


Cardiology: From anatomical and physiological discoveries to the beginnings of the medical specialty in the interior of Rio Grande do Sul

 <https://doi.org/10.56238/sevened2024.016-026>

**Naiane Ronsoni Rigo¹, Natalia Demarco Kielek², Bruna Malacarne³, Maísa Diane Turra Lena⁴,
Elisabete Maria Zanin⁵ and Miriam Salete Wilk Wisniewski⁶**

ABSTRACT

In the early days of humanity, the heart was considered the central point of life, both organic and spiritual. Several peoples dedicated themselves to understanding cardiovascular anatomy and physiology, proposing theories that explained the functioning of such a complex system. In Brazil, medical researchers, including Carlos Chagas, suggested considerable advances in scientific research, such as the discovery of the pathophysiology and cardiac manifestations of Chagas Disease, in 1909. In 1943, the Brazilian Society of Cardiology was founded and in 1948 the Society of Cardiology of Rio Grande do Sul, boosting the recognition of the specialty in the country. In this context, this article intends to compose a timeline on cardiology, highlighting aspects of its regional inclusion in a municipality in the north of Rio Grande do Sul. The methodology is based on bibliographic and documentary research on the history of cardiology, taking into account global aspects of the specialty, in addition to deepening its insertion in Erechim-RS, through reports of three cardiologists, considered part of the pioneer group in care in the locality. The report was obtained through a conversation circle open to the community on November 22, 2023, called "History of Cardiology in Erechim" and which marked the 50th anniversary of the specialty in the locality.

Keywords: Medicine, Memory, Health.

¹ Medical student. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim

² Medical student. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim

³ Medical student. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim

⁴ Medical student. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim

⁵ Doctor in Sciences from UFSCar. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim

⁶ Doctor in Health Sciences from UNESC/SC. Integrated Regional University of Alto Uruguai and the Missions – URI Erechim



INTRODUCTION

HISTORY OF CARDIOLOGY IN THE WORLD

Since the dawn of humanity, the heart has been considered the central point of the existence of living beings, both from the point of view of survival and from the perspective of spirituality (Gallian, 2010). Many scholars have tried to decipher the anatomical and physiological nuances of this organ, being responsible for what we now know as the specialty of Cardiology.

In Ancient Egypt (1500 BC), it was believed that it was from the heart that the sources of life, feelings, and thoughts came (Gallian, 2010). Its importance was such that after death, it was the only organ that would be reattached to the mummified body, since those made during the individual's life remained in his heart, and this had to be evaluated in the passage between life and death (Gallian, 2010). From an anatomical point of view, it was the main structure from which a system of channels started, which transported the substances of life (blood, feces and semen) and spiritual elements (benign and evil spirits) (Bestetti; Restini; Couto, 2014).

Hippocrates, considered the father of medicine, was a pioneer in detailing the anatomical structures of the heart, attributing to the cardiovascular system the responsibility of transporting life to the rest of the body (Bestetti; Restini; Couto, 2014). The organ was formed by two heart valves with three leaflets (tricuspid); two communicating ventricles, the right one, larger and with blood inside, and the left, thicker and made up of yellow bile, mind and spirit; the atria, although described, were not part of the structure of the organ (Bestetti; Restini; Couto, 2014; Diniz *et al.*, 2022). The blood vessels would originate from the heart itself and leave for the rest of the body (Bestetti; Restini; Couto, 2014).

Galen (first century AD) stated that the heart was a muscle formed by two ventricles, the left was more hypertrophied, since it retained air, and the right transported blood through two vessels, one that would go to the lung and the other that would reach the rest of the body (Bestetti; Restini; Couto, 2014). Blood originated from the liver, through the modification of digested food, and left for the other parts of the body (Décourt, 1990; Bolli, 2019b). The arterial system was composed of "spirituous" or "air" contents, while the venous system was called "sanguine" (Décourt, 1990). In the left ventricle, venous blood would turn into "spirituous" blood, becoming "pneuma" (Décourt, 1990; Bolli, 2019b).

As the human body was considered sacred, dissections were no longer allowed until the Renaissance, resulting in a period of hiatus from the anatomical knowledge that permeated the cardiovascular system (Bestetti; Restini; Couto, 2014).

In the tenth century, Al-Bukhari Akhawayni found that the human heart had the primary function of pumping blood and was formed by four cavities with valves that prevented blood reflux to the pulmonary vessels and aorta (Bestetti; Restini; Couto, 2014). He also described the path of the



cardiac-pulmonary circulation, emphasizing that blood from the right ventricle was directed to the lungs and then to the left ventricle and aorta, being distributed to the rest of the body (Bestetti; Restini; Couto, 2014). Ibn-Nafis, in the twelfth century, improved the idea of pulmonary circulation with the discovery of pulmonary arteries and veins (Bestetti; Restini; Couto, 2014). He also believed that the nutrition of the heart came from vessels that permeated the organ, and he was the first to hypothesize the existence of coronary arteries (Bestetti; Restini; Couto, 2014).

In Europe, the Italian physician Berengario de Carpi, in the fifteenth century, using the dissection of cadavers as a means of study, stated that the heart was composed of four chambers, two atria and two ventricles, and semilunar and atrioventricular valves, followed by papillary muscles (Bestetti; Restini; Couto, 2014). But it was Fabricius ab Aquapendente, in the seventeenth century, who described the anatomical physiology of these valves, stating that their function was to contain blood reflux (Bestetti; Restini; Couto, 2014).

Another important figure for the development of cardiology was William Harvey, a British physician, disciple of Fabricius ab Aquapendente and considered the father of cardiovascular physiology (Bolli, 2019a). In 1628, Harvey published the book *De Motu Cordis*, refuting Galen's ideas, until then accepted by the scientific community of the time (Bolli, 2019a; Bolli, 2019b). In this work, there are mentions about the physiology of cardiac contractility, in which the doctor states that the organ fills with blood passively and contracts actively, a moment synchronous with the peripheral pulsation (Bolli, 2019b). In addition, Harvey described the function of the four heart valves: pulmonary, aortic, mitral, and tricuspid, stating that the first two prevented the backflow of blood to the ventricles and the last two to the atria (Bolli, 2019b). The venous system was also the subject of study, and it was found, after performing an experiment with a tourniquet, that the blood flow from the veins was towards the heart, not the other way around (Bolli, 2019b). In addition, he made discoveries about the functioning of the pulmonary circulation, corroborating the description of Ibn al-Nafis, he stated that the blood flow started from the right ventricle and reached the lungs, returning to the cardiac chamber through the left ventricle, without the existence of pores in the ventricular septum (Bolli, 2019c).

The year 1816 was also marked by a major discovery related to the specialty of cardiology: the creation of the stethoscope, by the Frenchman René Théophile Hyacinthe Laënnec (Colognese *et al.*, 2022). Prior to the appearance of the instrument, auscultations were performed by placing an ear on the patient's chest, a practice that was uncomfortable and was often hampered by intrinsic characteristics of each patient, such as obesity (Colognese *et al.*, 2022).

The first electrical study of cardiac contraction, the electrocardiogram, was carried out in 1887, by Augustus Waller, still with some limitations (Colognese *et al.*, 2022). This feat motivated Willem Einthoven to research new techniques and improve the quality of the records, coming to the



conclusion that each electrical impulse generated five waves, which were called P, Q, R, S, and T, the nomenclature used to this day (Colognese *et al.*, 2022).

HISTORY OF CARDIOLOGY IN BRAZIL

In Brazil, an important milestone for local medicine was the arrival of the court of King D. João VI, in 1808, which encouraged the opening of Medical Schools and the directing of health care to more specialized professionals, since in the beginning, a general practitioner needed to attend to diseases of various systems of the human body, establishing diagnoses and conducts (Colognese *et al.*, 2022).

The country continued to advance in health studies, following global scientific trends (Colognese *et al.*, 2022). The Brazilian physician Carlos Chagas was the first to publish a scientific study that dealt with a heart disease in Brazil, Chagas disease, in 1909. He also introduced the first electrocardiogram into the Manguinhos laboratory (Mesquita; Souza, 2019).

However, it was the increase in the incidence of heart disease in the population after the urbanization process in the 1930s that was the real driver of the emergence of the specialty of cardiology in Brazil, a period in which specialization courses began to be created in the cities of São Paulo and Rio de Janeiro (Mesquita; Souza, 2019).

Noting the change in the pathological profile that the country was going through, from a higher prevalence of infectious diseases to chronic diseases, the Vargas Government created, in 1941, the Cardiovascular Disease Care Service, directed by Genival Londres and Segadas Vianna (Kropf, 2023).

On August 14, 1943, in the Cardiology Service of the Municipal Hospital of São Paulo, the Brazilian Society of Cardiology (SBC) was founded, whose first president was Dante Pazzanese and 112 affiliated founding members in its first year of operation (Mesquita; Souza, 2019; Kropf, 2023). The date began to be celebrated as Cardiologist Day, from 2005 onwards (Mesquita; Souza, 2019). Subsequently, in 1948, the first SBC journal, the "Brazilian Archives of Cardiology", was created, boosting research and dissemination of scientific knowledge related to the specialty (Kropf, 2023).

In the state of Rio Grande do Sul, the Society of Cardiology of Rio Grande do Sul (SOCERGS) was founded in 1948 and had as its first president cardiologist Rubens Mário Garcia Maciel, also a founding member of SBC (ANM, 2024; SOCERGS, 2024). Rubens Maciel brought important advances to the state, such as electrocardiography (ANM, 2024). He also founded the Sul-Rio-Grandense Institute of the History of Medicine (now the Gaúcho Foundation of the History of Medicine), due to his great interest in rescuing the historical facts and memories that permeated his profession (ANM, 2024).

HISTORY OF CARDIOLOGY IN ERECHIM

The first cardiologist to establish himself in the municipality of Erechim was João Alberto Pegorini, in 1973. Subsequently, in 1977, Ivan Carlos Salomoni was the second to attend in the locality, having a brief passage, since, in 1984, he lost his life in a plane crash at the age of 36 (Genovez, 2018; Capoani; Serpa; Fahl, 2023).

In 1979, at the invitation of João Alberto Pegorini, who needed help with medical care, Mauro Roberto Capoani (Figure 1) was the third cardiologist to arrive in the city. Graduated in Medicine from the Federal University of Rio Grande do Sul (UFRGS) in 1976, he took a course in internal medicine at Santa Casa de Misericórdia de Porto Alegre and a medical residency in cardiology at the Institute of Cardiology of Porto Alegre. He started working at the Santa Terezinha Hospital (currently the Santa Terezinha de Erechim Hospital Foundation-FHSTE), at the time a private hospital. At first, he was unable to enter the public hospital, the Hospital de Caridade de Erechim (HCE) (Capoani; Serpa; Fahl, 2023).

Figure 1 – Mauro Roberto Capoani, cardiologist who worked in Erechim-RS



Source: URI-Erechim

He faced several adversities in his first care at Santa Terezinha Hospital, due to the infrastructure. The electrocardiogram, the initial exam in the care of cardiology consultations, could not be performed, since the hospital did not have it. The care of serious patients was also impaired, as basic structures such as the emergency room, laboratory and X-ray machine were not available. When faced with these situations, Mauro Roberto Capoani considered giving up, however, he chose to improve the service. On his own, he acquired a stop cart with a pacemaker and defibrillator and set up a kind of emergency room in one of the hospital's rooms, a primitive structure, but which allowed some safety when attending to severe cases (Capoani; Serpa; Fahl, 2023).

In addition to the hospital, he attended patients at home. In one of the cases, he attended a lady and, with the help of a portable heart monitor, which he used to optimize these consultations, he

found an important arrhythmia. In the middle of the physical examination, the patient unfortunately suffered a cardiac arrest, the ambulance was called and all first aid was performed immediately, but she did not survive (Capoani; Serpa; Fahl, 2023).

In 1984, after a conversation between Mauro Roberto Capoani and Ivan Carlos Salomoni, both agreed that Erechim needed to expand the cardiology service. Thus, they contacted Milton Araújo Serpa (Figure 2). The doctor graduated from the Federal Faculty of Medical Sciences Foundation of Porto Alegre (FFFCMPA, currently the Federal University of Health Sciences of Porto Alegre - UFCSPA), in 1981, and is a specialist in cardiology from the Institute of Cardiology of Rio Grande do Sul (Capoani; Serpa; Fahl, 2023).

Figure 2 – Milton Araújo Serpa, cardiologist working in Erechim-RS



Source: URI-Erechim

He arrived in the region shortly after the completion of the Intensive Care Unit (ICU) of the HCE, designed by anesthesiologist Aldo José Peixoto. With this structure, it was possible to perform a series of procedures that were not commonly performed by cities the size of Erechim, such as electrical cardioversion, the treatment of acute myocardial infarction, and the treatment of severe heart failure requiring mechanical ventilation (Capoani; Serpa; Fahl, 2023).

Another technology briefly added to the cardiology service was the echocardiogram, an innovation for the 1980s. With the exam, the diagnoses of heart diseases were made with greater precision; It was as if the doctor was looking at the cardiological pathologies through a keyhole, with the arrival of the echocardiogram, the vision expanded, a door was opened. At first, the existing device was the M-module or one-dimensional echocardiogram, limiting the visualization of the cardiac chambers and the diagnostic accuracy. In mid-1989, with the joint efforts of several physicians, diagnostic imaging was *upgraded*, after the acquisition of the two-dimensional echocardiogram, a considerable advance, especially in the area of congenital heart diseases in

neonates. Possibly, many of these cases in neonates were underdiagnosed with the unidimensional echocardiogram (Capoani; Serpa; Fahl, 2023).

Another milestone in Erechinense cardiology was the arrival of the hemodynamics service. In 2002, at the initiative of Mauro Roberto Capoani, coronary angiography, also known as catheterization, began to be performed. This service was responsible for the implantation of the first permanent pacemaker in Erechim, in 2004, in partnership with cardiac surgeon Roque Faleiro, from Passo Fundo-RS. The accreditation of the service in the Unified Health System (SUS) was denied by the State. The procedures were carried out for a short period of time and, due to financial conditions, had to be interrupted. In 2010, with the collaboration of a group of physicians, including cardiologists, vascular surgeons, neurologists, radiologists, and anesthesiologists, a new hemodynamics service was made possible, this time with private care and by health insurance (Fahl, 2020; Capoani; Serpa; Fahl, 2023). If the agreement via SUS had happened, it seems that hemodynamics in the city would have advanced considerably today, in addition to the fact that Erechim would become a reference in the subject (Capoani; Serpa; Fahl, 2023).

In 1984, shortly after Milton Araújo Serpa settled in the city, there was a cardioverter defibrillator with a pacemaker generator in the ICU of the HCE, creating the possibility of implanting temporary pacemakers in cases of bradyarrhythmias. However, there was only one pacemaker electrode, so that when the patient implanted the permanent pacemaker, the cable was returned, sterilized, and used in the next case. This cardioverter device was not mobile, a fact that prevented the safe transport of patients who were going to implant the permanent pacemaker in Porto Alegre. To solve the problem, they had, together with the cardiologists, the idea of removing a permanent pacemaker from a gentleman (with the consent of the family) who had died shortly after implantation. They sent the device to a specialized company, which disassembled, sterilized the parts and assembled a kind of *pace box*, which allowed the electrode to be connected and served as a battery, making the transport of the patient feasible. Both procedures carried out are unthinkable today, however, they were necessary at the time, both due to the lack of resources and the available infrastructure. Even with all the difficulties, the doctors thought of solutions to serve patients in the best way with the available resources, enabling increased survival. Over time, the services were updated and acquired new equipment, abolishing these practices that, in a way, were improvised and expressed considerable risks (Capoani; Serpa; Fahl, 2023).

Célio Friedholdo Fahl (Figure 3) was the fifth cardiologist to work in Erechim. He graduated in medicine from the Federal University of Pelotas (UFPel) in 1985 and specialized in internal medicine at the São Vicente de Paulo Hospital in Passo Fundo and in cardiology at the Dr. Lazzarotto Heart Hospital, in Porto Alegre (Capoani; Serpa; Fahl, 2023).

Figure 3 – Célio Friedholdo Fahl, cardiologist working in Erechim-RS



Source: URI-Erechim

In 1990, he met with Mauro Roberto Capoani during a Congress in Cardiology in the city of Recife-PE and received an invitation to join the group of cardiologists in Erechim. The municipality had low receptivity to the entry of new physicians, with a well-defined division of work between each hospital. That said, Célio Friedholdo Fahl proposed the creation of a joint clinic with Mauro Roberto Capoani and Milton Araújo Serpa, considered unfeasible at the moment, even so, the doctors established a partnership, sharing patients and procedures, dividing the work and reducing individual anguish. They made it clear, both at the Santa Terezinha Hospital and at the HCE, that they would work as a team. Célio Friedholdo Fahl and otorhinolaryngologist João Elmar de Oliveira were the first professionals to work simultaneously in the two hospitals. There were other physicians who were part of the clinical staff of both, but who, preferably, attended in a single place (Capoani; Serpa; Fahl, 2023).

He had the Santa Terezinha Hospital as the first place of care, he worked both in the emergency room and meeting the cardiology demand. At that time, the emergency care unit was located on the first floor of the building, which did not have elevators, consequently, if it was necessary to take a critically ill patient to the surgical block (on the third floor), the patient was placed on a stretcher or wheelchair and the doctor on duty and the hospital doorman carried him up the stairs. The hospital did not yet have an ICU, so the room improvised by Mauro Roberto Capoani in the past served as a monitoring unit for the most serious patients, such as in cases of need to reverse arrhythmias with medication (Capoani; Serpa; Fahl, 2023).

Two cases he attended marked him for life, both of neonates with congenital heart diseases, identified and referred for surgical correction by the doctor. The first was that of a 30-day-old girl who remained in continued care with the cardiologist for the rest of her life. The second case was that of a boy who, during the return visit, stated that he wanted to be a doctor and today has a degree in medicine and specialized in cardiology (Capoani; Serpa; Fahl, 2023).



Doctor Mauro Roberto Capoani, after a few months working in the city, managed to join the clinical staff of HCE, where he remained until his retirement in 2018. He left Santa Terezinha Hospital shortly before retiring. Currently, he no longer works in the specialty, dedicating himself exclusively to medical expertise. Milton Araújo Serpa, on the other hand, continues to serve patients in his office and at HCE, in addition to dedicating himself to intensive care, since he has a title from the Brazilian Society of Intensive Care. Cardiologist Célio Friedholdo Fahl, in addition to remaining in this occupation, is also a full professor at URI-Erechim in the courses of Medicine, Law and Dentistry, where he has worked for more than 25 years, and head of the medical department of Ypiranga Futebol Clube de Erechim (Capoani; Serpa; Fahl, 2023).

FINAL CONSIDERATIONS

The history of cardiology in the municipality of Erechim, in the north of Rio Grande do Sul, acquires unique meaning when told by the memories of three of the first cardiologists to work in the locality. Despite the difficulties encountered at the beginning, with the lack of resources and infrastructure, the challenges were overcome by the persistence of the professionals, who always sought the best care for their patients. A timeline was built based on the dialogue of the doctors, who represented all cardiology professionals who work or have worked in the municipality.

The conversation circle brought the community closer to the scientific-academic environment, arousing interest in sharing individual memories that contribute to the understanding of the history experienced daily by health service users.



REFERENCES

1. ANM. (2024). Rubens Mário Garcia Maciel. Disponível em: <https://www.anm.org.br/rubens-mario-garcia-maciel/#:~:text=Destacou%2Dse%20como%20um%20excelente,em%20ensino%20de%20p%C3%B3s%2Dgradua%C3%A7%C3%A3o>. Acesso em: 14 jul. 2024.
2. Bestetti, R. B., Restini, C. B. A., & Couto, L. B. (2014). Development of anatomophysiological knowledge regarding the cardiovascular system: From Egyptians to Harvey. **Arquivos Brasileiros de Cardiologia**, 103(6), 538-545. Disponível em: <https://www.scielo.br/j/abc/a/JJKqv8R6cVqmr6kjfhGVYVL/?lang=pt>. Acesso em: 12 maio 2024.
3. Bolli, R. (2019a). William Harvey and the discovery of the circulation of the blood. **Circulation Research**, 124(8), 1169-1171. Disponível em: <https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.119.314976>. Acesso em: 13 maio 2024.
4. Bolli, R. (2019b). William Harvey and the discovery of the circulation of the blood. **Circulation Research**, 124(9), 1300-1302. Ovid Technologies (Wolters Kluwer Health). <http://dx.doi.org/10.1161/circresaha.119.314977>. Disponível em: <https://www.ahajournals.org/doi/full/10.1161/CIRCRESAHA.119.314977>. Acesso em: 13 maio 2024.
5. Bolli, R. (2019c). William Harvey and the discovery of the circulation of the blood. **Circulation Research**, 124(10), 1428-1429. Disponível em: <https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.119.314978>. Acesso em: 13 maio 2024.
6. Capoani, M. R., Serpa, M. A., & Fahl, C. F. (2023, 22 nov.). Roda de conversa História da Cardiologia em Erechim. Erechim.
7. Colonese, B. A., Jacobina, R., & Serpa, M. A. (2022). História da cardiologia. In: R. Jacobina et al. (Orgs.), **História da medicina: História das especialidades médicas clínicas** (Vol. 2, pp. 217-242). Salvador: Edufba. Disponível em: <https://repositorio.ufba.br/handle/ri/36329>. Acesso em: 14 maio 2024.
8. Décourt, L. V. (1990). O mecanismo da circulação do sangue: A verdade pela obra de Harvey. **Arquivos Brasileiros de Cardiologia**, 54(1), 41-47. Disponível em: <http://cardiol.br/portal-publicacoes/Pdfs/ABC/1990/V54N1/54010008.pdf>. Acesso em: 13 maio 2024.
9. Diniz, J., & Coautores. (2022). A evolução histórica do estudo da anatomia: Uma revisão bibliográfica. **Revista de Saúde**, 13(1), 6-8. Disponível em: <https://editora.univassouras.edu.br/index.php/RS/article/view/2945>. Acesso em: 12 maio 2024.
10. Fahl, C. (2020). Angiocenter celebra 10 anos em Erechim. Disponível em: <https://www.jornalbomdia.com.br/noticia/42476/angiocenter-celebra-10-anos-em-erechim>. Acesso em: 12 jul. 2024.
11. Gallian, D. M. C. (2010). O destronamento do coração: Breve história do coração humano até o advento da modernidade. **Memorandum: Memória e História em Psicologia**, 18, 27-36. Disponível em: <https://periodicos.ufmg.br/index.php/memorandum/article/view/6636>. Acesso em: 12 maio 2024.



12. Genovez, G. (2018). Aconteceu em 1984 em Gaspar: Queda de avião mata cinco pessoas. Disponível em: <https://cruzeirodovale.com.br/aconteceu-em-gaspar/aconteceu-em-1984-em-gaspar-queda-de-aviao-mata-cinco-pessoas/>. Acesso em: 11 jul. 2024.
13. Kropf, S. P. (2023). Trabalhadores, tecnologia e saúde: A construção da cardiologia como especialidade médica no Brasil (décadas de 1930 e 1940). *Revista de História*, 182, 1-32. Disponível em: <https://www.scielo.br/j/rh/a/XdLj94ZphnDkkVngtZHCYkz/>. Acesso em: 14 maio 2024.
14. Mesquita, E. T., & Souza, A. L. A. G. de. (2019). Cardiology and the cardiologist - Yesterday, today and tomorrow. *Arquivos Brasileiros de Cardiologia*, 113(3), 335-338. Disponível em: <https://www.scielo.br/j/abc/a/wF4XTVt5964MdC88ZhtDkwQ/?lang=pt>. Acesso em: 14 maio 2024.
15. SOCERGS. (2024). História. Disponível em: <https://www.socergs.org.br/historia>. Acesso em: 14 jul. 2024.