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## **Nikolay Ivanovich Pirogov and his contribution to medicine in 19th Century Imperial Russia**

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# Chapter 1

## General introduction

## General Introduction

During my study of Slavic language and literature (1992-2001) at the University of Leiden an elective could be filled. The chosen theme was Healthcare spearheaded on hospitals in the Russian Federation, which was even more narrowed to the "*history of nursing*". For the desk research of this article, it soon occurred that hardly any articles on the subject could be found in English scientific literature. Even in the library of the Royal Dutch Academy of Science, English literature was hardly available except for a few articles in Russian in some not complete volumes of Russian medical journals. More and more, it became clear that the subject and theme "the development of the medical profession and the contribution in Russia" were unknown and unexplored areas, especially in the English language. It needed attention to be discovered. To do such research requires some knowledge of Medicine and proficiency in several languages and especially in Russian.

My dissertation is about the profession of Medicine, particularly the medical substantive developments and organisation of medical care initiated by Nikolay I. Pirogov. To refine the research, it was decided to describe the development of the medical profession of a barber-surgeon to a scientific physician based on solid study with the focus on Nikolay Pirogov. It is about the profession of Medicine, particularly the medical substantive developments and organisation of medical care initiated by Pirogov. It was decided to use as much as primary literature possible with regards to Pirogov.

The hypotheses or central question for my research on Nicolay I. Pirogov is a comparison with Herman Boerhaave.

Why becomes a(n) (inter)national scholar relatively unknown or well-known. Boerhaave was an innovator in the Netherlands and Europe. His furthest and the only journey was restricted to Harderwijk.

Pirogov was an innovator in Russia and the world. His journeys went all over Europa, and his furthest distant was to La Spezia in Italy.

To answer the central theme, other questions evolve:

- ◆ Why was the time ripe for a reformer/designer like Pirogov?
- ◆ What has been Pirogov's essential contribution from a national and international perspective?
- ◆ When we compare Pirogov with his well-known predecessor Boerhaave, co-indirect designer of the Russian medical school, what are the similarities and differences?
- ◆ Although Pirogov described breakthroughs and co-founded an international health organisation, why has his work not been recognised after the first world war outside Russia?

This manuscript does not include the social and political aspects surrounding the implementation and development of the profession of Medicine and solely focussed on the medical impact. This is a different approach often taken by historians in humanities.[1-3] An exciting approach but not in this context. For a reader interested in this approach, the secondary literature we would like to refer to Mark Turda in *The Oxford Handbook of History of Medicine*.

To understand why Nikolay Ivanovich Pirogov was important for the profession of Medicine in Imperial Russia of the 19<sup>th</sup> century, an overview of the medical development is given in this introductory chapter. During research it became obvious the prominent role the Netherlands had played. An additional question arose. Can Pirogov be considered a follower or a product of the Dutch Leiden medical school?

### ***The birth of medicine in Russia***

From the IX to the XVIII century, Medicine in Russia went through a long and complicated course. After Kievan Rus' conversion to Byzantium Christianity, monks provided rudimentary medical care in the monasteries, along with folk healers. Most of the population in Russia did not have access to qualified medical care and relied on traditional folk remedies, which consisted mainly of the use of herbs and ointments. When urbanisation and welfare became more common, the demand arose for a different and more extensive form of medicine, not only for external but also for internal medicine. Only rich people received qualified medical care, which foreign physicians provided.

Tsar Mikhail Fyodorovich (1613-1645), the first reigning Romanov, instituted improvements in social welfare and healthcare. Around 1620 he established the Aptekarskiy Prikaz (Ministry of Pharmacy) in Moscow.[4] He also invited many foreign doctors to Russia. This institution was established and managed by pharmacists to supervise and organise the work of pharmacists, doctors *medicinae* and barber-surgeons. The "Minister" of Healthcare was an apothecary and not a doctor *medicinae*. The Prikaz opened the first medical school in 1654 with court physicians and foreign doctor *medicinae* providing education. Instructions included surgery, anatomy, pharmacology, practical diagnosis of internal diseases and ambulatory medicine.

### ***Peter the Great visited the Netherlands and Leiden University***

Peter the Great in 1682 became the Tsar of Russia at a very young age of ten years. He had many friends both among Russians and foreigners. One of his closest friends was the family doctor Johan Termont, an experienced Dutch barber-surgeon. He was the first teacher of Peter in theoretical and practical Medicine.[5-7] Peter's childhood friends and his travels abroad influenced his views on the modernisation of Russia.[4,8]

Before Peter the Great a classical medical school did not exist, only the barber-surgeon school of the Aptekarskiy Prikaz mentioned above. Tsar Peter, with his great interest in medicine and science, was well aware of the need for the training of a medical corps for the navy and land force. If he wanted to take his country out of isolation and transfer it into modern civilisation, he knew he had to travel to Europe to develop his visions and ideas. In 1697 Peter made his first visit to Europe with the Grand Embassy (a diplomatic mission to strengthen Russia's alliance with several European countries). The Netherlands and especially Leiden University was an important centre of medicine in Europe in the 17<sup>th</sup> and 18<sup>th</sup> century. Eager to learn as much as possible he travelled two times in 1697-98 and a third time in 1717 to Leiden University and took with him the blueprints of the university statutes of the Leiden University. Leiden was a city of physician-scientists and instrument makers mostly located at the Rapenburg, one could say forerunner what is the current Leiden Bioscience Park. Amsterdam was from a medical perspective the city of barber-surgeons, apothecaries and merchants.

Tsar Peter, who needed a new court physician, invited Nicolaas Lambertus Bidloo (1673/4-1735), who graduated at Leiden University. Bidloo accepted the offer and started his work in Russia in 1702.[4,9,10] His father, Lambert Bidloo, was a pharmacist in Amsterdam. His uncle, and brother of his father, was Govert Bidloo, Rector Magnificus of Leiden University. One of his teachers was Carol Drelincourt (1633 - 1697), who was the mentor of Herman Boerhaave, so Bidloo and Boerhaave were fellow students and medical contemporaries.

After his first trip to Europe in 1703 Peter the Great founded Saint Petersburg, which became the capital of Imperial Russia. He also organised training of the most talented Russian students at Leiden University. Peter realised that this was not sufficient and together with Nicolaas Bidloo, he founded the first medical hospital school with an anatomical theatre and a botanical garden in Moscow. The "Bidloo school" in Moscow officially opened its doors in 1707 for Russians and Russians with foreign roots. It was the first higher education institute, that prepared students for a possible follow-up study to Doctor Medicinae abroad. After graduation, these scholars were sent mostly to Leiden University. The Bidloo school became the breeding school for Russian Doctor Medicinae (to compare with a PhD-degree). [10,11] Peter also opened ten hospitals in large strategic centres among others a garrison, a navy and a land force hospital in 1710 in Saint Petersburg, and navy hospitals in Kronstadt and Revel. These hospitals also contained schools, where after a period of practical work time in regiments a barber-surgeon title could be obtained.

The Aptekarskiy Prikaz grew in staff size. Gradually it changed from a court institution to a state institution.[8] Peter the Great decided in 1707 to rename the Aptekarskiy Prikaz to Aptekarskaya Kantselyariya (Pharmaceutical Chancellery). [4,8,12] The school belonging to the Aptekarskiy Prikaz was not a higher education institution but prepared barber-surgeons to serve in the military and the navy. Over 60 years of its existence the school functioned unevenly. In modern sense, it was not a school. Because Peter had established better alternatives, he decided to close the school of the Kantselyariya. The decision was consistent with the reforms initiated

by Peter the Great.

In 1712 a large part of the Aptekarskaya Kantselyariya was moved to the new capital Saint Petersburg. In 1716 Tsar Peter appointed instead of an apothecary a doctor medicinae head of the Chancellery. This doctor medicinae was for the first time by crown named Arkhiyater of the Chancellery (synonymous for Minister of Healthcare). Thus, from that time on the title "Arkhiyater" became reserved for the most senior civil servant or politician with responsibilities for health care. Before Peter's decision, any court physician was called an "Arkhiyater".

In 1725 the Aptekarskaya Kantselyariya underwent a name change again and was named Meditsinskaya Kantselyariya (Medical Chancellery). Till the reign of Catherine the Great the Arkhiyater, a doctor medicinae was Minister of Healthcare. (Table 1)

<b>Members of the Romanov Dynasty, who played an important role in the development of Russian Medicine</b>	
<i>Tsar - Tsarina</i>	<i>Reign</i>
Tsar Mikhail Fyodrovich	1613 – 1645
Tsar Peter the Great	1672 – 1725
Tsarina Catherine the First	1725 – 1727
Tsarina Anna Joannovna	1730 – 1740
Tsarina Elisabeth the Great	1741 – 1761
Tsarina Catherine the Great	1763 – 1796
Tsar Paul I	1796 – 1801
Tsar Aleksandre I	1801 – 1825
Tsar Nicholas I	1825 – 1855
Tsar Aleksandre II	1855 – 1881

**Table 1** Overview of the reigns of the successive Tsars in the period of investigation

In 1755 Tsarina Elisabeth the Great (reign: 1741-1762), daughter of Peter the Great, founded the University in Moscow. The first generation of professors had Russian roots or were Russians of foreign origins. They were trained at the Bidloo school or the university of the Academy of Science and had obtained their Doctor Medicinae Degree at Leiden University.

A pupil of Herman Boerhaave, Pavel Zakharyevich Kondoidi, became director of the Meditsinskaya Kantselyariya (1753-1760). Kondoidi succeeded the oldest nephew of Herman Boerhaave, Herman Kaau-Boerhaave after his death. Pavel reformed the education and examination system.

The first Russian professor in the medical faculty of the Moscow University was

Semyon G. Zybelin. He graduated in 1758 at the Moscow University in Philosophy. Subsequently, he studied some time at the Imperial Academy of Science, but he received a doctorate in medicine in Leiden in 1764. He taught at the Moscow University theoretic medicine.

The two-track policy for medical education of Peter the Great continued till the third quarter of the 18<sup>th</sup> century, even though when Tsarina Catherina the Great (reign: 1762-1796) remained in these footsteps. In 1763 she transformed the name of the Meditsinskaya Kantselyariya into the Meditsinskaya Kollegiya (Medical Collegium) with extended powers. She installed a board of three directors (Collegium) with a doctor medicinae as one of the members. In 1764 it was given the right to confer the degree of Doctor Medicinae, although it rarely used this right. Catherine the Great institutionalised healthcare more, and during her reign, Russia became increasingly self-sufficient in the field of trained medical professionals. She elaborated on the modernisation of Peter the Great. (Table. 2)

Name	Founder or Renamer	Founding or renaming year	In charge
Aptekarskiy Prikaz	Mikhail Fyodorovich	1620	Apothecary
Aptekarskaya Kantselaryariya	Peter the Great	1707	Doctor medicinae (Arkhiyater)
Meditsinskaya Kantselaryariya	Peter the Great	1725	Doctor medicinae (Arkhiyater)
Meditsinskaya Kollegiya	Catherine the Great	1763	board of three directors (Collegium) inclusive doctor medicinae
Meditsinskaya Kollegiya	Aleksandre I	1802	Ministry of Internal Affairs with a Medical Department
			Ministry of Education with department Medical education

**Table 2** Overview of the development of the "Ministry of Health", with the names that were used, the founder of the governmental structure, the founding year and the individual or collective that was in charge.

In 1786, the schools of both medical hospital schools were separated and converted into independent medico-surgical schools (the Bidloo school and the navy and land force hospital school in Saint Petersburg). They obtained the right to educate own students and "to lead them to the doctoral degree" together with the University of Moscow. Till that moment this right belonged only to the Medical Office. In 1798,

12 years later, the medico-surgical schools of Moscow and St. Petersburg have been renamed to Imperial Medico-Surgical Academies. The Moscow Medico-Surgical Academy existed until 1804. Not only its 45 students but also all the medical instruments and the library were transferred to the Imperial Medico-Surgical Academy (now the Military Medical Academy named S.M. Kirov) in St.Petersburg. Nicolaas Bidloo in Moscow and Herman Boerhaave with his Leiden colleagues and their students rolled out the scientific basis for medical education and healthcare in Russia. (Table 3)

	Moscow			Saint Petersburg	
Year	Entity	Entity	Entity	Entity	Entity
1654 – 1714	Barber-surgeon school at the Aptekarskiy Prikraz				
1707	'Bidloo school', anatomical theatre, botanical garden, hospital, preparatory school for postdoc PhD-title				
1710					
1755		Establishment of the Lomonosov University of Moscow	Navy hospital with school Preparation for barber-surgeon in military service	Landforce hospital with school Preparation for barber-surgeon in military service	
1786	As well as in Moscow as in Saint Petersburg the schools were separated from the hospitals				
1786	Medico-surgical Academy		Lomonosov University	Medico-surgical Academy	
1798	Merger of the Moscow Medico-surgical Academy with the Saint Petersburg Medico-surgical Academy				
1798 - now	Lomonosov University			Imperial Medico-surgical Academy (since 1881 Military Medical Academy named S.M. Kirov)	

**Table 3** Simultaneous development of the medical education in Moscow and Saint Petersburg.

**The Kunstkamera, museum of anthropology and ethnography. The purchase of the collections of Frederik Ruysch and Albert Seba**

Tsar Peter had an above-average interest in surgery and the management of trauma, on which he in part was taught by his private physician, Termont.[2] During his first Grand Embassy to the Netherlands Peter, most of his time lived in Amsterdam and visited more than once the anatomist Frederik Ruysch, who became his second teacher in medicine. He taught Peter how to carry out a phlebotomy, surgical incisions, suture wounds, extract teeth and to perform post mortems. After his return from the first Grand Embassy to Moscow in 1699, Peter carried out a series of lectures on anatomy for the boyars (noblemen) with demonstrations on cadavers. [13,14]

Since 1672 Ruysch had perfected the preparation technique of anatomical specimens and blood vessels by injection of dyes and resins. He invented an original way of embalming corpses. He sampled a unique collection of museum exhibits



(congenital abnormalities and malformations) and created the first anatomical museum in Amsterdam. His museum possessed a rich collection of anatomical objects, dried plants, insects and birds. All were carefully described in great detail by Ruysch. Twice a week, Ruysch's museum was open to the public. Peter the Great greatly admired the anatomical specimens of humans and animals on his visits to the museum. In 1698 he obtained his first collection of these specimens, including among other anatomical preparations. These anatomical objects are known as the private "small collection" of 26 dry and wet human specimens of Fredrik Ruysch. This first collection became part of the Aptekarsky Prikaz in Moscow awaiting the settlement of St.Petersburg. The collection was transferred in 1798 to the Imperial Medico-Surgical Academy (now the Military Medical Academy named S.M. Kirov) in St.Petersburg.

Peter the Great wanted his own museum with curiosities and founded the Kustkamera in 1714. Meanwhile, Peter again travelled in 1716-1717 with his second Grand Embassy through Europe among others to France and the Netherlands. When given a chance, he bought the famous Ruysch collection of anatomical preparations for his new Kunstkamera.[15,16] The Tsar managed to get Ruijsch to reveal to him the secrets of embalming the dry and preserving the wet specimens. Peter passed on this knowledge to his court physician Laurentius L. Blumentrost (1676-1756) as the chief supervisor of the Ruijsch collection, so that he could care for the collection. Blumentrost, in turn, passed on the secret to doctor Rieger who finally put it in writing and made the secret public. From February 1718 on Peter's orders, the Kustkamera extended to contain all examples of birth deformations of both humans and animals in Russia. The Tsar also bought in 1716 the natural history collection of the apothecary Albert Seba.[15,17] It contained 340 jars with animals kept in the spirit of wine, a quantity of fish and other marine products, and without counting a collection of several artificial and curious pieces.

The Kunstkamera opened for public in 1719. In 1721 a complete medical library and a rich collection of other rare items such as minerals and shells that had belonged to Peter's physician Robert Areskine were also added to the Kunstkamera. [4]

Peter the Great established the Imperial Academy of Science in 1724, and the Kunstkamera became a part of the Academy.[18]

### **The Imperial Academy of Science**

#### ***Science in the post-enlightenment period***

During his second Grand Embassy Tsar Peter visited France and the Academy of Science in Paris, of which he became a member.[4-8,19,20] To become more connected with science in Europe, Peter decided to establish in 1724 an Academy of Sciences in St. Petersburg along the lines of the French Academy. After Peter died in 1725, during her short reign Tsarina Catherine the First (1625-1727) continued the work of her husband Peter. The first meeting of the Academy took place on 27 December 1725 in the presence of the Tsarina. At the end it lasted two years before the official grand opening took place on 27 December 1726.

The Academy of Science contained a gymnasium (grammar school) for the preparation of future students, and a university with three faculties (law, medicine and philosophy). Already before his death, Peter donated his library and the

Kunstkamera to the newly created Academy of Sciences.

In 1726, the first year the Academy functioned, its gymnasium received 120 students and in the second year 58. The university of the Academy not only received students from its own gymnasium but also grand-aided students from other religious, educational institutes, where Latin was taught. The mastery of Latin was necessary since the education at the university was given in Latin by the invited foreign professors. The university contained a library, curiosities, an astronomical observatory, an anatomical theatre and a botanical garden.

***Attracting followers of Boerhaave as the basis of the medical school and expansion. Education in connection with wonderment and science***

Laurentius Lavrentevich Blumentrost (1692-1755), court-physician of Peter I and his successors, who had studied at the Leiden University, became the first president of the Academy of Sciences. In the years 1726 and 1727, more experienced doctors came to Russia and enrolled in the Academy. These also included his older brother Johannes Deodatus Blumentrost (1676-1756), president of the Meditsinskaya Kantselyariya (Ministry of Healthcare). (Table 4)

<b>Family Blumentrost</b>				
<b><i>First and fathers name</i></b>	<b><i>Family ties</i></b>	<b><i>Tsar/tsarina</i></b>	<b><i>Education</i></b>	<b><i>Profession</i></b>
Laurentius	Father	Aleksey Mikhailovich Fyodor Alekseevich Peter the Great	Mühlhausen	Arkhiyater (court physician)
	Oldest son played no role in healthcare and migrated not to Russia.			
Laurentius Christian	Second son	Imperial princesses	unknown	court physician
Johannes Deodatus (Ivan Lavrentevich)	Third son	Peter the Great Catherina the First Anna Ivanovna (Joannovna) Elisabeth the Great	Königsberg Halle <b>Leiden</b>	<ul style="list-style-type: none"> <li>• court physician</li> <li>• army surgeon</li> <li>• Arkhiyater (Minister Healthcare)</li> </ul>
Laurentius Lavrentevich	Fourth and youngest son	Peter the Great Catherina the First Anna Ivanovna (Joannovna) Elisabeth the Great	Halle <b>Leiden</b>	<ul style="list-style-type: none"> <li>• court physician</li> <li>• President Academy of Science</li> <li>• Director of Military Hospital in Moscow</li> <li>• State Councillor</li> <li>• Curator Moscow University</li> </ul>

**Table 4** Overview of the influential family Blumentrost, whose members occupied important positions in the administration of healthcare.

During the 18<sup>th</sup> century, 46 Russians or Russians with foreign roots studied in Leiden, where they were awarded the doctor medicinae degree. Of them, three studied in Leiden before the appointment of Herman Boerhaave, 11 during Herman's Boerhaave time and 32 after Boerhaave's death. All kept contact with their former Leiden teachers. Most of them played a crucial role in the development of medicine and held high positions. They were able to offer their Dutch teachers also vital positions at the Russian court or in the Academy of sciences. Herman Kaau-Boerhaave, nephew of Herman Boerhaave became minister of healthcare (1748-1753) during the reign of Elisabeth the Great. His younger brother Abraham Kaau-Boerhaave became a member of the Imperial Academy of Science of St. Petersburg in 1744, when he was still practising as a physician in The Hague. In 1746 he came to St. Petersburg where he first got a position at the Admiralty hospital. In 1748 he was appointed Professor of Anatomy and Physiology. He had studied at Leiden University and enjoyed lessons among others from his uncle Herman Boerhaave. When Abraham Kaau-Boerhaave died in 1758 in Russian, he left eight manuscripts behind. Abraham Kaau-Boerhaave was the teacher and maecenas of Alexius Protassiev, who first studied in Leiden and afterwards anatomy at the Imperial Academy of Science. Protassiev was one of the first native Russians who specialised in this subject and was appointed Professor of Anatomy.[9;14] Another Russian who became a member of the Academy was Mikhail V. Lomonosov, who was appointed professor of chemistry. He had studied in Marburg, Germany. He suggested the establishment of the Moscow University.

Other well-known Dutch professors from Leiden were invited to become a member of the Imperial Academy, but they did not always accept the offered positions. Herman Boerhaave declined the invitation of Tsarina Anna Joannovna. Also, Bernard Siegfried Albinus and Hieronymus Davides Gaubius thanked for the honour.

In the Russian annals are also mentioned father Johannes and son David de Gorter. Johannes studied medicine in Leiden and discussed various physiological and pathological theories under the chairmanship of Bernhard Siegfried Albinus, professor of anatomy and rector of the Leiden University. Another member of the Academy was the German Carl Friedrich Kruse who also had studied medicine in Leiden. He for a long time served as the chief physician of the Imperial Lifeguards in St. Petersburg. During the reign of Catherine the Great he was in 1770 appointed as an assistant personal physician and State Councillor by the court. His wife was the daughter of Herman Kaau-Boerhaave and heir to the Boerhaave heritage.

Not until the Russian economy became more developed other universities were established at the beginning of the 19<sup>th</sup> century.

### **The long period of near silence in Russian medical science**

It took Russia approximately 130 years to build up a self-sufficient medical training since Peter the Great started reforms of Russia. By the beginning of the 19<sup>th</sup> century, Russia had already 1519 doctors and barber-surgeon of Russian origin. Four hundred twenty-two were in the army, 128 in the navy and 879 in hospitals and

medical boards.

Also Tsar Paul I (reign: 1796-1801) and his both sons, Aleksandre I (reign: 1801-1825) and Nicholas I (reign: 1825-1855), continued the reforms of educational enlightenment of their ancestors. Both brothers wanted to become more and more independent from foreign medical doctors but also understood that Russia as a great European power, could not afford to be left far behind Europe after the Napoleonic War in 1812.[21,22]

Under Tsar Aleksandre I and Nicholas I the Russian economy developed further, which resulted in a significant increase in the number of higher education institutions with medical faculties.[15,17] By 1860, Russia had eight universities, as part of which the opening and medical faculties in Dorpat (now Tartu in the Republic Estonia, 1802), Vilnius (1803), Kazan (1804), Kharkov (1805), and Kiev (1841).[4,8]

Tsar Aleksander I (reign: 1801-1825) established the Ministry of Internal Affairs in 1802, and the Meditsinskaya Kollegiya (Medical Collegium) became the Medical Department part of this Ministry. It became the main body for medical and sanitary control. Medical education was placed under the Ministry of Education.

According to the university ruling of 1804, the universities have the use of the right to autonomy (the election of the rector, deans, professors, etc.). Some universities were transmitters of advanced democratic ideas, and the government actively stifled the freedom-loving sentiments in the higher educational institutions. In 1820 the government announced audits of universities. Such an audit in the Kazan University caused the closure of the anatomical theatre and museum, and autopsies were no longer allowed. All the anatomical specimens were made unrecognisable and buried in a church ceremony.

During the reign of Nicholas I a new university charter was released in 1835 that banned the autonomy of universities and the authorities subjected them to the Board of Trustees, appointed by the tsarist government.

### **Breaking the silence: Pirogov stands up as a designer of modern Russian medicine**

The Tsars and Tsarinas have laid the foundations and created the conditions for healthcare reform, which took about 130 years from Peter the Great on. However, the doctors had to shape the house and its contents. Above all, it also asked for indispensable chief supervisors with a well-trained medical knowledge. Tsar Nicholas I (reign: 1825-1855) understood this very well, especially after the Napoleonic War in 1812. He continued with the enlightenment and reforms in healthcare. He invited talented students of different disciplines of Russian universities to volunteer to go abroad for a further PhD-study at the German-Baltic University of Dorpat (now Tartu in the Republic Estonia), one of the best of that time in the German-speaking area and Russia. The aim of this study in Dorpat and their traineeship of two more years at foreign universities in Europe was to prepare these Russian students as staff members in the Department of the Ministry of Public Education and as professors of Universities. The first group of talented students was sent out in 1828, including Nikolay Ivanovich Pirogov (1810-1881). To raise the medical skills in Russia to a level equal to that of the advanced countries of Europe

another 30 years was needed, in which Pirogov played a crucial role.

Nikolay Pirogov was a well-educated physician of Russian origin, who studied at the Moscow University, at the German-Baltic University of Dorpat and at the universities in Berlin and Gottingen. During his postdoc, he also visited Paris and met there with other foreign colleagues. He kept developing himself and was very interested in new developments in medical health care. He would reorganise the medical education, introduce a new curriculum for medical students, which from then on for the first time included the teaching of topographical and applied anatomy. He extended surgery from a craft to a science, equipping doctors with scientifically based techniques of surgical intervention. His contributions reached beyond the boundaries of surgery. He was a dedicated teacher who encouraged students to excel clinically and guided them in scientific endeavours.

To offer Pirogov the right stage in the history of world medicine, we decided to compare him with Herman Boerhaave. This Dutch physician, with his Leiden colleagues, his Dutch and Russian students, including his nephews, stood at the cradle of health care and medical education in Russia. Can we conclude that Pirogov was influenced by the Dutch medical school and does his name and work subsequently belong in the range of his well-known medical predecessors?

**The research questions for this thesis were:**

The central question is why becomes a(n) (inter)national scholar relatively unknown or well-known among others Herman Boerhaave?

- ◆ Why was the time was ripe for a reformer/designer like Pirogov.
- ◆ Why has the recognition of his work been left behind outside Russia, although he described major breakthroughs and co-founded an international health organisation?
- ◆ What has been his essential contributions from a national and international perspective?
- ◆ When we compare Pirogov with his well-known predecessor Boerhaave, co-indirect designer of the Russian medical school, what are the similarities and differences?

**Chapter Two** of the thesis describes the development of Russian medicine from the 9<sup>th</sup> to the beginning of the 19<sup>th</sup> century. It details the role of physicians trained in the Netherlands. In this chapter, the reader gains insight into the position of Russia in Medicine before Pirogov became a medical student at the University of Moscow in 1824.

In **Chapter Three**, we illustrate the role of Pirogov as a pioneering Russian surgeon and medical scientist and show how in Russia he elevated surgery to science and that his name was attached to medical interventions.

In **Chapter Four**, we describe the contribution of Pirogov to anatomy. Pirogov passionately believed in the importance of anatomy for surgeons. He was appointed Professor of Applied Anatomy and Surgery at the Imperial Medico-Surgical Academy in Saint Petersburg. In that capacity, he introduced the teaching of microscopy and histology to the medical Curriculum. In 1846 he formed the Institute for Applied Anatomy within the Academy, where in addition to teaching medical students future teachers of anatomy in Russia were trained. Pirogov published extensively on anatomy, including several anatomical atlases and contributed to the introduction of anatomy into surgery.

In **Chapter Five**, we focus on his contribution to military and civilian anaesthesia. In his time anaesthesia was evolving into a science. It became crucial for the subsequent development of surgery both for civilians as well as on the battlefield. We hypothesise that he was very ahead in thinking about anaesthesia. Pirogov was well aware of the international literature on anaesthetic risks, for instance, what was written about the death of Hanna Green, and he commented on it with facts and arguments.

In **Chapter Six**, we explored what motivated Pirogov to employ women in health care, and how he was able to stand up for it together with Grand Duchess Elena Pavlovna (sister-in-law of Tsar Nicholas I). They both committed to train and deploy women in health care during wars and later in hospitals. We also investigated the background of these women and what education they received.

In **Chapter Seven**, we investigate what Pirogov intended as one of the founders of the Red Cross, what he has contributed as a consultant and how he was appreciated as a fellow physician in August 1897 during the International Medical Congress in Moscow.

In **Chapter Eight**, we compare the contributions of Pirogov and Boerhaave in light of the development of modern Medicine in Russia. We compare their innovations, quantify their bibliography both locally as well as international and investigate their international network and analyse their connection with Anglo-Saxon literature through the ages. We hypothesise that, despite scientific excellence, a scholar can remain or become largely unknown due to unfavourable environmental factors, which lead to the fact that the work is no longer quoted and therefore ends up in oblivion. Furthermore, it appeared that in particular alumni of Leiden University, especially since Peter the Great, had played a major role in the development of medicine in Russia throughout the 18<sup>th</sup> century. Can in that perspective Nikolay Pirogov be seen as a belated student of “the Medical School”?

In **Chapter Nine**, the findings are summarised and concluding remarks are made.

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