur reposities werden makkelijker dan ooit tevoren gemaakt door spierverslappers. Vanaf dat moment moest iedere patiënt verslapt worden; iedere patiënt had een anesthesist nodig. Ook op de toediening van anesthesie zelf had spierverslapping een belangrijke invloed. In feite bracht het alle innovaties van de laatste 20 jaar bij elkaar. Spierverslappers waren intraveneuze middelen waarvoor dus een intraveneuze toegang noodzakelijk was. Spierverslappers verlamden ook de ademhalingsspieren waardoor endotracheale intubatie en kunstmatige beademing noodzakelijk werden. Al deze ingrepen in de normale fysiologie hadden meer invloed op de circulatie, daardoor was een nauwkeurige homeostase van de circulatie noodzakelijk. Anesthesie met spierverslapping werd een speciale anesthesie en niet meer alleen voor speciale chirurgie. De toediening van anesthesie zelf was nu speciaal genoeg om een medisch specialisme te worden. Tekstboeken werden niet meer voor studenten en huisartsen geschreven. De beknopte tekstboeken verdwenen en werden vervangen door nieuwe series van alles omvattende boeken van Lee en Evans, geschreven voor anesthesisten.

De ultieme katalysator voor de derde fase van specialisatie in anesthesie in Engeland was de naoorlogse National Health Service in 1948, naar het voorbeeld van de Emergency Medical Service. Dit betekende een revolutionaire hervorming van de medische

staf in ziekenhuizen en leidde tot ziekenhuisafdelingen met consultants, aankomend specialisten, arts-assistenten en co-assistenten. Deze afdelingen kenden een hiërarchische structuur, als in het leger en als in Duitsland. Anesthesie werd ook georganiseerd binnen ziekenhuisafdelingen. De anesthesisten, sterk aangemoedigd, in de gelegenheid gesteld en in feite zelfs gedwongen door het Engelse Royal College of Surgeons bij monde van zijn voorzitter Webb-Johnson, traden toe tot de gelederen van de specialisten onder de hoede van een Faculty of Anaesthetists van de Royal College of Surgeons. De anesthesist moest de fysioloog van de operatiekamer worden. Hun opleiding werd opgeschaald naar een periode van vijf jaar. Vanaf dat moment werd de selecte en in ledental beperkte club van professionele anesthesisten in Engeland ingehaald door zijn eigen succes. De Association of Anaesthetists veranderde van een exclusieve club in een belangenorganisatie voor een groeiend aantal anesthesisten. Het zou uiteindelijk tot 1992 duren voordat de anesthesisten een eigen Royal College of Anaesthetists werd verleend in een tijd dat bijna alle specialismen hun eigen College kregen. De hegemonie van de Royal College of Surgeons was ten einde.

In Duitsland ontdekte vanaf 1949 een nieuwe generatie van jonge artsen uit chirurgische klinieken het gat in de markt en reisden naar het buitenland om daar zich de moderne anesthesie eigen te maken. In Engeland waren zij getuige van de comfortabele positie van de anesthesisten in de National Health Service. Bij hun terugkeer naar Duitsland beheersten zij de endotracheale intubatie, spierverslapping en circulatoire homeostase. Zij waren echter ook vastberaden om een specialisme voor anesthesie te vestigen in Duitsland. De in anesthesie geïnteresseerde chirurgen als eerste fase specialisten werden vervangen door een nieuwe generatie van professionele anesthesisten die werden benoemd als opleiders. Het jaar 1953 markeerde de tweede fase van specialisatie in anesthesie met de oprichting van een vereniging en de uitgave van een tijdschrift, nu met alleen anesthesisten aan de leiding. Het eerste certificaat voor anesthesie werd in hetzelfde jaar verleend. Vanaf dat moment maakten het specialisme en de ondersteunende industrie een explosieve groei door, als een veer die lange tijd ingedrukt was geweest. De anesthesie ondersteunende industrie herleefde in de economische wederopbouw met onder andere plastic hulpmiddelen vooral als intraveneuze toegang. De traditionele chirurgen probeerden eerst nog alles onder controle te houden onder één dak maar in 1955 erkende de voorzitter van de Deutsche Gesellschaft für Chirurgie aarzelend de arbeidsdeling in de operatiekamer. Net als Webb-Johnson in Engeland in 1947 zag hij de anesthesisten als de specialisten voor de controle over de vitale functies. Hij had geen keus; de internationalisering van anesthesie was een feit met de oprichting van de World Federation of Societies of Anaesthesiologists eveneens in 1955 in Scheveningen in Nederland ten tijde van het eerste World Congress of Anaesthesiologists.

Bij het ontbreken van een radicale revolutie in honorering zoals de National Health Service verliep de derde fase van specialisering in anesthesie in Duitsland trager dan in Engeland. De feitelijke losmaking van de chirurgie en de verspreiding van moderne anesthesisten gebeurde pas toen de anesthesisten staf in een ziekenhuis op dezelfde

hoogte kwam en hetzelfde gehonoreerd werd als de chirurgische staf. Dit vond pas plaats toen er een aparte beroepsbelangenvereniging voor anesthesisten kwam in 1961; gelijke rechten voor chirurgen en anesthesisten werden overeen gekomen in 1964.

#### 9.4. Epiloog

We hebben twee verschillende wegen gezien waarlangs de toediening van anesthesie een medisch specialisme is geworden. Het contrast was diep geworteld in een verschil in chirurgische en ziekenhuistraditie in Engeland vergeleken met Duitsland. Engelse chirurgen beschouwden de toediening van anesthesie beneden hun stand. Duitse chirurgen beschouwden de patiënt als één geheel, dat niet in een chirurgie en een anesthesie deel gesplitst kon worden. Om die reden was anesthesie in Engeland van begin af aan ingebed in de algemene praktijk; in Duitsland was anesthesie ingebed in de chirurgie. In beide landen was er steeds een onderstroom ten gunste van specialisatie in anesthesie. In Engeland werd deze gevormd door een kleine selecte groep van professionele anesthesisten. In Duitsland leidden chirurgen dit debat. Kennisonwikkeling en nieuwe technologie, zoals de toepassing van samengeperste gassen, gemechaniseerde toediening van anesthesie, intraveneuze anesthesie, endotracheale intubatie en spierverslapping, gaven van tijd tot tijd een versnelling aan de onderstroom voor specialisatie maar waren nooit beslissend voor een echt derde fase specialisme voor anesthesie. Externe omstandigheden als oorlog, financiële en grondstof problemen remden van tijd tot tijd het proces. Kennis, technologie en industriële steun in Duitsland en Engeland waren met uitzondering van een tijd voor en tijdens de Tweede Wereldoorlog heel vergelijkbaar.

Het moment van de onomkeerbare overgang naar een erkend derde fase specialisme, gelijkwaardig aan de traditionele specialismen, lag dichterbij elkaar dan verwacht. In Engeland was het in wezen de oprichting van de Faculty of Anaesthetists of the Royal College of Surgeons in 1948. In Duitsland ontwikkelde de specialisering in anesthesie zich meer geleidelijk tussen 1953 en 1964. In Engeland was de directe aanleiding een revolutie buiten de kring van anesthesisten; de National Health Service met specialisten in vast dienstverband overkwam hen. In Duitsland was een revolutie door jonge artsen binnen de chirurgische gevestigde orde nodig om een specialisme voor anesthesie vaart te geven. Naar voorbeeld van Engeland en in een sfeer van verwestering van de West-Duitse samenleving zagen deze jonge artsen het gat in de markt en profiteerden van de nieuwe technieken met spierverslapping en endotracheale intubatie. In beide landen was erkenning door de chirurgen van het nut van een specialist voor de vitale functies of operatiekamerfysioloog noodzakelijk om het specialisme anesthesie te bezegelen. Deze bijna gelijktijdige definitie van de inhoud van het nieuwe specialisme maakte de taken van de anesthesist vergelijkbaar in beide landen en in feite over de hele wereld.

Was het specialisme anesthesie klaar in 1960? In feite was dat zo. Het domein was gedefinieerd: de patiënt comfortabel houden tijdens en na de chirurgische ingreep, met andere woorden een brug over onstuimig water vormen. Het nieuwe specialisme werd

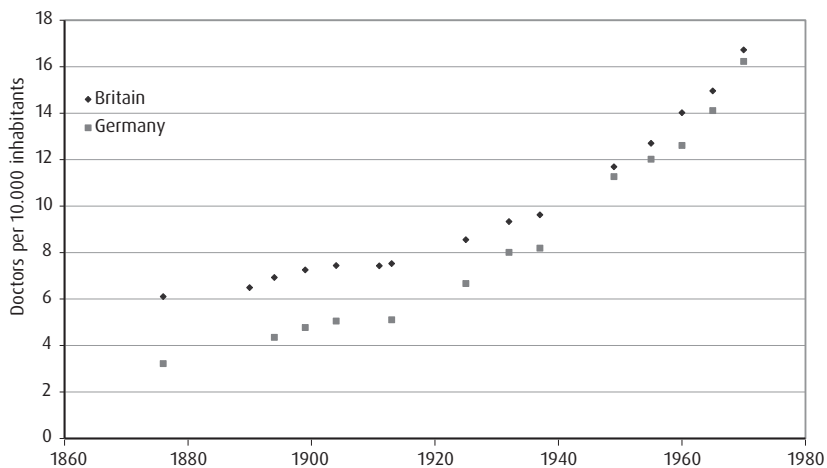


wereldwijd zeer succesvol; het aantal beoefenaren oversteeg de aantallen bij de traditionele specialismen. Niet alleen het aantal anesthesisten groeide. Het specialisme zelf ontwikkelde verder in de tweede helft van de 20<sup>e</sup> eeuw. Nieuwe soorten chirurgie voor patiënten van zeer jong tot zeer oud, van grote reconstructieve tot minimaal invasieve procedures leidden tot nieuwe uitdagingen voor de toediener van anesthesie. Nieuwe technieken zoals elektronische monitoring en langdurige beademing, grondige kennis van de farmacologie, intensieve zorg en pijngeneeskunde zouden worden ontwikkeld of overgenomen door het specialisme. Aan het begin van de 21<sup>e</sup> eeuw, nadert de spanwijdte van het domein van de anesthesie een kritisch punt waar nieuwe subspecialismen opduiken. Op dat punt duikt ook de oude vraag weer op of een patiënt en zijn zorg in nog meer delen kan worden opgeknipt. Uiteindelijk herhaalt de geschiedenis zichzelf.



# Graphs section

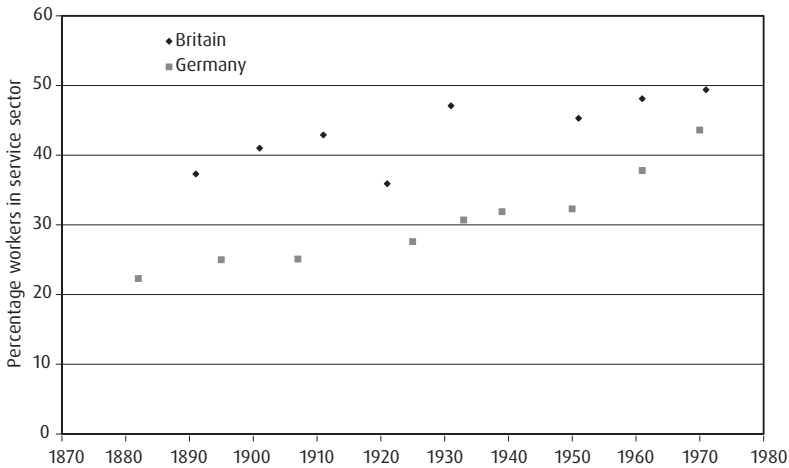
**Graph 1. Number of doctors per 10.000 inhabitants in Germany and Great Britain 1876 -1970.**



Sources: Number of doctors in Britain: General Medical Council written communication April 14<sup>th</sup> 2005. Number of doctors in Germany, Deutsches Reich or East and West Germany together: Bundesärztekammer Statistik Herbert-Lewin-Platz 1 10623 Berlin. Written Communication September 7<sup>th</sup> 2004. Numbers of inhabitants: Mitchell, *British Historical Statistics* (1988) 11-14. Statistisches Bundesamt. V II B-173.

Note: This graph illustrates Britain's lead in the number of doctors up to the postwar period, one of the prerequisites for medical specialization.

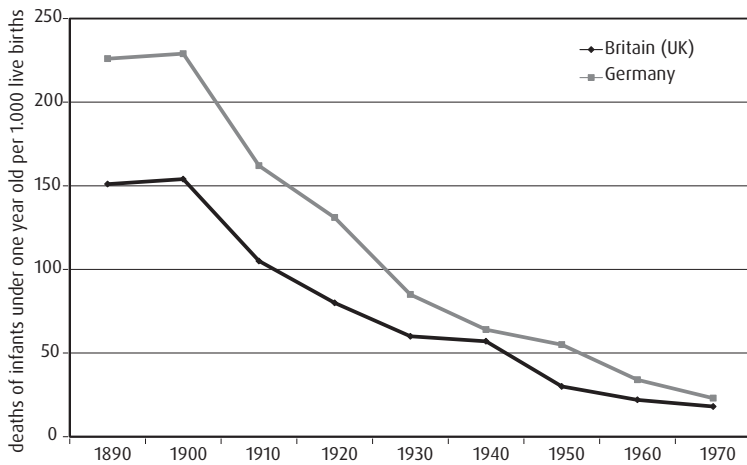
**Graph 2. Percentage Workers in the Service Sector in Germany and Great Britain 1880-1980**



Source: Flora, *Society in Western Europe* (1975) 512, 524.

Note: this graph illustrates Britain's lead in the transition to a service economy including healthcare, one of the prerequisites for medical specialization.

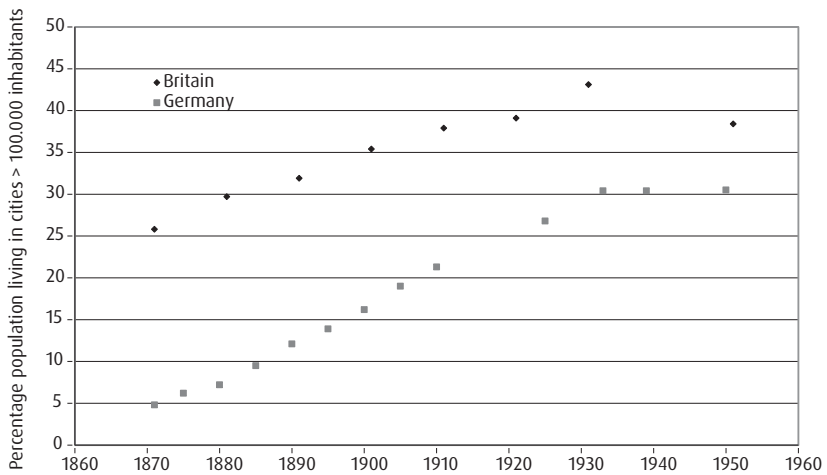
**Graph 3. Infant Mortality in Britain and Germany 1890-1970**



Source: Mitchell, *International Historical Statistics* (2003) 121-126.

Note: this graph illustrates the rate at which Germany caught up with declines in infant mortality; a lower infant mortality rate is one of the phenomena of industrialization.

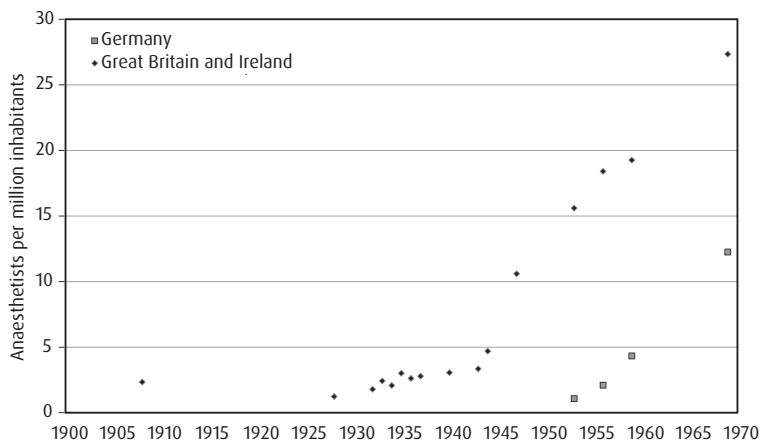
Graph 4. Urbanization in Britain and Germany 1870-1960



Source: Flora, *Society in Western Europe* (1975) 262, 278.

Note: this graph illustrates the big difference in urbanization between Britain and Germany, one of the drivers of medical specialization.

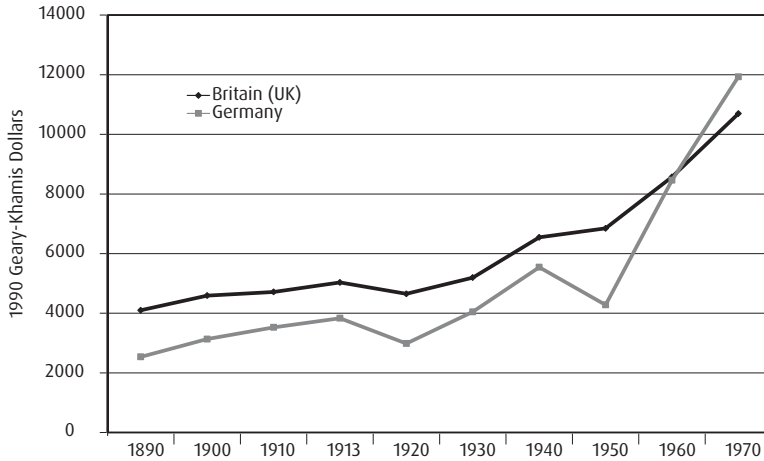
**Graph 5. Number of anaesthetists per million inhabitants in Germany and Great Britain and Ireland 1932-1970**



Sources: the numbers of anaesthetists for Germany are obtained from available membership figures for the Deutsche Gesellschaft für Anästhesiologie und Intensivmedizin (DGAI) by Lehman, 'Die Deutsche Gesellschaft für Anaesthesie' (1967) 259-268 and van Ackern, '50 Jahre' (2003) 109; for Great Britain and Ireland they are obtained from electronic mail correspondence in 2004 and 2009 with Trish Willis, Archivist for the Association of Anaesthetists of Great Britain and Ireland, assuming 25% trainees. The dot in 1908 is derived from the membership of the Society of Anaesthetists at its dissolution. The corresponding numbers of inhabitants are obtained from the Statistisches Bundesamt, Pressestelle V II B-173 by electronic mail correspondence in 2004 and from Mitchell, *British Historical Statistics* (1988) 13-14.

Note: the curve shows two distinct phases, the first from 1908 to 1945 and the second from 1945 to 1970 and later. In the first phase the Society of Anaesthetists as well as the Association of Anaesthetists had a maximum number of members, 100 and 150 respectively. During the Second World War with the appointment of anaesthetists in the Emergency Medical Service and the Royal Army Medical Corps this maximum was abandoned. Natural growth began in 1948 with the introduction of the National Health Service. In Germany natural growth began in 1953 with the recognition of the specialty and the foundation of the Deutsche Gesellschaft für Anaesthetie. In the decades after 1970 the curves will fuse.

**Graph 6. Gross Domestic Product per capita in Britain and Germany 1890-1970.**  
 The GDP for Germany is adjusted for the territory of the Federal Republic Germany before the unification in 1990. Basically it reflects the GDP of West Germany.



Source: Maddison, *Monitoring the World Economy* (1995) 194-197, 231.

Note: this graph illustrates Britain's leading economic status, one of the prerequisites for medical specialization.





# Appendices

## Appendix 1 The shortest history of anaesthesia and its specialty

From ancient times attempts have been made to switch off consciousness and pain, both vital protective functions of the central nervous system, during surgical procedures.<sup>1</sup> Various agents, such as alcohol and morphine, were used. Due to their uncontrollable action only brief operations could be performed. These consisted of tooth extractions, incisions of abscesses, the dressing of wounds and in desperate cases amputations. Pain remained the limiting factor for more extensive surgery.

The enlightenment of the 18<sup>th</sup> century and humane advancements in the 19<sup>th</sup> century considered the whims of nature like pain, disease, invalidity and ultimately death to be no longer acceptable. Man would no longer accept pain during surgery and labour. For this reason public and scientific attention was paid to the alleviation of pain. Under the influence of the simultaneous boom in chemistry experiments, gases and vapours were tested for use as anaesthetics. The first demonstration of anaesthesia by inhalation of ether vapour at Massachusetts General Hospital in Boston in the US on October 16<sup>th</sup> 1846 is considered to be the beginning of modern anaesthesia.<sup>2</sup> The news spread over the world at the speed of the steamers that transported the letters and newspapers. On December 21<sup>th</sup> 1846 ether was administered in London by Robert Liston, on December 22<sup>th</sup> 1846 by Antoine Jobert de Lamballe in France and on January 25<sup>th</sup> 1847 by Franz Christoph von Rothmund in Germany.<sup>3</sup> All of them were surgeons. Since the clinical application of ether in 1846 anaesthesia has developed gradually. Other volatile anaesthetics were developed, with chloroform used as the main alternative to ether as early as 1847.<sup>4</sup>

At the turn of the century local anaesthetics with their direct action on conductive nervous structures made it possible to selectively anaesthetize a part of the human body. The pain stimulus could be interrupted at various points on its way from the site of

1 Rushman, *History of Anaesthesia* (1996) 1.

2 Morton, *Administration of sulphuric ether* (1947). Rushman, *History of Anaesthesia* (1996) 12.

3 Schüttler, 'Entdeckung und Entwicklung des Anästhesie' (2003) 6-7.

4 Simpson, 'A new anaesthetic agent' (1847) 549-550.

surgery to the conscious brain: at the site of the operation (1884),<sup>5</sup> in the spinal canal (1899),<sup>6</sup> in an arm or leg (1908)<sup>7</sup> or in the epidural space (1921).<sup>8</sup>

The 20<sup>th</sup> century brought innovations, often considered to be milestones in the emergence of an anaesthetic specialty, such as endotracheal intubation (1928),<sup>9</sup> intravenous anaesthesia (1932),<sup>10</sup> the maintenance of water and mineral balance during surgery (ca. 1940) and muscle relaxation (1942).<sup>11</sup> Authors have stressed that it was the growing control over vital functions demonstrated by anaesthetists during the world wars that especially promoted the need for and acceptance of anaesthesia as a separate medical specialty. The control and maintenance of circulation and ventilation appeared to be decisive to the success of war surgery. The tools needed for this controlling function, access devices like endotracheal tubes and intravenous cannulas, became and still are the trademarks of the anaesthetist in every hospital.

From 1955 anaesthesia spread its wings into adjacent fields of medicine like intensive care, pain treatment and perioperative medicine. Consequently the present specialty of anaesthesia consists of more than administering anaesthetics. The anaesthetist controls vital functions like consciousness, pain, respiration, circulation, muscular tension and homeostasis in a balanced way.

5 Carl Koller, ophthalmologist in Vienna anaesthetized the cornea of a patient with cocaine in 1884.

A paper on this novelty was read by Joseph Brettauer at the Ophthalmological Congress at Heidelberg

6 Bier, 'Versuche über Cocainisierung' (1899) 361.

7 Bier, 'Localanästhesie an den Gliedmassen' (1908) 1007.

8 Pagés, 'Anesthesia metamérica' (1921) 351-365; 385-396.

9 Magill, 'Endotracheal anaesthesia' (1929) 83-88.

10 Weese, 'Pharmakologie des intravenösen Kurzmarkotikums Evipan-Natrium' (1933) 47-48.

11 Griffith, 'Curare in general anesthesia' (1942) 418-420.

## Appendix 2 The operation registers

Operation registers from British and German hospitals were identified by using Internet search engines. The keyword for Britain was 'operation register' and for Germany 'Operationsbuch'. In Britain the Hospital Records Database was also searched. Registers dated before 1890 were not found. One has to keep in mind that organized in-hospital surgery only began in the second half of the 19<sup>th</sup> century. Up to then surgery was done at the patient's or the surgeon's home. Hospitalization was connected with the growing use of machinery like sterilizers and trolleys with pressurized gases for anaesthesia. Operation registers were included when they contained data over a substantial period of at least 20 years. From this period a sample survey was taken at intervals of every 5 or 10 years (depending on the period covered by the books) of one month, usually January or 100 operations. In total 2,683 operations in 5 hospitals in Britain and 3,360 operations in 4 hospitals in Germany were studied.

For every operation the following data, if available, were retrieved: surgeon's name, surgical assistants' names, kind of surgical procedure, kind of anaesthetic technique, name and qualification of the administrator of anaesthetics. The kind of surgical procedure and the surgeon's name were always available.

### The classification of the surgical procedures

When the procedures performed in all of the hospitals studied during the whole period of research are taken together a list of 13 surgical procedures can be compiled containing 88% of all procedures. The procedures and their numbers (percentage) per country are given in Table 6. Only these 13 common procedures, their staffing and anaesthetic technique were taken into consideration.

**Table 6. Thirteen common procedures and their distribution in the investigated hospitals between 1890 and 1970**

Procedure	Britain	Germany
Superficial surgery on the skin and subcutaneous structures including wound toilets, incision of abscesses and excision of superficial abnormalities	439 (18%)	987 (33%)
Surgery of the loco motor apparatus including arthrotomy, bone surgery, digital surgery, fracture reposition and tenotomy	419 (17%)	339 (11%)
Appendectomy	270 (11%)	347 (12%)
Hernia of the abdominal wall, mainly inguinal hernia	206 (9%)	362 (12%)
Gynaecology including curettage, caesarean section, surgery of uterus, adnex or vagina.	391 (16%)	115 (4%)
Urology including surgery of penis, testis, prostate, bladder, ureter and kidney	203 (8%)	143 (5%)
Laparotomy	114 (5%)	172 (6%)
Gastric surgery	83 (3%)	125 (4%)
Anal surgery	99 (4%)	98 (3%)
Strumectomy	26 (1%)	112 (4%)
Cholecystectomy	64 (3%)	70 (2%)
Mamma surgery	47 (2%)	62 (2%)
Colostomy	39 (2%)	44 (1%)

Note: The list contains varieties of surgery that would later be classified by surgical specialties like orthopaedics, gynaecology and urology. Four kinds of surgery do not appear: ear-nose-throat and ophthalmic surgery, which were performed under local anaesthesia; and plastic and neurosurgery which were whether non-existent or highly specialized.

## The classification of the administrators of anaesthetics

A person with the prefix Dr or Mr (only in Britain) is counted as doctor.

If in Britain he is listed as an anaesthetist in *The Medical Directory* on the staff of the hospital in question or in Germany in the directory of anaesthetists by Frey in the city in question in 1966, he is scored as 'Anaesthetist'.<sup>12</sup>

If he appears throughout the operation register only in the column of the administrator of anaesthetics, but he is not an anaesthetist he is scored as 'Doctor'.

If he appears throughout the operation register in the columns surgeon, surgical assistant and administrator of anaesthetics he is scored as 'Surgical (House) Staff'.

If the administrator of anaesthetics did not comply with the above-mentioned definitions he was scored as 'Non-Medical Staff'. This group only appeared in Germany and contains 'Schwester, Pflege', nurse, 'Famulus', student or technicians recognizable by a given name or the lack of any title.

## The classification of the anaesthetic technique

The anaesthetic technique often appeared to be a mix of agents. Chloroform for example was mainly used as an induction agent with ether as a maintenance agent. The same goes for barbiturates. In principle the induction agent is noted as the technique. The recording of the anaesthetic technique was too incomplete for statistical processing. Nevertheless some trends are apparent for each hospital and are discussed.

Local anaesthesia is always mentioned separately because it was administered by the surgeon handling the same case.

Regional anaesthesia, like spinal anaesthesia, if used at all, was administered by doctors who were not involved in the surgical procedure. For that reason these cases are scored with the administrators of general anaesthesia and not as a separate group like local anaesthesia.

<sup>12</sup> *The Medical Directory* is a commercial non-governmental product containing the names of health practitioners and data from healthcare establishments in the United Kingdom. It has been published since 1845. Frey, *Verzeichnis der Fachärzte für Anaesthesiologie* (1966).

## The hospitals

The following hospitals were studied. Examples of pages in the registers are given in figures with the hospitals. Due to privacy regulations copying a register was not always permitted. The names of patients and sometimes of doctors had to be obscured for copying.

### Britain

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St. Bartholomew's Hospital, London (Figure 27)

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Location: Centre of London

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Size: approximately 700 beds

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Type: Teaching Hospital

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Registers: 1930 to 1961

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**Table 7. Years and numbers of surgical procedures studied in St Bartholomew's Hospital 1930-1961**

Year	Number of procedures	Selection of 13 procedures	Percentage
1930	100	94	94%
1931	50	48	96%
1936	50	48	96%
1938	50	27	54%
1940	100	88	88%
1945	99	74	75%
1950	100	97	97%
1951	50	49	98%
1960	100	75	75%
1961	50	50	100%
All	749	650	87%

Note: There is some fluctuation in the contribution of the 13 procedures. This has several explanations. The book from 1938 was the personal operation register of the plastic surgeons Mr Harold Delf Gillies and Mr Archibald Hector McIndoe. This Gillies was ENT-surgeon in 1914. A part of their surgical procedures, like harelip corrections, was not performed in the other hospitals. For that reason the contribution of the '13 procedures' is lower in that register. In 1945 due to war damages operative activities were reshuffled. At that time eye surgery was performed in the general surgical suite. In the book from 1960 ENT, dental surgery and varices made up the part that was not included in the selection of 13.

**Table 8. Administrators of anaesthetics in the 13 procedures St Bartholomew's Hospital 1930-1961**

Year	Anaesthetist	Doctor	Surgical Staff	Local Anaesthesia	None or not mentioned	Sum
1930	21 (22%)	68 (72%)	1 (1%)		4 (4%)	94
1931	24 (50%)	23 (48%)			1 (2%)	48
1936	13 (27%)	30 (63%)	5 (10%)			48
1938		12 (44%)	12 (44%)	3 (11%)		27
1940	36 (41%)	24 (27%)	18 (20%)	8 (9%)	2 (2%)	88
1945		46 (62%)	9 (12%)	14 (19%)	5 (7%)	74
1950	27 (28%)	64 (66%)		4 (4%)	2 (2%)	97
1951	13 (27%)	35 (71%)		1 (2%)		49
1960	15 (20%)	51 (68%)		8 (11%)	1 (1%)	75
1961	18 (36%)	28 (56%)		4 (8%)		50

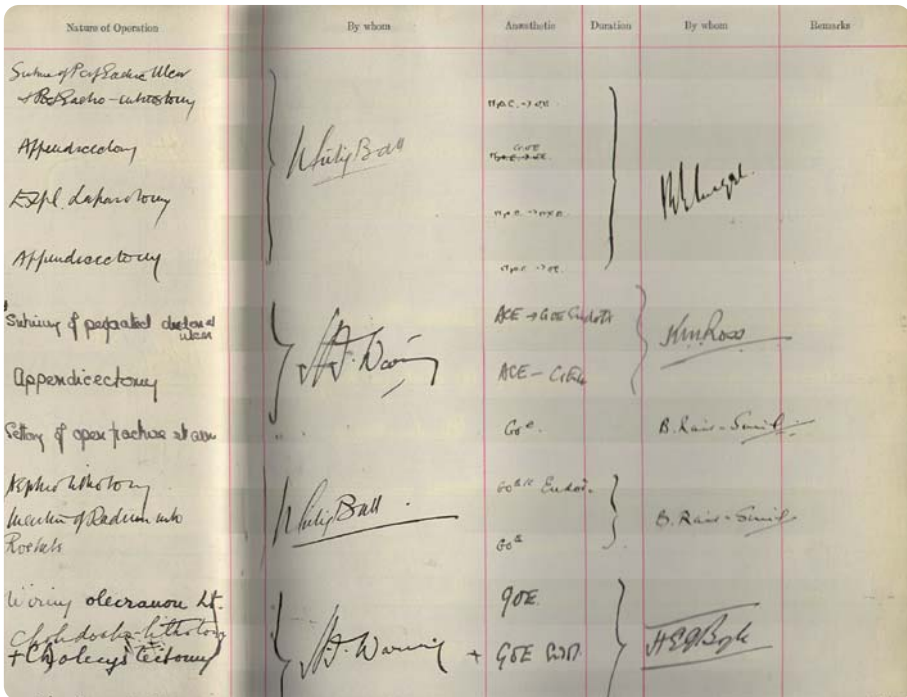


Figure 27. Operation Register from St Bartholomew's Hospital, London, 1930 containing signatures of Boyle, Rait Smith and Ross.

## Crumpsall Infirmary, Manchester

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 Location: northern suburb of Manchester
 

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 Size: 1927: 1600 beds incl. 614 psychiatry; 1937: 1400 beds and 131 cots; 1947:  
1150 beds
 

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 Type: Workhouse Hospital
 

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 Registers: 1927 to 1947
 

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**Table 9. Years and numbers of surgical procedures studied in Crumpsall Infirmary 1927-1947**

Year	Number of procedures	Selection of 13 procedures	Percentage
1927	50	50	100%
1937	50	45	90%
1947	100	90	90%
All	200	185	93%

**Table 10. Administrators of anaesthetics in the 13 procedures in Crumpsall Infirmary 1927-1947**

Year	Anaesthetist	Doctor	Surgical Staff	Local anaesthesia	Sum
1927			50 (100%)		50
1937		27 (60%)	13 (29%)	5 (11%)	45
1947	3 (3%)	81 (90%)	1 (1%)	5 (6%)	90

Note: Spinal anaesthesia was used in one-third of the cases in 1947. Its use was not indicated for a specific new kind of operation.



## London Hospital (Figure 28)

Location:	Whitechapel, Centre of London
Size:	approximately 900 beds
Type:	General teaching hospital
Registers:	1902 to 1951

**Table 11. Years and numbers of surgical procedures studied in London Hospital 1902-1951**

Year	Number of procedures	Selection of 13 procedures	Percentage
1902	100	96	96%
1911	100	83	83%
1921	100	83	83%
1931	100	84	84%
1941	100	88	88%
1951	100	60	60%
All	600	494	82%

Note: The distortion in representation in 1951 is caused by the introduction of laminectomies and surgery on the skull and brain. For these procedures local anaesthesia was frequently used.

**Table 12. Administrators of anaesthetics in the 13 procedures in London Hospital 1902-1951**

Year	Anaesthetist	Doctor	Surgical Staff	Local anaesthesia	None or not mentioned	Sum
1902					96 (100%)	96
1911	47 (57%)	5 (6%)	24 (29%)	5 (6%)	2 (2%)	83
1921	58 (70%)	6 (7%)	18 (22%)	1 (1%)		83
1931	70 (83%)	7 (8%)	4 (5%)		3 (4%)	84
1941	16 (18%)	44 (50%)	10 (11%)	8 (9%)	10 (11%)	88
1951		56 (93%)	2 (3%)	1 (2%)	1 (1%)	60

**NOTES ON OPERATIONS.**

No.	Date.	Time of Operation.	Order of Theatre.	Operation.	Surgeon.	House Surgeon.	Dressers.	Theatre Assistants.	Signature.
1	Sept 16	9.35	1	Excision of abscess of back.	H. Hutchinson	H. Morley	H. Jones	W. K. Fawcett	Dr. B. Hall
2		3.48	2	Excision of compound fracture of femur.			Hughes		
3		3.35	3	Excision of compound fracture of femur.			Morrison		
4		3.47		Excision of abscess.					
5	22	2.53	1	Amput. of finger.			Blair		Dr. Kelly
6		3.30	2	Neurectomy.			Elliot		
7		3.45	3	Neurectomy.			Woods		
8		4.11	4	Neurectomy.			Morrison		
9		4.25	5	Neurectomy.			Quart		Shown by Mr. Morley
10		5.25	1	Removal of Squamous Proliferation.			Wright		
11		2.18	1	Fract. femur.			Morrison		Dr. B. Hall
12		3.27	2	Neurectomy.			Blair		
13		3.58	3	Neurectomy.			Morrison		
14		4.16	4	Neurectomy.			Quart		
15		4.32	5	Neurectomy.			Morrison		Dr. B. Hall
16	Sept 17	3.24	1	Excision of abscess of back.			Morrison		Dr. B. Hall
17		3.42	2	Excision of abscess of back.			Wright		
18		4.10	3	Excision of abscess of back.			Morrison		
19		4.30	4	Excision of abscess of back.			Wright		
20		5.35	5	Excision of abscess of back.			Morrison		
21		6.8	6	Excision of abscess of back.			Wright		
22		6.15	7	Excision of abscess of back.			Morrison		
23		7.20	8	Excision of abscess of back.			Wright		
24		7.35	9	Excision of abscess of back.			Morrison		
25		8.30	10	Excision of abscess of back.			Wright		
26		8.55	11	Excision of abscess of back.			Morrison		
27		9.10	12	Excision of abscess of back.			Wright		
28		9.25	13	Excision of abscess of back.			Morrison		
29		9.40	14	Excision of abscess of back.			Wright		
30		9.55	15	Excision of abscess of back.			Morrison		

Figure 28. Operation Register London Hospital 1911.

## Scunthorpe and District War Memorial Hospital (Figure 29)

Location:	Scunthorpe, North Lincolnshire, 60.000 inhabitants
Size:	72 beds in 1929, 204 beds in 1945
Type:	General hospital in area with heavy industry
Registers:	1927 to 1949

**Table 13. Years and numbers of surgical procedures studied in Scunthorpe Hospital 1927-1949**

Year	Number of procedures	Selection of 13 procedures	Percentage
1927	34	34	100%
1930	61	56	92%
1935	84	76	90%
1940	123	117	95%
1945	143	121	85%
1949	153	130	85%
All	598	534	89%

**Table 14. Administrators of anaesthetics in the 13 procedures in Scunthorpe Hospital 1927-1949**

Year	Doctor	Surgical Staff	Local anaesthesia	None or not mentioned	Sum
1927	32 (94%)		1 (3%)	1 (3%)	34
1930	34 (61%)	16 (29%)	2 (4%)	4 (7%)	56
1935	64 (84%)	9 (12%)	3 (4%)		76
1940	48 (41%)	67 (57%)	2 (2%)		117
1945	38 (31%)	74 (61%)	6 (5%)	3 (2%)	121
1949	92 (71%)	35 (27%)	2 (2%)	1 (1%)	130



Withington Hospital, Manchester

Also Chorlton Union Workhouse Hospitals or Township of South Manchester Hospitals

Location: southern suburb of Manchester

Size: 2450 beds in 1930, 1180 beds in 1935 and 1939

Type: Workhouse hospital

Registers: 1900 to 1939

**Table 15. Years and numbers of surgical procedures studied in Withington Hospital 1900-1939**

Year	Number of procedures	Selection of 13 procedures	Percentage
1900	50	47	94%
1910	50	41	82%
1916	100	91	91%
1920	100	86	86%
1930	100	91	91%
1935	100	93	93%
1939	100	88	88%
All	600	537	90%

**Table 16. Administrators of anaesthetics in the 13 procedures in Withington Hospital 1900-1939**

Year	Anaesthetist	Doctor	Surgical Staff	Local anaesthesia	None or not mentioned	Sum
1900					47 (100%)	47
1910				3 (7%)	38 (93%)	41
1916		1 (1%)	78 (86%)	9 (10%)	3 (3%)	91
1920		58 (67%)	18 (21%)	7 (8%)	3 (3%)	86
1930			72 (79%)	2 (2%)	17 (19%)	91
1935		31 (33%)	25 (27%)	3 (3%)	34 (37%)	93
1939	11 (13%)	63 (72%)	9 (10%)	4 (5%)	1 (1%)	88

## Germany

Allgemeines Krankenhaus Charité, Berlin (Figure 30, 31)

Location:	centre of Berlin
Size:	1500 beds
Type:	University Hospital
Registers:	1912 to 1970

**Table 17. Years and numbers of surgical procedures studied in Charité Krankenhaus 1912-1970**

Year	Number of procedures	Selection of 13 procedures	Percentage
1912	100	86	86%
1916	100	85	85%
1920	100	91	91%
1930	100	80	80%
1937	100	82	82%
1940	100	79	79%
1945	100	75	75%
1949	100	89	89%
1959	100	84	84%
1970	100	53	53%
All	1000	804	80%

Note: The underrepresentation of the 13 procedures in 1970 is caused by the presence of 24 neuro-surgical cases, 8 vascular and 10 cardiac cases in that year.

**Table 18. Administrators of anaesthetics in the 13 procedures in Charité Krankenhaus 1912-1970**

Year	Anaesthetist	Doctor	Surgical Staff	Non-Medical Staff	Local Anaesthesia	None or not mentioned	Sum
1912		27 (31%)	7 (8%)	20 (23%)	29 (34%)	3 (3%)	86
1916				38 (45%)	21 (25%)	26 (31%)	85
1920		1 (1%)			15 (16%)	75 (82%)	91
1930					34 (43%)	46 (58%)	80
1937					33 (40%)	49 (60%)	82
1940					37 (47%)	42 (53%)	79
1945					29 (39%)	46 (61%)	75
1949		2 (2%)	34 (38%)	5 (6%)	44 (49%)	4 (4%)	89
1959		69 (82%)	1 (1%)	1 (1%)	12 (14%)	1 (1%)	84
1970	9 (17%)	32 (60%)	11 (21%)		1 (2%)		53

Note: The registers were badly kept up between 1920 and 1945.

Landes- Nummer	Name	Alter	Station	Stand	Wohnung	Tag der Eingel.	Tag der Ausg.	Diagnose	Operation	Operateur	Nur- für den Fall	Man- u- el- com.	Dauer	Namen des Nicht- erfahrenen
1890		53 J	II	Marmosa		2.5	8	Neu des Hals	Neu des Hals Tumor	Dr. B.			1/2	Dr. B.
1891		49 J	III	Wohnung		4.8	8	Myoma d. Gebärmutter V. Gebärmutter mit Halsung 28 (1888) schräg. Verkümmung Myoma	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1892		49 J	I	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1893		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1894		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1895		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1896		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1897		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1898		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.
1899		49 J	II	Wohnung		5.3	8	Myoma d. Gebärmutter (Myoma)	Myoma d. Gebärmutter Tumor	Dr. B.			1/2	Dr. B.

Figure 30. Operationsbuch Allgemeines Krankenhaus Charité 1912.



222	Autobio- graphische Anamnese	Name	Alter	Station	Stand	Wohnung	Tag der Einget.	Tag der Oper.	Diagnose	Operation	Operateur	Narkose um min.	Zeit Dauer	Name des Narkose- mittels
1259		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1260		A. Kautler	28 J.	I			19/1	19/1	Delirium, Nerven- krankheit	Narkose II. Grad	Prof. Dr. St.	100	1/2 h	Chloroform
1261		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1262		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1263		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1264		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1265		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1266		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1267		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform
1268		H. St. Kalten	31 J.	III			19/1	19/1	Struma colloid.	Strumektomie	St.	20	1/2 h	Chloroform

Figure 31. Operationsbuch Allgemeines Krankenhaus Charité January 1916. Nurse Meta administers anaesthetics.

## Allgemeines Krankenhaus, Meiningen (Figure 32)

Location:	Meiningen, Thüringen, former East Germany, 20.000 inhabitants
Size:	500 beds
Type:	general hospital
Registers:	1930 to 1970

**Table 19. Years and numbers of surgical procedures studied in Meiningen Krankenhaus 1930-1970**

Year	Number of procedures	Selection of 13 procedures	Percentage
1930	101	78	77%
1940	103	85	83%
1950	152	149	98%
1960	115	112	97%
1965	65	64	98%
1970	128	126	98%
All	664	614	92%

Note: The lower contribution of the 13 procedures in 1930 was caused by the presence of ENT-surgery that was not recorded in the following years.

**Table 20. Administrators of anaesthetics in the 13 procedures in Meiningen Krankenhaus 1930-1970**

Year	Doctor	Surgical Staff	Non Medical Staff	Local anaesthesia	None or not mentioned	Sum
1930				10 (13%)	68 (87%)	78
1940				28 (33%)	57 (67%)	5
1950				33 (22%)	116 (78%)	149
1960		10 (9%)	34 (30%)	40 (36%)	28 (25%)	112
1965		5 (8%)	14 (22%)	26 (41%)	19 (30%)	64
1970	70 (56%)	24 (19%)	4 (3%)	26 (21%)	2 (2%)	126

166. Nr. Kranken- buch Nr.	Datum	Name, Alter, Wohnort	Diagnose	o) Operateur b) Assistenten	Narkose			Dauer der Operation	Ort der Operation und Bestand	Ausgang der Krankheit	Bemerkungen
					mit mm	ohne Anästhe- tika	andere Anästhe- tika				
101	15.1.60		gallensteinen- Ca. Stadium II	Operiert v. Meininger u. Dr. Jochen H. u. K. K. K.				OTN	Prothylargan- Narkose	17.1 26.2.60	5 5
102	"		ind. Nieren- Narkose	Dr. J. J. u. Dr. W. W.				OTN	Rad. Op. n. Barbitur.		
103	"		Phosphor- narkose	Dr. J. J. u. W. W.				OTN	Phosphor- Narkose		
104	"		Ulcus- narkose	Dr. J. J. u. W. W.				OTN	Magen- Resektion	28.1.60	
105	"		"	Dr. J. J. u. W. W.				OTN	"		

Figure 32. Operationsbuch Allgemeines Krankenhaus Meiningen 1960.

Moabit Krankenhaus, West Berlin (Figure 33, 34)

Location:	formerly Turmstrasse 21, West Berlin
Size:	ca 970 beds
Type:	district hospital
Registers:	1890 to 1945

**Table 21. Years and numbers of surgical procedures studied in Moabit Krankenhaus 1890-1945**

Year	Number of procedures	Selection of 13 procedures	Percentage
1890	100	88	88%
1900	100	92	92%
1910	100	92	92%
1920	101	96	95%
1930	99	94	95%
1935	97	88	91%
1940	100	93	93%
1945	99	89	90%
1945a	100	88	88%
All	896	820	92%

Note: In 1945 there were operation registers from two different sites.

**Table 22. Administrators of anaesthetics in the 13 procedures in Moabit Krankenhaus 1890-1945**

Year	Doctor	Surgical Staff	Non Medical Staff	Local anaesthesia	None or not mentioned	Sum
1890					88 (100%)	88
1900					92 (100%)	92
1910				5 (5%)	87 (95%)	92
1920				9 (9%)	87 (91%)	96
1930				21 (22%)	73 (78%)	94
1935	2 (2%)	54 (61%)		18 (20%)	14 (16%)	88
1940	6 (6%)	72 (77%)		10 (11%)	5 (5%)	93
1945	1 (1%)	60 (67%)	12 (13%)	7 (8%)	9 (10%)	89
1945a		33 (38%)	46 (52%)	2 (2%)	7 (8%)	88

Krankheits- Nr.	Geburts- Nr.	Mittl. Größe	Alter	Blut		Krankheit	Operation	Sterblich	Befund, spez. Untersuchungen	Bemerkungen
				Hämoglobin	Hämatokrit					
616	21	145	45	85	10	Beobachtet Mutter an 2 Wochen post partum	1/2	Caesaria langsam R.		
617	19	145	45	10	10	Wochen an 2. Woch	1/2	Tracheotomie		
618	21	145	45	10	10	Wochen an 2. Woch	1/2	Tracheotomie		
619	19	145	45	10	10	Wochen an 2. Woch	1/2	Tracheotomie		
620	21	145	45	10	10	Wochen an 2. Woch	1/2	Tracheotomie		

Figure 33. Operation Register Moabit Krankenhaus, Berlin, February 1910.

Städtisches Krankenhaus Moabit									
Lohn buch Nr.	Krankh.	Krankh.		Arzt Nr.	Kranken- nummer	Krankh.	Operation	Bemerkungen	1945
		Alter	Ortszahl						
1555		60 J.	816		4908		36 H.	unvoll. Nerven	
1552		30 J.	816		4915		30 H.	Dorsion	
1573		64 J.	928		4925		31 H.	Hand u. Fuß Fraktur Pharynx u. Larynx	
1588		42 J.	836		4938		31 H.	Varicella	
1597		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1599		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1600		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1601		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1602		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1603		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1604		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1605		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1606		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1607		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1608		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1609		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1610		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1611		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1612		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1613		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1614		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1615		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1616		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1617		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1618		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1619		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1620		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1621		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1622		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1623		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1624		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1625		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1626		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1627		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1628		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1629		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1630		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1631		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1632		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1633		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1634		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1635		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1636		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1637		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1638		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1639		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1640		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1641		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1642		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1643		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1644		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1645		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1646		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1647		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1648		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1649		24 J.	246		4948		31 H.	Kolonperforation eigen	1945
1650		24 J.	246		4948		31 H.	Kolonperforation eigen	1945

Figure 34. Operation Register from Moabit Krankenhaus, Berlin 1945.

## Universitätsklinikum Tübingen Krankenhaus (Figure 35)

Location:	Tübingen, Baden-Württemberg, 80.000 inhabitants
Size:	approximately 1500 beds
Type:	University Hospital
Registers:	1928 to 1960

**Table 23. Years and numbers of surgical procedures studied in Tübingen Krankenhaus 1928-1960**

Year	Number of procedures	Selection of 13 procedures	Percentage
1928	100	91	91%
1930	100	94	94%
1935	100	92	92%
1940	100	96	96%
1945	100	81	81%
1950	100	96	96%
1955	100	96	96%
1960	100	92	92%
All	800	738	92%

**Table 24. Administrators of anaesthetics in the 13 procedures in Tübingen Krankenhaus 1928-1960**

Year	Anaesthetist	Doctor	Surgical Staff	Non-Medical Staff	Local Anaesthesia	None or not mentioned	Sum
1928		4 (4%)	27 (30%)	9 (10%)	49 (54%)	2 (2%)	91
1930		1 (1%)	48 (51%)		43 (46%)	2 (2%)	94
1935		1 (1%)	31 (34%)		60 (65%)		92
1940		1 (1%)	59 (61%)	3 (3%)	33 (34%)		96
1945			38 (47%)	13 (16%)	27 (33%)	3 (4%)	81
1950			6 (6%)	44 (46%)	43 (45%)	3 (3%)	96
1955		8 (8%)	57 (59%)	1 (1%)	30 (31%)		96
1960	9 (10%)	54 (59%)	13 (14%)		16 (17%)		92

Ulk. Nr.	Datum	Abt.	Namens und Vorname	Alter	Krankheit	Oper. Name	Operation	Operateur und Assistenten	Art der Schnittverletzung	Dauer der Operation	Menge des mitgetragenen Blutes	Notiz zur Notiz	Bemerkungen
85	6. I.	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	40'	1000 ml	Bluterguss	
86	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
87	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
88	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
89	6. I.	K.	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
90	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
91	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
92	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
93	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
94	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
95	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
96	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
97	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	
98	1	FT	H. Himmelschein	37	Bluterguss in den Brustkorb	Öffnen des Brustkorbs	Öffnen des Brustkorbs	R. Klein	Bluterguss in den Brustkorb	30'	1000 ml	Bluterguss	

Figure 35. Operation register Universitätsklinikum Tübingen 1945, also showing blood transfusion as a surgical procedure.



### Appendix 3 The surgical instruments companies and their catalogues

One way to take a look into an operating theatre at the end of the 19<sup>th</sup> century is to open the catalogue of a surgical instruments supplier or wholesaler from that time. In these catalogues one virtually walks through a hospital of those days. They offered items ranging from surgical knives to infusion fluids and from operating tables to doorplates for the consultation room. In this study the development of the anaesthetic industry is derived from these commercial catalogues. To obtain as broad a view as possible all catalogues of industrial companies based in Germany or Great Britain between 1890 and 1970 and selling anaesthetic equipment were listed by the following method.

In the library search engines Picarta<sup>®</sup> and Worldcat<sup>®</sup> the keywords Preiscourant, chirurgische, surgical, Instrumente, instruments, catalog(ue) and Katalog were tracked. The keywords anaesthesia, Anästhesie, Narkose produced no results in this context. The libraries of the Rijksmuseum voor de Geschiedenis van de Natuurwetenschappen en van de Geneeskunde, also known as Museum Boerhaave in Leiden, the Netherlands and of the Thackray Medical Museum in Leeds, UK were researched on-site. In order to double-check the list of companies, all company names stamped on anaesthetic equipment depicted in anaesthetic or surgical textbooks or mentioned in secondary literature were traced. For example, Magill usually mentioned in his publications the names of firms where he obtained his devices for intratracheal and endotracheal anaesthesia.<sup>13</sup> Buxton depicted mouth gags made by Mayer & Meltzer.<sup>14</sup> A second check was performed using the bibliography by Davis and Dreyfuss on the instrument industry.<sup>15</sup>

The main instrument companies are listed below.

13 Magill, 'Forceps for intratracheal anaesthesia' (1920) 670. Magill, 'Apparatus for thacheal insufflation anaesthesia' (1921) 918. Magill, 'An apparatus' (1923) 228. Magill, 'Expiratory attachment for endotracheal catheters' (1924) 1320.

14 Buxton, *Anaesthetics* (1892) 47-49.

15 Davis, *The finest instruments ever made* (1986).

## Aesculap



Figure 36. The Aesculap logo. Aesculap is considered to be the mother of all German instrument makers.

The history of this company began in 1867 when Gottfried Jetter, a ‘Messerschmied’, cutler, started to manufacture surgical instruments in Tuttlingen in southwest Germany. In 1887 his brothers-in-law Wilhelm and Karl Christian Scheerer joined him and the name of the company was changed to ‘Jetter & Scheerer’. In the same year an establishment in Berlin was opened. Its logo, with the staff of Aesculapius, introduced in 1889, has become world-famous (Figure 36). Instruments from Aesculap were sold by instrument wholesalers like Medicinisches Waarenhaus.<sup>16</sup> In 1890 Gottfried Jetter retired as manager and opened branches abroad. In 1895 the family business was transformed into an ‘Aktiengesellschaft’, a joint-stock company, and renamed ‘Aktiengesellschaft für Feinmechanik vormals Jetter & Scheerer’. In 1969 the name became ‘Aesculap-Werke Aktiengesellschaft vormals Jetter und Scheerer’, or Aesculap. In its history the company had establishments in New York, London, Paris, Constantinople, Buenos Aires and Tokyo. In Berlin Aktiengesellschaft had an establishment at Karlstrasse 18 near Charité Krankenhaus. Aesculap is considered to be the mother of and model for all cutler-surgical instrument makers.

## Allen & Hanburys

The story of Allen & Hanburys is a fine illustration of the role of pharmaceutical companies in the instrument industry. The company was founded in 1715 by Silvanus Bevan as an apothecary at Plough Court, 37 Lombard Street, London. The name Allen & Hanburys came into being in 1792 when the scientist William Allen joined the company. He married Charlotte Hanbury in 1806. The plough from Plough Court remained the logo of the firm. The main business was the production, sale and distribution of pharmaceuticals like cod-liver oil, malt extracts, throat pastilles and baby food. Later insulin, hormones and respiratory drugs entered the assortment. The company also manufactured and sold surgical instruments from the beginning. Their production could be considered as the personal hobby of some of the firm’s founders, like Cornelis Hanbury II who was a surgeon himself. In 1914 Allen & Hanburys started the production of operating tables. This product would become world-famous. They were manufactured in the firm’s own workplaces at Bethnal Green in London (Figure 37).

<sup>16</sup> Medicinisches Waarenhaus, *Chirurgie-Instrumente* (1906) 25.

<sup>17</sup> Weston-Davies, ‘The surgical instrument maker’ (1989) 40-43.

<sup>18</sup> Chapman-Huston, *Through a city archway* (1954) 211, 237-244. Tweedale, *At the Sign of the Plough* (1990) 98-99, 119, 175-179.



Figure 37. Allen & Hanburys Instrument Factory (1901). Although originally a pharmaceutical company, Allen & Hanburys had an extensive surgical instrument branch.

An advantage for Allen & Hanburys, like other pharmaceutical companies, was their experienced and widespread distribution system. This correlation has been noticed before.<sup>17</sup> After the Second World War the hand-crafting of surgical instruments became too expensive to survive and vanished. Allen & Hanburys limited itself to pharmaceuticals again and was purchased by Glaxo Laboratories (later GlaxoSmithKline). However, in Great Britain respiratory research and drug production is still done under the old company name.<sup>18</sup>

Allen & Hanburys had branches worldwide. Its agencies were based in countries of the British Empire and Commonwealth: Arabia, Australia, Canada, Egypt, India, Kenya, Malaya, New Zealand, Nigeria, the West Indies and South Africa, but also outside the empire in Argentina, Belgium, China, France, Italy, the Netherlands, Spain, the US and Germany. The agency in Hamburg was however closed after the Great War. In London Allen & Hanburys had several locations near the big hospitals. The original location at Plough Court was close to St. Bartholomew's Hospital. In Marylebone, near University College Hospital and Middlesex Hospital, Allen & Hanburys had shops at 48 Wigmore Street and 7 Vere Street.

19 B. Braun, *Hauptliste* (1955) 43-44, 47.

### B. Braun Melsungen

Like Allen & Hanburys, B. Braun Melsungen was originally a pharmaceutical company. In 1839 Julius Wilhelm Braun started a mail order business for local herbs and drugs from the Rosen-Apotheke, which he had acquired in Melsungen. His son Bernard Braun registered the company as B. Braun in 1867. B. Braun had a great interest in surgery and anaesthesia. It was world-famous for its suture materials, ready-to-use intravenous fluids and access devices. Products from Rüsck and Dräger were resold.<sup>19</sup> B. Braun, Melsungen has had branches worldwide since the end of the 19<sup>th</sup> century in New York, London, Paris, Constantinople, Buenos Aires and Tokyo.<sup>20</sup>

### British Oxygen Company

This company was founded in 1886 by Arthur and Leon Brin. The original name was Brin's Oxygen Company or BOC. To produce oxygen they used a patented high temperature barium oxide process. In 1906 the Brin brothers acquired permission to use a patent held by Linde in Germany, to produce oxygen by repeatedly cooling down air. Because the Brin process was no longer the core business they renamed the company British Oxygen Company, also abbreviated as BOC. In 1935 the company established a medical division, called BOC Medishield, which could provide central oxygen storage and delivery to hospitals. In 1939 the company took over Coxeter & Son. From 1950 BOC Medishield began producing anaesthetic machines named after great anaesthetists like Boyle. BOC Medishield clearly profiled itself as an anaesthetic company. It sold not only machines but also devices like endotracheal tubes manufactured by Leyland Medical International, laryngoscopes, face masks, intravenous equipment and even anaesthetic charts.<sup>21</sup> In fact the anaesthetic branch was only a small part of BOC. It had many more industrial applications for compressed air. In 1982 BOC Medishield merged with Ohio Medical Instruments from the US to form Ohmeda.<sup>22</sup>

The company had many branches in the United Kingdom in Birmingham, Manchester and Glasgow and abroad in Australia, France, Germany and the US. In London the British Oxygen Company was located near the Westminster Hospital in Horseferry Road.

### Chiron-Werke

This company also came into being in Tuttlingen, southwest Germany, in 1921 as 'Fabriken feinmechanischer und chirurgischen Instrumente', Factory for fine-mechanic and surgical instruments, as a merger of two of the many similar existing cutlery and surgical instruments manufacturers in this region. In 1922 its name was changed to Chiron, a clear reference to its example and competitor Aesculap. In Greek mythology χείρων,

20 'From druggist to global player' B. Braun Melsungen, 2009, available at <http://www.bbBraun.com/company/history>.

21 British Oxygen Company, *Medical Price List* (1954); *Intubation Instruments* (1957); *Anaesthetic Sundries* (1961).

22 BOC, 'A brief history' (2009) available at [www.boc.com](http://www.boc.com).

23 Chiron 'Ahead through experience' (2009) available at [www.chiron.de/company/history](http://www.chiron.de/company/history)

Chiron, was the teacher of Aesculap. Its high tide for the surgical instrument manufacturing was the 1930s when its catalogue offered 30,000 articles and was printed in German, English, French and Spanish. Chiron exported 81% of its production. During the Second World War the production shifted to military goods. After the Second World War the medical branch remained small and it was sold in 1976.<sup>23</sup>

### Coxeter

Coxeter & Son was one of the companies in London that started to compress gases into a bottled and transportable form in 1868. From the beginning the administration of gaseous and volatile anaesthetics was a market for Coxeter & Son. They produced face masks and tubing for administration systems. After the First World War Coxeter produced complete anaesthetic machines, after the design of Boyle amongst others. In the inter-war years Coxeter enlarged its interests by purchasing the majority of shares of AC King. In 1939 Coxeter itself was taken over by the British Oxygen Company. Coxeter had no sales organization. Its products were offered by all wholesalers. Its address in London was 171 Pancras Road near Marylebone.

### Down Brothers

In Britain one of the leading companies in this market sector was Down Brothers Ltd, which was to merge with Mayer & Phelps after the Second World War. Down Brothers really sold everything one could ever use in a hospital or private surgery. Approximately every 5 years a new and thicker catalogue appeared. Down had the honour of producing the thickest catalogue of all wholesalers in 1935, with over 2,000 pages.

Down Brothers Ltd had agencies in London, Calcutta and Toronto.<sup>24</sup> In London Down Brothers had shops in St. Thomas Street and near Marylebone at 22A Cavendish Square. Being in the vicinity of major hospitals was important. Therefore the front page of its catalogue in 1929 mentioned the shop in St. Thomas Street as located opposite Guys Hospital.

### Dräger

The Dräger Company was founded in 1889 in Lübeck, Germany, by Johann Heinrich Dräger. The core business was the production of pressure-reducing valves. The first compressed gas Dräger delivered these valves for was carbon dioxide in beer tap systems. The first anaesthetic machines were developed in 1902 in cooperation with the Lübeck surgeon Otto Roth. From that year on Dräger kept in close contact with the anaesthetic world. In 1906 an overpressure cabinet was produced. Anaesthesia was by no means the only terrain where Dräger deployed activity. Protective breathing masks have always formed a major part of the assortment. During the two world wars Dräger produced gas masks for military and civilian use. Dräger machines were sold worldwide.<sup>25</sup>

<sup>24</sup> Down, *Catalogue of surgical instruments* (1929) title page.

<sup>25</sup> Dräger, *The History of Dräger* (2006) 7-23.

### King AC

Charles King opened his medical supplies store at 33-34 (later 27) Devonshire Street, London after the First World War. Like other medical supply companies this location was in Marylebone close to the heart of medical London. He cooperated with great anaesthetists like Magill in the years between the two world wars. His shop was described by the American anaesthetist Ralph Waters as a Mecca for anaesthetists. King also collected historic anaesthetic equipment, which has been described by Kenneth Bryn Thomas in his book, *The Development of Anaesthetic Apparatus*. The King collection is now at the offices of the Association of Anaesthetists of Great Britain and Ireland.

### Leyland Medical International (Leymed)

One of the first producers of rubber endotracheal tubes was Leyland and Birmingham Rubber Company, established in 1880 in Leyland, Lancashire. During the Second World War they supplied endotracheal tubes, stamped with 'AC King' after Magill's earlier partner, to BOC Medishield and wholesalers like Medical & Industrial Equipment.<sup>26</sup> For this purpose Leyland established a separate medical branch named Leyland Medical (Leymed) International.

### Mayer & Meltzer, Mayer & Phelps

This company was founded in 1863 by Joseph Mayer from Romania, who became a British subject in the same year, and by H. Meltzer. Meltzer died in 1886, Mayer in 1892. The company was continued by Ernest Mayer, son of John, and Percy G. Phelps. Its London shop was established at 71 Great Portland Street; the factory was at 83 Dean Street. International establishments were in Melbourne, Cape Town and Johannesburg. The firm had several famous customers. For instance, Joseph T. Clover, a London chloroformist in the 1860s, praised Mayer & Meltzer for the perfection of his ether inhaler. Morell Mackenzie, a pioneer of laryngology in Britain, ordered the special delivery of a tracheotomy tube to be used in the treatment of obstructive laryngeal cancer in the German Emperor Frederick III on February 8<sup>th</sup> 1888 in San Remo.<sup>27</sup> In later years the company was renamed Mayer & Phelps and had establishments at 34 and 59-61 New Cavendish Street (Chiron House). Mayer & Phelps used as their trademark the same mythological figure as Chiron-Werke in Germany. After the Second World War the company vanished in a merger with Down Brothers.

### Rüsch Weichgummiwaren – Interview with Heinz Rüsch

The story of Rüsch has been published several times. For this study it was possible to record the results of a personal interview by the author with Heinz Rüsch on January 10<sup>th</sup> 2004 in Jungholz, Austria. Heinz Rüsch was born in Bad Canstatt in 1928. As a child he

<sup>26</sup> Electronic mail correspondence in 2003 with Jack Crabtree, sales manager at Phoenix Medical, the continuation of Leyland Medical International after its acquisition by Teleflex in 2003.

<sup>27</sup> Mayer, *Illustrated catalogue* (1915) Preface.

<sup>28</sup> Bude-Hackenberg, *Willy Rüsch* (1985) 104.

lived in a villa on factory terrain in Rommelshausen. His father was Willy Rüschi, who died in 1980. Heinz Rüschi was an engineer and entered the management of the Rüschi company in 1953. He expanded the company considerably. This is illustrated by the increase in buildings in its industrial zone.<sup>28</sup> Rüschi had had a subsidiary in the US since 1906 and delivered its goods to 76 countries. Heinz Rüschi retired in 1989.

In 1885 Rüschi manufactured products including 'Schlundbougies', enteral tubes, used to dilate the oesophagus of horses. They were made of woven silk or cotton and dipped in a cobalt-resin-enamel. In 1904 the first tube with a balloon was made out of this 'Lackgewebe'. By that time it had become the universal process to produce catheters. Rubber was introduced in the first decades of the 20<sup>th</sup> century. The company changed its name by that time to Rüschi Weichgummiwaren. 'Lackgewebe' remained in use until 1950. Latex was introduced after the Second World War.

In 1886 the automobile manufacturer Daimler used 'Rüschi-Schlauch', tubing from Rüschi, as 'Bougierrohr', a spark plug sheath, to isolate the ignition wires in cars. Rüschi produced this isolation tubing for the automobile industry until after the Second World War. Rüschi supplied all the great German car producers, like Volkswagen, Mercedes and BMW. During the Second World War the tubing was made of synthetic rubber. After 1945 this production was hived off. Demand from the automobile industry had become too small. The medical industry was more interesting. Henkel-Teroson in Heidelberg has taken over the production of this isolation material.

Heinz Rüschi managed to acquire some 700 patents for the company. In 1929 Rüschi manufactured the first rubber rectal catheter with a balloon according to Nordman.<sup>29</sup> This balloon was what was at stake in the patent process in 1954 against C.R. Bard in the US. Bard had patented a urologic balloon catheter in 1944. This patent process was won by Rüschi. Rüschi cooperated with companies like Dräger and with individual doctors such as Sauerbruch for the production of anaesthetic masks, drains and so on. A rubber industry comparable to Rüschi existed only in Britain with Leyland, Warne, Franklin and Eschman as company names. Medical & Industrial Equipment was known to Heinz Rüschi but only as a wholesaler, not as a manufacturer.

Directly after the Second World War Heinz Rüschi, then an 18-year-old student, had a special driver's licence to deliver rubber medical devices, including endotracheal tubes, from the Rüschi Company to US Army hospitals in Germany. The production of endotracheal tubes according to Magill's curved model of massive rubber was started after the war. This model was not patented, neither was the model with cuff according to Waters and Guedel. Later, the reinforced spiral endotracheal tube was patented by Rüschi. The size for endotracheal tubes has always been the Charrière. Before, during and immediately after the Second World War no market for endotracheal tubes existed in

<sup>29</sup> Rüschi, *Catalogus* (1960) 2090.

<sup>30</sup> Rummel, *75 Jahre Willy Rüschi* (1960) 27.

Germany. There were no doctors that used them. The German army did not purchase them.

The raw material for the rubber products was 'Naturkautschuk' (natural rubber). During the war this was scarce.<sup>30</sup> The 'Überwachungsstellen', surveillance agencies, supervised its rationing. Experiments were performed on a large scale with replacements like Buna-S (from oil) and PVC, at first manufactured by IG-Farben as Ig-lit, subsequently by Rüschi as Rüschielit. Nevertheless, Buna was never used for medical applications like urological and gastro-enterological catheters, or for endotracheal tubes. The medical industry was too important, also for morale, to use surrogate raw material. After the war 'Naturkautschuk', natural rubber, was still rationed. Yet, because it was used for medical purposes Rüschi was supplied with it. Rüschi had been the only rubber company to survive the interwar rubber crisis in Germany. Due to its international contacts and its links with the automobile industry Rüschi had been able to obtain 'Naturkautschuk', natural rubber, as raw material and to keep producing rubber products although between 1928 and 1953 no catalogue was published. After the Second World War Rüschi became the embodiment of the re-entry of German companies in the circle of medical devices industry.

### John Weiss and Son

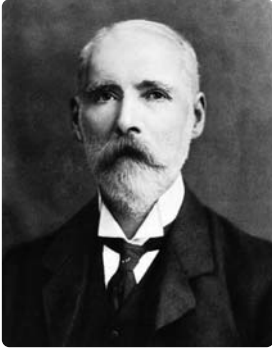
Originally this family company of cutlers and surgical instrument makers came from Braunschweig and later Rostock in Germany. It established itself in London in 1787. The relation of cutlery and surgical instrument fabrication was clear to see at its shop window at 62 Strand near Charing Cross Hospital in Agar Street. The company manufactured gum catheters as early as 1823 according to their catalogue of chirurgical instruments.<sup>31</sup> The company still exists but is specialized in ophthalmic surgery.

<sup>31</sup> Weiss, *Catalogue of Chirurgical Instruments* (1823).



## Appendix 4 Some key figures

Ordered by their date of birth



### Dudley Wilmot Buxton (1855-1931)

Buxton was educated at University College and University College Hospital in London. After his graduation he worked with Sidney Ringer, the inventor of Ringers' solution, on the action of drugs on the heart. From 1885 he concentrated on the administration of anaesthetics and was appointed to University College Hospital and the Royal Dental Hospital in London. He lived at 82 Mortimer Street in the middle of Marylebone. In 1888 he wrote the first textbook on the administration of anaesthetics in general named *Anaesthetics, their uses and administration*. It would go through

six editions by 1920. He was a member of the Anaesthetics Committee of the British Medical Association which wrote a report on the safety of anaesthesia from 1891 until 1900. He supported the dentists in their drive for the autonomous administration of general anaesthetics. He was a founding member of the Society of Anaesthetists in 1893 and would be its president at one time. In 1923 he was a founding editor of the *British Journal of Anaesthesia*.<sup>32</sup>



### Frederic William Hewitt (1857-1916)

Hewitt was educated at St. George's Hospital medical school in London. Although his career at first seemed to be in internal medicine he turned to anaesthetics because of his seriously defective eyesight. His main hospital appointment was at St. George's Hospital. In practice he was a proponent of gas and oxygen delivery from pressurized cylinders. Hewitt not only wrote a line of textbooks for anaesthesia; he always strove for the improvement of the social and educational aspect of the administration of anaesthetics. His personal crusade, the prevention of death under anaesthetics, was at its highest from 1908 to 1911 when he tried in vain to legally forbid the

administration of anaesthetics by unqualified persons.<sup>33</sup>

<sup>32</sup> Anonymous, 'Obituary Dudley W. Buxton' (1931) 37.

<sup>33</sup> Blomfield, 'Sir Frederic William Hewitt' (1927) 116-23.



### Franz Kuhn (1866-1929)

Kuhn was born in Aschaffenburg, Germany. After his medical study in Würzburg, Berlin and Munich he began surgical training in Giessen in 1891. Here he developed a great interest in anaesthesia and the protection of the airway by endotracheal intubation. In 1899 he moved to Kassel where he worked as a surgeon. In 1905 he presented his peroral intubation which was performed without laryngoscopy but by digital manipulation. This intubation enabled positive pressure ventilation and was the counterpart of Sauerbruch's underpressure cabinet. Together with the Dräger Company he developed the Kuhn-Dräger positive pressure ventilation machine in 1908. With the B. Braun Company in Melsungen he developed sterile catgut sutures and isotonic glucose infusion solutions.<sup>34</sup> His endotracheal tube is considered to be a precursor of modern endotracheal intubation. It failed however due to its steel construction and its complicated introduction in the airway. Photo: with kind permission of Springer Science and Business Media.



### Ferdinand Sauerbruch (1875-1951)

Sauerbruch was born in Barmen, Wuppertal. He graduated in medicine in Leipzig in 1902. He trained for surgery in Erfurt and later in Breslau under Mickulicz. In 1904 he presented his experiments with an underpressure cabinet to prevent lung collapse during intrathoracic surgery. The first application on a human was performed in 1905. In 1910 he became a professor of surgery in Zürich and developed an extensive private practice. In the First World War he was a consultant surgeon to the 15<sup>th</sup> German army corps. After the war he was a professor of surgery in Munich. In 1920 he established 'Deutscher Ersatzgliederwerkstätten Sauerbruch DERSA', a German factory for Sauerbruch limb prostheses. In 1928 he moved to the Charité in Berlin where he stayed until his retirement in 1949. He was a fierce opponent of splitting up the surgical specialty. In this context he is often blamed for hindering the establishment of anaesthesia as a medical specialty in Germany. That view is not supported in this study.<sup>35</sup>

<sup>34</sup> Dietz, 'Sterile catgut Kuhn' (2007) 2275-83.

<sup>35</sup> Sauerbruch, *Das war mein Leben* (1951).



### Alfred Edward Webb-Johnson (1880-1958)

Webb-Johnson was born in Stoke-on-Trent as the son of Samuel Johnson and Julia Webb. All of their children adopted their mother's maiden name to have Webb-Johnson as their surname. Alfred qualified for medicine at the Victoria University in Manchester in 1903. After surgical residencies he became an assistant surgeon at the Middlesex Hospital in London in 1911. He served as a consulting surgeon in both the First and Second World War in the rank of Colonel. His surgical interest was urology, by then a part of surgery. His merits however were mainly in the organization of surgery in Britain and its dominions. He was a charming man, had many friends and consorted with kings without losing his common touch. He was a personal friend of Queen Mary and Her Majesty's surgeon. He was a master at fundraising, especially for stately buildings, amongst others for his Royal College of Surgeons at Lincoln's Inn Fields in London. Lord Nuffield was one of the benefactors.<sup>36</sup> In 1932 Webb was elected to the Council of the Royal College of Surgeons of England and would be the longest-serving president of the college, from 1941 to 1949. In 1948 he became Lord Webb-Johnson. He strove for the Royal College of Surgeons to be a centre of postgraduate teaching; not just for surgery but also for gynaecology, dental surgery, ophthalmology, radiology, otolaryngology, general practice and anaesthesia. In 1948 he led the formation of the Faculty of Anaesthetists of the Royal College of Surgeons, which was actually point when British anaesthetists began to be recognized as medical specialists.<sup>37</sup>



### Ashley Skeffington Daly (1882-1977)

In the context of this book Daly is to be considered as the most important British anaesthetist. He was educated in London and qualified in 1905. He was a pupil of Frederic Hewitt. He was appointed to the London Hospital from 1910 to 1947. In the First World War he served as an anaesthetist in the Royal Army Medical Corps. After the war he wrote the anaesthetic chapter in Barling's *A Manual of War Surgery*. He was president of the section of anaesthetics of the Royal Society of Medicine and a founder of the Association of Anaesthetists in 1932. He himself received the Diploma in Anaesthetics in 1935 without examination. In the years of growth of the number of anaesthetists for the army he was president of the Association from 1941 to 1943 and at

<sup>36</sup> Webb-Johnson, 'Viscount Nuffield' (1949) 64-67.

<sup>37</sup> Webb-Johnson, 'Foreword by the President' (1947) 7. Anonymous, 'Lord Webb-Johnson' (1953) 1-3. Anonymous, 'Obituary Lord Webb-Johnson' (1958) 1357-1359. Gordon-Taylor, 'In Memoriam Lord Webb-Johnson' (1958) 64-66.

the same time as Brigadier General the highest-ranked adviser in anaesthetics to the army. In this function he initiated a number of improvements in the training of anaesthetists. A more central role in these crucial years was impossible.<sup>38</sup> After his retirement he contributed the anaesthetic chapter to the official *History of the Second World War* in 1953.



**Ivan Whiteside Magill (1888-1986)**

Magill was born the son of Sara Whiteside and Samuel Magill in Larne in Northern Ireland. He qualified from the University of Belfast in 1913. He was medical officer in the rank of captain in the First World War. After the war he became an anaesthetist at Barnet War Hospital and the Queen's Hospital for Facial and Jaw Injuries in Sidcup. In 1923 he was appointed to the Brompton Hospital for Consumption and in 1924 to Westminster Hospital. Together with Stanley Rowbotham he developed the rubber endotracheal wide-bore intubation. Its historic presentation before the Section of Anaesthetics of the Royal Society of Medicine was in 1928. In addition to this trademark of future anaesthetists he developed several handy minor solutions for the administration of anaesthetics. All of these goods were sold by Medical & Industrial Equipment of which Magill was the director. He was one of the initiators of the Diploma in Anaesthetics. He obtained the diploma himself in 1935 without an examination. He lived at 66 Wimpole Street in Marylebone until 1941 when his house was bombed. During the Second World War he was an adviser in anaesthetics to the Ministry of Health, a consultant adviser to the Emergency Medical Service and to the Royal Navy. He was a legend in his own lifetime.<sup>39</sup>

38 Parry Brown, 'Obituary AS Daly' (1978) 387-389.

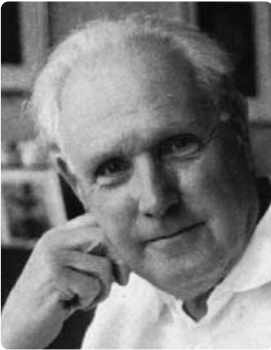
39 Rowbotham, 'Ivan Magill' (1951) 49-55. Edridge, 'Sir Ivan Whiteside Magill' (1987) 231-233.



#### **Karl Heinrich Bauer (1890-1978)**

Bauer was born in Schwarzdorf, Oberfranken, Germany. He served as a medical officer in the First World War. He was a professor of surgery and director of the surgical university clinic in Breslau from 1933 to 1943. From 1943 until 1962 he was a director of the surgical clinic in Heidelberg. He was the first rector of the University of Heidelberg after its reopening in 1945. In 1952 and 1958 he was president of the Deutsche Gesellschaft für Chirurgie. Although he had the traditional reluctance to accept a separate anaesthetic specialty he is to be considered the German designer of the division of labour

between surgeon and anaesthetist in the modern operating theatre.<sup>40</sup>



#### **Hans Franz Edmund Killian (1892-1982)**

Killian was born in Freiburg as the son of a rhino-laryngologist. His medical study at the University of Freiburg has been interrupted by the First World War in which he served as Front Officer. He graduated in 1921 and became assistant surgeon to Eduard Rehn, who was a professor of surgery in Freiburg from 1928 to 1952. Killian habilitated for surgery and orthopaedics in 1930 at the University of Freiburg. During his surgical training he made a study trip to Britain and the US to witness modern anaesthesia techniques. In 1935 he became extraordinary professor of surgery in Freiburg. From 1943

to 1945 he was the last German professor of surgery in Breslau. During the Second World War he was a consultant surgeon to the German army on the eastern front. He had always been interested in anaesthesia and wrote several textbooks on it. In 1934 he wrote *Narkose zu operativen Zwecken* and in 1954 *Die Narkose*. Together with Schmidt he was a fierce proponent of a separate anaesthetic specialty. In 1949 he started this discussion again during a lecture on the application of muscle relaxation for the German society of surgery. He was one of the founders of the 'Deutsche Gesellschaft für Anästhesie'.<sup>41</sup>

40 Schwaiger, 'Karl Heinrich Bauer in Memoriam' (1979) 441-443.

41 Nolte, 'Franz Edmund Killian' (1982) 95-96.



### Henry Hamilton Bailey (1894-1961)

Bailey was born in Bishopstoke, Hampshire. He served as a temporary surgeon during the First World War in the Royal Navy. After the completion of his surgical training he worked as a surgeon in Liverpool and London. He was the best-known writer of surgical textbooks in Britain. In the Second World War he was enlisted in the Emergency Medical Service. He published *Surgery of Modern Warfare*, by then the bible for military surgeons around the world. In subsequent editions of this book a growing role for the anaesthetist was described, including circulatory management. Despite his extensive authorship he was never elected to a teaching hospital or a surgical chair. This is an illustration of the non-academic nature of surgery and medicine in Britain at that time. Bailey died in Malaga, Spain.<sup>42</sup>



### John Gillies (1895 -1976)

Gillies was born and educated in Edinburgh, Scotland. He served in the First World War with the Highland Light Infantry in the British Expeditionary Forces. After his medical graduation in 1923 he became a general practitioner in Yorkshire. After a few years he decided to turn to anaesthetics. He was a resident with Magill in London. He returned to Edinburgh in 1932 to start work as an anaesthetist in the Royal Hospital for Sick Children and later the Royal Infirmary. He obtained his Diploma in Anaesthetics in 1935. He was well-known for his gentle approach to patients. He told his students over and over that the such-and-such anaesthetic they would routinely administer that day was a life-changing event for the patient, who would talk about it for months. He was president of the Association in the turbulent years of the beginning of the National Health Service. His guidance and determination in those years was essential to the specialty.<sup>43</sup>

42 Anonymous, 'Obituary Hamilton Bailey' (1961) 1043-1044.

43 Helliwell, 'Obituary John Gillies' (1976) 1311-1313.



### **Helmut Carl Detlef Schmidt (1895-1979)**

Schmidt was born in Berlin. He graduated in Frankfurt and Hamburg. From 1923 he trained in surgery in the Eppendorf Hospital in Hamburg under Sudeck. He wrote his thesis on the re-introduction of gaseous anaesthesia in Germany. Its use had fallen into oblivion due to the economic and industrial crisis in Germany after the First World War. In 1928 Schmidt made a study trip together with Killian to Great Britain and the US to study the art of anaesthesia in the Anglo-Saxon world. In the same year he was a member of the organizing committee of the first German anaesthesia congress. Schmidt profiled himself as a fierce proponent of thorough training in anaesthetics, and believed that large hospitals and university hospitals should have anaesthetic specialists to attain this goal. He was offered a teaching chair in anaesthetics at the University of Hamburg but he refused because of the uncertain financial future of such a novelty. In 1934 he went to Remscheid for a position as chief surgeon. His crusade for an anaesthetic specialty went on and was crowned in 1953 with the recognition of anaesthesia as a separate specialty.<sup>44</sup>



### **Robert Reynolds Macintosh (1897-1989)**

Macintosh was born in New Zealand. He was a fighter pilot during the First World War. After the war he qualified from Guy's Hospital in London. He first wanted to become a surgeon but chose anaesthesia, especially for dentistry. In 1937 he was the first person to occupy the Oxford Chair in Anaesthetics, established by the owner of the Oxford Morris Motor Company, later Lord Nuffield. Macintosh obtained his Diploma in Anaesthetics in 1939. His anaesthetic department was almost a spiritual centre of anaesthesia around the Second World War. He was an adviser in anaesthetics to the Royal Air Force in the rank of air commodore. He was a proponent of the controlled education and employment of nursing personnel to assist the anaesthetist. He published a series of textbooks on general anaesthesia with special reference to dentistry. He became famous for his curved laryngoscope blade and for the invention of the first special field equipment for anaesthesia, the Epstein Macintosh Oxford vaporizer.<sup>45</sup>

44 Goerig, 'Helmut Schmidt' (1996) 621-631.

45 Mushin, 'Professor Emeritus Robert Reynolds Macintosh' (1989) 951-952.



### Richard Heinz-Joachim Bark (1918-1963)

Jochen Bark was born in Weissenborn, Thüringen. He studied medicine in Freiburg, Munich and Königsberg. After his graduation he worked in the surgical department of Eduard Rehn in Freiburg and in the sanatorium in Todtmoos. In 1949 he had the opportunity to go to Macintosh in Oxford to receive training in anaesthesia. On his return he became an anaesthetist at the sanatorium in Todtmoos. In 1954 he went to Tübingen to become chief of the anaesthetic department of the University Hospital. His scientific merit was based on his work on the electroencephalogram

during anaesthesia.

He was an exponent of the new generation of young German doctors, often with a surgical background, who saw the hole in the market for anaesthetists in postwar Germany. He was at the base of the first recognition of anaesthesia as a specialty by the 56<sup>th</sup> German 'Ärztetag', meeting of doctors, in 1953 in Lindau, Bavaria. He was the founding president of the 'Deutsche Arbeitsgemeinschaft für Anästhesie' in 1952 and the first president of its successor the 'Deutsche Gesellschaft für Anästhesie' in 1953. He was a contributor to *Der Anaesthetist* from 1953 and to the first German *Lehrbuch der Anästhesiologie*. Internationally he was vice president of the World Federation of Societies of Anaesthesiologists. He died tragically in an airplane crash on Easter Sunday 1963.<sup>46</sup>

46 Frey, 'In memoriam Jochen Bark' (1963) 228.



## Appendix 5 The sizes of anaesthetic devices

The standardization of sizes has always been far removed from the market in anaesthetic devices. The use of traditional non-metric sizes appealed more to the imagination of users. In the rubber devices the Charrière size or French Gauge has always been dominant. Francois Joseph Benoit Charrière defined it in the 1830s in Paris as an appropriate gauge for his urological dilating bougies. Until then most instruments came from Great Britain, for example from the Weiss Company in London. Weiss used the English gauge with increments of 0.5 mm. With typical French elegance Charrière considered increments of one-third of a millimetre to be more convenient and comfortable for the patient. The British urologist Thompson spoke highly of this finely graded gauge and introduced it as the French gauge in contrast to the English gauge. Besides its use in urology, catheters became the universal sterile tubing in hospitals and were used to experiment with new invasive techniques. In this way urological catheters were used for intratracheal insufflation. The French catheter size would gradually push aside all existing sizes in use by various companies. But this process was to last more than 100 years. Down Brothers as a typical British firm used the English size for tracheal catheters in its catalogue in 1900. More surprising is the phenomenon that one catalogue could use different sizes at the same time. In their 1929 and 1930 catalogues Down Brothers and Allen & Hanburys offered Magill's endotracheal catheters for children in English Gauge and for adults in French Gauge.<sup>47</sup> Down Brothers used nine new King's sizes for Magill's curved tubes.<sup>48</sup> In the 1938 catalogue Allen & Hanburys even used English, French and 12 King's sizes on the same page.<sup>49</sup> This inconsistency lasted until after the Second World War.<sup>50</sup>

Rüsch used English and French catheter gauges mixed up. Besides these there was also a German Size, identical to the French Size.<sup>51</sup> In the Rüsch catalogue of 1910 tracheal catheters were offered in Ch(arrière) 10-30, but other tracheal catheters with a bone knob were sized in Engl(ish Gauge) 8-15.<sup>52</sup> Although the metric sizes came to be the standard size in the 20<sup>th</sup> century it proved very difficult to ban the old familiar size of the Charrière. In the Rüsch catalogue of 1993 the internal diameter of an endotracheal tube is indicated in millimetres and the external diameter in Charrières.<sup>53</sup> In 2001 millimetres were used for internal and external diameters, but the Charrière is still recognizable in the order number of some special devices like armoured tracheal tubes.<sup>54</sup>

47 Down, *Catalogue of surgical instruments* (1929) 1359c. Allen, *Surgical Equipment* (1930) 47-48.

48 Down, *Catalogue of surgical instruments* (1936) 2069.

49 Allen, *Catalogue of Surgical Instruments* (1938) 36.

50 Allen, *Catalogue of Operation Tables* (1953) 514-515.

51 Tucker, 'History of sizing' (1982) 346-349.

52 Rüsch, *Chirurgie-instrumente und Weichgummiwaren* (1910) 35.

53 Rüsch, *Elastische Medizinische Instrumente* (1993) 7.

54 Rüsch, *Airways* (2001) 15.

The Charrière has never been used for intravenous access devices. This is in line with the observation that urological catheter material had never been used for this purpose. One exception confirms the rule. In 1961 Down Brothers used the Charrière for intravenous nylon catheters with the addition that the measure was 'approximate'.<sup>55</sup>

For intravenous needles and later catheters in Germany the standard was the millimetre and in Britain it was usually the Standard Wire Gauge. Contrary to the Charrière these were legally enforced sizes, and were not used only for medical equipment, but were standards from the steel industry. Wire gauges are old measures of thickness. They originated in the British iron wire industry at a time when there was no universal unit of thickness. The gauge is closely related to the iron, steel and especially the wire-drawing industry. An iron plate was cut into strips, which were rolled and hammered into rods. The rod was drawn through a conical hole in a hardened draw-plate, die or gauge. After intermediate annealing the resulting wire could be drawn through a next and narrower hole in the draw-plate to produce a thinner wire and so on. After the first draw and hence reduction gauge number 2 resulted. After the second draw the size was gauge number 3, and so on. When the quality and consistency of the material increased it became possible to draw thinner wire with still higher gauge numbers. This explains why most gauges have higher gauge numbers for smaller sizes. Wire gauges were measured and described in inches during the 19<sup>th</sup> century. In the United Kingdom one wire gauge was standardized and legally enforced as the Standard Wire Gauge.<sup>56</sup>

<sup>55</sup> Down, *Surgical instruments* (1961) p N2.

<sup>56</sup> Pöll, 'The story of the gauge' (1999) 575-81.

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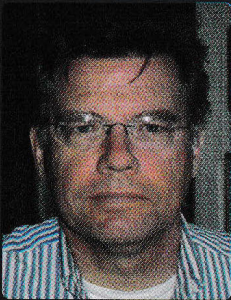
# Curriculum vitae of the author

Johan Sebastian Pöll was born September 28<sup>th</sup> 1952 in The Hague, The Netherlands. He attended primary school at the Da Costa School, The Hague, and gymnasium at the Christelijk Lyceum de Populierstraat, also in The Hague. He studied medicine at the Rijks Universiteit in Leiden and received his medical degree in 1977. After his military service as a medical officer in the Alexanderkazerne in The Hague he became assistant general practitioner to Th. van Stockum in 1979 and house officer in the Respiratory Care Unit in the Academic Hospital in Leiden in 1980 under Johan van Zanten. From 1981 to 1984 he was trained in anaesthetics in the same hospital under Prof. Joh. Spierdijk. From 1985 to 1989 he was an anaesthetist at the Juliana Children's Hospital and the Bethlehem Hospital in The Hague. Since 1989 he has worked as an anaesthetist in the Westeinde Hospital in the Hague, after the merger with Sint Antoniushove in Leidschendam in 1998 renamed the Medical Centre Haaglanden. Since 2003 he has been the teacher of anaesthetics at this hospital.

Since 1994 he has been a member of the Central Disciplinary Court of Healthcare. From 1995 to 1998 he was president of the Netherlands Society of Anaesthesiologists. Since 2004 he has been honorary secretary to the Concilium Anaesthesiologicum. Since his military service he has been a reserve Lieutenant-Colonel and served in Afghanistan and Kosovo. Since 1996 he has participated in voluntary Interplast missions, providing reconstructive surgery in Vietnam, Uganda and Rwanda.

He is married to Clementine Pauline Ernestine (Climmy) Tjepkema; they have three children and two grandsons.





The anaesthetist and the surgeon: two medical specialists working apart together. In the 21<sup>st</sup> century this is our daily reality, but what in history caused this division of labour around the surgical patient? To answer this question the author compared the evolution of the anaesthetic specialty in Britain and Germany, because separate anaesthetists existed in Britain long before they emerged in Germany. In this book you will become re-acquainted with all innovations and notable names, usually depicted as the proponents or opponents toward anaesthetic specialization. In the end, the author describes new insights into the causes for this compartmentalization of surgery and anaesthesia rooted deeply in the surgical and hospital traditions in both countries.

Johan Sebastian Pöll (1952) is anaesthetist and teacher in anaesthetics in the Hague, the Netherlands. He is a past president of the Netherlands Society for Anaesthesiology.

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