Dying in Hospital. Integrating and Valorising Sources About Individuals who Passed Away in Transylvanian Healthcare Institutions During the Modern Era

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Dying in Hospital

Integrating and Valorising Sources About Individuals who Passed Away in Transylvanian Healthcare Institutions During the Modern Era

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ABSTRACT

This article explores the integration and research value of the death register from the Carolina State Hospital in Cluj (hu: Kolozsvár, de: Klausenburg), covering the years 1888 to 1895. Preserved at the Cluj County Branch of the National Archives of Romania, in the History of Medicine Collection, this source has been included in the Transylvanian Health Database (TrHD), and contains data on over 1,300 deceased patients, offering insights into individuals' characteristics (such as names, sex, age at death, denomination, marital status, place of birth, date of death, causes of death, and institutional practices). Most patients were young, unmarried males from various parts of the former Austro-Hungarian Monarchy. The denominational structure of the deceased, dominated by Calvinist (Reformed), Roman Catholic, and Greek Catholic denominations, mirrors the broader ethnic composition of Cluj at the time. Common causes of death included infectious diseases and chronic illnesses, while rare conditions were also recorded with notable medical precision in the source. To enable cross-temporal and cross-linguistic comparisons, these causes of death were standardized and coded using the historical ICD10h system. Building on this foundation, the source and the resulting database are expected to support, in both the near and distant future, broader analyses of medicalization, morbidity, mortality inequality, and the evolution of healthcare in this semi-peripheral region of historical Europe. Looking ahead, future research aims to expand the data by integrating admission records and similar registers from other medical institutions in Transylvania and Romania, thereby contributing to international historical demography and the social history of medicine.

Keywords: Hospital death register, Individual level cause of death data, ICD10h, Transylvania, Cluj

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1 INTRODUCTION

The development of the medical system in modern Europe, particularly the gradual expansion of hospital networks and the increased accessibility of medical services, has allowed scholars to capture a social category that previously remained somewhat in the shadows: patients. Moreover, the diversity of preserved historical medical sources, comprising admission registers, death registers, clinical records, and administrative documents, has enabled the capture of both individual and collective experiences of hospitalized individuals. It has also allowed the delineation of a distinct branch within the history of medicine: the history of patients.

Several studies conducted so far have focused on patients in hospitals in Belgium and Germany, as well as in the cities of Venice, Amsterdam, and Sundsvall. These have highlighted significant transformations of these institutions over the course of the 19th and 20th centuries, in terms of both their institutional functions and in the profile of patients and patterns of mortality. Thus, in Belgium during the 19th century, the university hospitals of Ghent, Liège, and Louvain had patients drawn almost exclusively from disadvantaged social classes, with hospitals being intended primarily for poor adults. In the 20th century, they gradually began to accept children and the elderly, and after 1945, with the expansion of the social security system, access became universal (Horrent et al., 1994). In the case of the hospital in Venice, research results indicated that it was not merely an asylum for the poor, but also an institution undergoing medical specialization, where certain diseases, such as chronic or degenerative conditions, were treated more intensively. Nevertheless, admission remained largely determined by the lack of family resources rather than strictly therapeutic reasons. The hospital thus became an intermediate space between "care" and "cure", and charity and modern medicine (Derosas & Munno, 2020).

In Germany, admission registers from the university hospitals of Göttingen, Freiburg, Stuttgart, and Munich show that the institution did not exclusively serve the destitute or marginalized individuals, but rather primarily young adults who were professionally active and socially integrated, yet economically vulnerable. The early introduction of hospital insurance systems explains the constant presence of workers, apprentices, and servants, transforming the hospital into a primarily therapeutic institution rather than one of social assistance (von Bueltzingsloewen, 1994). Although the stated purpose of the Sundsvall County Hospital was to provide care for the needy sick of the local area, in practice it admitted anyone who fell ill or was injured within the region. As a result, the institution assumed responsibility for the health of the entire regional population rather than solely for the town's residents. Funded through both local and central public resources, including contributions from the Swedish government, the hospital attracted a remarkably diverse patient population. Thus, between 1844 and 1900, industrial and agricultural workers, sailors, and soldiers constituted the majority of patients. However, one also finds craftsmen, farmers, and members of the lower middle and middle classes, as well as paupers and prostitutes, broadly reflecting the social structure of towns in northern Sweden at the time (Brändström & Broström, 1989). The *Binnengasthuis* in Amsterdam evolved between 1856 and 1896 from a charitable institution associated with poverty and death into a modern medical centre that was cleaner and better organized. Institutional reforms, in addition to the modernization of buildings, the training of medical staff, and the adoption of antiseptic and anaesthetic measures, all contributed to this transformation (Diepgrond & Riswick, 2025).

From the perspective of mortality, the studies analyzed have shown that hospitals concentrated vulnerable populations, for whom the risk of death was high, but explainable through a series of factors related to the nature of disease, age, and social context. In Venice, infectious respiratory diseases such as tuberculosis, pneumonia, and bronchitis dominated the structure of in-hospital deaths. Mortality was also influenced by the patients' social precariousness (Derosas & Munno, 2020). At the Sundsvall County Hospital this was largely influenced by the type of disease, with the worst outcomes recorded for circulatory disorders, infectious diseases, urinary tract conditions, and respiratory diseases, particularly tuberculosis, which disproportionately affected workers in the timber industry who lived in precarious conditions (Brändström & Broström, 1989). In Amsterdam, the risks of death were determined primarily by the type of disease, age, and year of admission, while socioeconomic status played a secondary role (Diepgrond & Riswick, 2025). In Belgium, the epidemiological transition led to an increase in the share of deaths caused by degenerative diseases (Horrent et al., 1994). Overall, however, these works show that the hospital of the 19th and 20th centuries was a space in which social and medical vulnerability intersected with the process of modernization.

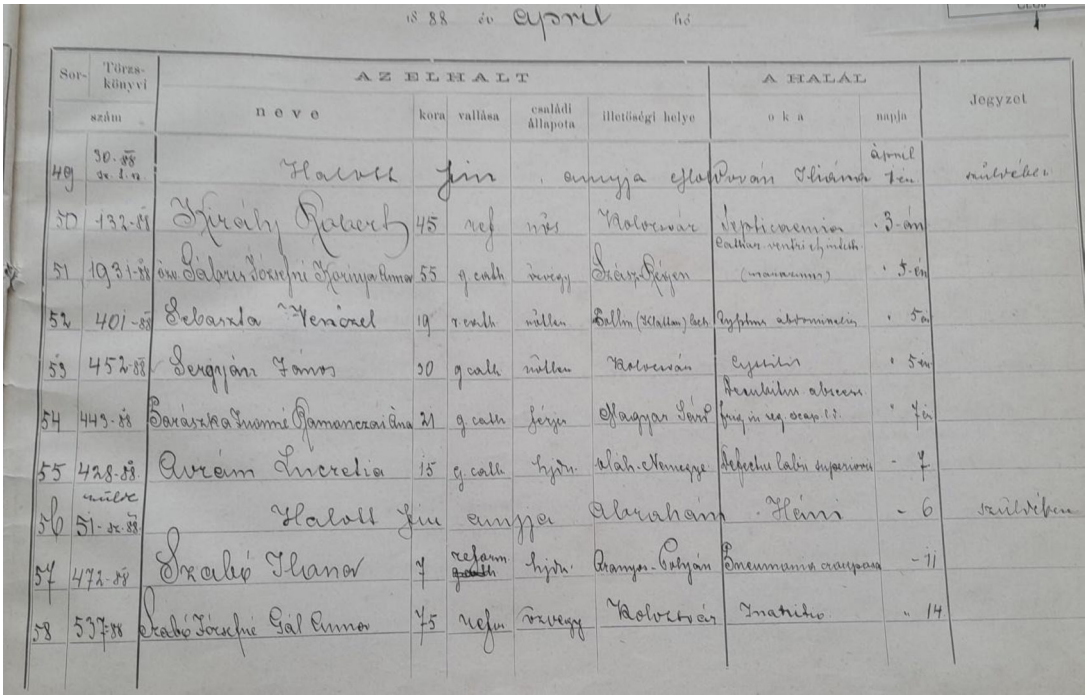
In full alignment with these European research directions, the Transylvanian Health Database (TrHD) project was launched in 2020 at the Centre for Population Studies in Cluj-Napoca, Romania. The initial objective was to trace the spread and organization of the medical system in a province with a semi-peripheral status within the Austro-Hungarian Monarchy, which was undergoing a process of profound transformation and modernization. Accordingly, in the first phase, TrHD reconstructed the medical infrastructure based on the political-administrative configuration of Transylvania in 1900 (Dumănescu et al., 2022). Subsequently, through the identification and use of data from the admission–discharge register of the Carolina Hospital in Kolozsvár/Klausenburg for the year 1877, an initial step was also taken toward recovering the history of Transylvanian patients.

The analysis of the 1,824 patients showed that the majority of those admitted were young adults aged between 16 and 30. They tended to be professionally active and belonging to modest social categories such as day labourers, workers, servants, or apprentices. There were also many vulnerable individuals such as beggars and prostitutes. This age structure confirms that the Carolina Hospital was mainly frequented by socially integrated but economically vulnerable individuals who needed treatment in order to maintain their capacity to work. Moreover, hospitalization was not free, and costs were covered by the patients' local municipalities through public health funds. In addition, employers were legally required to pay for hospitalization for their workers under Law III of 1875 (Dumănescu & Hegedűs, 2025).

As hospital admission registers became more accessible, the TrHD project expanded through the development of two additional components: a patient database (currently under construction) and one of people who died in hospital. The latter constitutes the subject of the present analysis and allows for an examination of hospital mortality, a central theme in the European studies discussed above. As such, the following article aims to integrate and explore the research potential of an essential source for the history of patients and hospital mortality: the death register of the Carolina Hospital in Cluj for the period 1888–1895, preserved at the Cluj County Branch of the National Archives of Romania, in the History of Medicine Collection, Fond 210.

The source provides detailed information on deceased patients, including name, age at death, denomination, marital status, place of birth, date, and cause of death, thereby offering insight into the characteristics of patients who died in hospital (Figure 1). Its systematic recording of causes of death provides a unique perspective on the reasons for in-hospital deaths at the end of the 19th century. Moreover, it also reflects the level of medical knowledge in a public hospital on the periphery of the Austro-Hungarian Empire.

Figure 1 *File from the hospital death register (1888–1895)*



Source: Cluj Branch of the National Archives of Romania, History of Medicine Collection, Fond 210.

2 THE CAROLINA STATE HOSPITAL IN CLUJ: A MEDICAL INSTITUTION IN 19TH-CENTURY TRANSYLVANIA

The Carolina State Hospital in the city of Cluj, the centre of the Habsburg province of Transylvania, opened its doors in approximately 1818. Its establishment was the result of joint efforts by the provincial government and the city council, who redirected part of the public funds towards the cause. It was also made possible by generous contributions from private donors. The most notable were the imperial couple, Emperor Francis I and Empress Caroline Augusta, who, during their visit to Cluj in 1817, donated 10,000 crowns to support the hospital. As a sign of their gratitude, the local authorities named the new hospital after the Empress.

Initially, the hospital was housed in the former Franciscan monastery in the old town centre and had fewer than 20 beds. However, by the 1850s, this number had grown to 80, and by the 1870s, it exceeded 160 (Gaal, 2023). When related to the city's growing population, this corresponded to approximately one hospital bed per 245 inhabitants in 1850. By circa 1870, the situation appears to have improved, with one hospital bed serving approximately 166 inhabitants. In the same manner, distinct medical departments began to emerge: surgery, internal medicine (including dermatology and venereology), obstetrics, and ophthalmology. As the original building quickly became inadequate, new premises were acquired, and departments such as ophthalmology, venereology, and obstetrics were relocated (Gaal, 2023).

From the beginning, the hospital collaborated with the Medico-Surgical Institute, which was founded in 1775. The opening of the Franz Joseph University in Cluj in 1872, the second university on the Hungarian side of the Habsburg Monarchy, had a significant impact on the hospital's evolution. Following the Austro-Hungarian Compromise of 1867, Transylvania became part of Hungary, and the hospital came under the administration of the Hungarian Ministry of the Interior. A portion of the patients were now under the care of the newly established medical faculty at Franz Joseph University, transforming the Carolina Hospital into both a public state hospital and a university one.

The university was under the supervision of the Ministry of Public Education. However, this dual affiliation created ongoing conflicts between the hospital administration and the university's medical faculty. Increasing calls were made for the entire hospital to be transferred under the jurisdiction of the Ministry of Religion and Public Education. It was hoped that this change would bring the funding needed to construct modern hospital buildings in a pavilion-style layout, similar to other hospital complexes across the monarchy[1] (Emlékkönyv a Kolozsvári Magyar Királyi Ferencz József Tudományegyetem, 1903).

Between 1888 and 1895, the period covered by the analyzed source, the hospital operated in six separate buildings that did not meet hygienic standards. As such, numerous complaints from faculty members about the hospital's deplorable conditions further emphasized the need for reform. Professors trained in Vienna and Budapest criticized the lack of space, inadequate isolation for contagious patients, absence of running water, and unhygienic sanitation facilities (Balogh, 1868; Pesti Napló, 1893). Patient numbers in the five main departments (internal medicine, surgery, venereology, ophthalmology, and obstetrics) increased steadily from 1,974 (1,127 men and 807 women) in 1888 to 2,709 (1,530 men and 1,179 women) in 1895.

In the years between 1883 and 1897, the mortality rate among hospital patients ranged from 5.06% to 6.94% (Gaal, 2023). In general, many European hospitals experienced high mortality rates during the 19th century. In Venice, between 1874 and 1880, 25% of all deaths occurred in the city's main hospital, with a further 15% taking place in other ones. In Spanish cities, the share of institutional mortality ranged between 20% and 40% of all deaths, while in London institutional deaths accounted for 16% of total deaths in 1861 (Derosas & Munno, 2020). Mortality was also high in Amsterdam hospitals, exceeding 10% in 1852 and in 1894–1895, and rising to almost 15% in 1860. In the Swedish hospital of Sundsvall, the mortality rate was 10.3% (Brändström & Broström, 1989).

By contrast, the low mortality rate observed at the Carolina Hospital between 1883 and 1897, with only 5.4% of deaths recorded in 1877, cannot be interpreted as an indicator of the hospital's therapeutic

1 The constant public pressure eventually yielded results, and in early 1896, the hospital was transferred to the Ministry of Religion and Public Education. Construction began on modern university clinics, with the first buildings becoming operational in 1899. These buildings, integral parts of the hospital complex on Clinicilor Street in Cluj-Napoca, still function today as hospitals, now as part of the Cluj County Emergency Hospital.

effectiveness, but rather as a reflection of admission and patient selection policies. Indeed, patients in a critical condition were often discharged shortly before death. However, the hospital admission registers offer no conclusive data on patients turned away due to incurable illness. The few cases in which the remarks column notes that a patient was discharged as incurable are too rare to meaningfully affect the overall statistics. The registers do, however, show a relatively low number of in-hospital deaths, suggesting that some patients may have been refused admission outright. No records of such cases survive, however, so neither their number nor the conditions involved can be estimated (Dumănescu & Hegedűs, 2025).

Despite infrastructural shortcomings, the hospital benefited from the work of well-trained and renowned physicians, many of whom were also university professors. A central figure was Dr Engel Gábor (1852–1935), who served as hospital director from 1887 (officially from 1890) until 1919. Trained in Budapest and Leipzig, he joined the gynaecology department in 1880 and, from 1893, taught gynaecological surgery at the university (Kenyeres, 1994). The surgery department was led from 1867 by Dr Joseph Brandt (c. 1839–1912), a Vienna University graduate and former military surgeon, who also headed ophthalmology until 1872.

By the 1870s, the surgery department had 65 beds, and Brandt gained European recognition through major surgical operations he performed, including one of the earliest ovarian cyst removals and nephrectomies (Gaal, 2011). The internal medicine department was headed for decades by Professor Zsigmond Purjesz (1846–1918), who became department chief in 1880. A prominent diagnostician and advocate of laboratory medicine, he authored the first Hungarian textbook of internal medicine and supervised the modern internal medicine clinic opened in 1899, which had 200 beds and advanced facilities (Gaal, 2018). Obstetrics also had a strong tradition, led initially by Dr János Maizner (1828–1902), a disciple of Ignaz Semmelweis, and later by Dr Dénes Szabó (1856–1918), who organized the modern obstetrics and gynaecology clinic inaugurated in 1899 (Gaal, 2019). Other notable physicians included dermatologist Ede Géber (1840–1891), head of the dermatology and venereology department (Emed, 2009), and psychiatrist Károly Lechner (1850–1922), a pioneer of Transylvanian neurology appointed as a professor in Cluj in 1899 (Iványi, 2008).

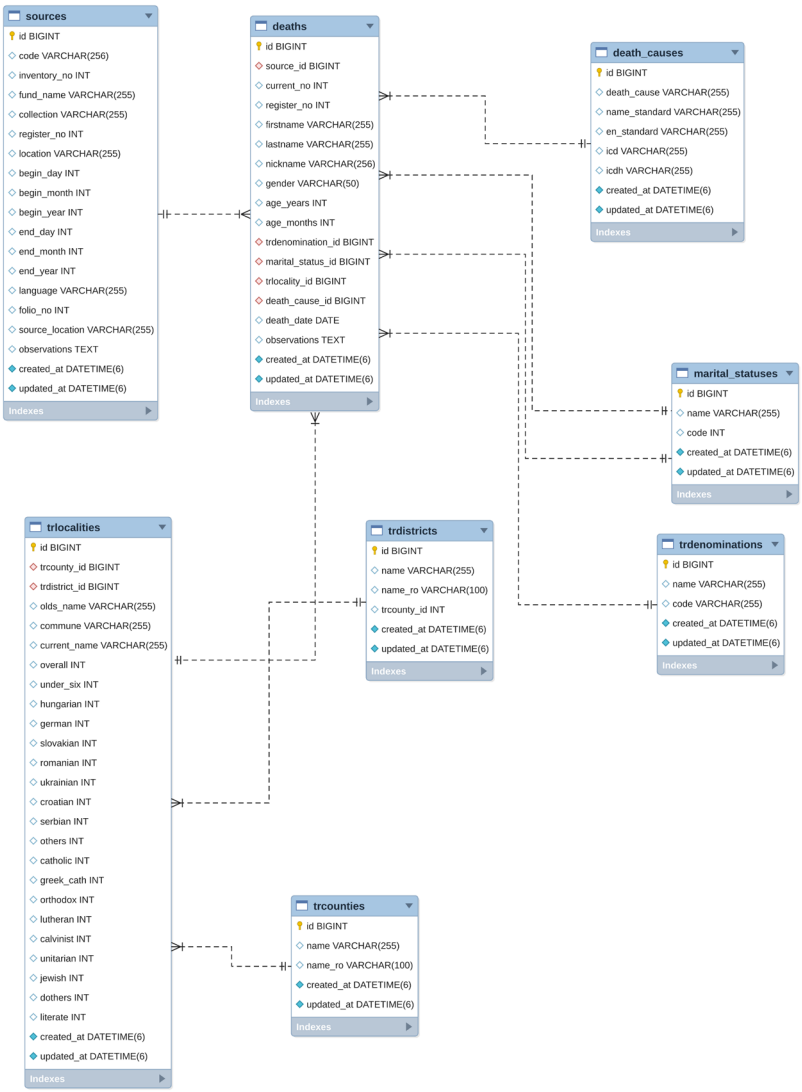
Throughout the period under analysis, the Carolina Hospital in Cluj was staffed by specialized medical personnel, who implemented modern medical methods and technologies. The institution was a state-run public hospital, well integrated into the healthcare system of the Austro-Hungarian Monarchy, and functioned predominantly as a curative medical facility. Although it retained certain elements of social assistance, hospital admission was nevertheless regulated, selective, and fee-based. At the same time, through its role as a university hospital, the institution actively contributed to the process of medicalization and the professionalization of medical practice.

3 THE TRANSYLVANIAN HEALTH DATABASE – THE REGISTER OF DEATHS

The Transylvanian Health Database (TrHD) is a comprehensive historical medical database system focused on Transylvanian medical records. It follows a method-oriented design approach, in which the database structure is optimized for predefined research methodologies. The system is implemented as a full-stack web application using the Ruby on Rails framework and illustrates the application of contemporary web development practices within the field of digital humanities. The Rails application architecture integrates several components including the user interface, as well as authentication and authorization methods, search functions, and data export tools. The user interface is made of generated views that facilitate data visualization and interacting.

Access to the database is administered through role-based authentication and authorization, allowing certain tables to be publicly accessible while restricting others to authenticated users. The search function allows users to make relevant queries and to retrieve relevant results for their questions. The export functionality supports the generation of Excel-formatted datasets, enabling researchers to extract selected records for use in external analytical tools or other research workflows. Everything is controlled through the user interface and views in order to eliminate the errors that a user might possibly make if he/she has direct access to the database. At the backend the system relies on a relational database implemented in MySQL (Figure 2). The core data entity is represented by the death records table. The component detailing patients who died at the Carolina Hospital was built considering the information provided by the register of deaths, supported by additional tables utilized in the overall data architecture.

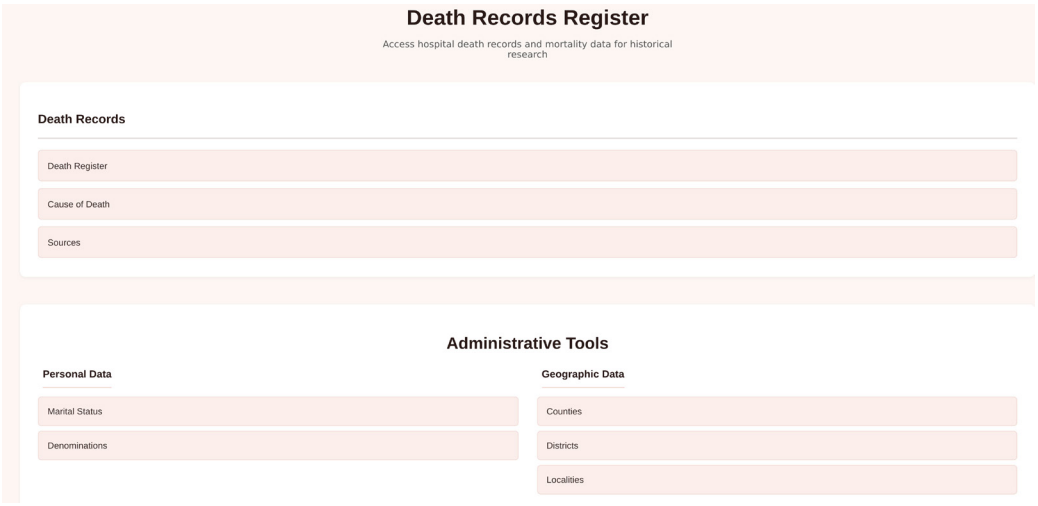
Figure 2 *Database model for the death register*



Source: TrHD – the register of deaths.

The hospital death register database includes eight tables, structured into two main metadata tables: the main one, with records fields about the patient/deceased, and several additional tables for counties, districts, localities, denominations, and marital status (Figure 3).

Figure 3 *Transylvanian Health Database – death register, user interface*



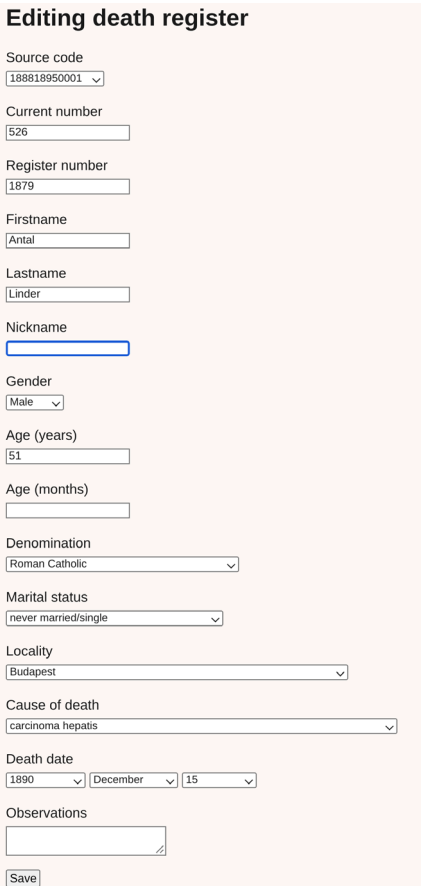
Source: TrHD – the register of deaths.

The tables dedicated to counties, districts, and localities are derived from the 1900 census, and due to these tables users can match individuals with their birthplace or domicile. All three tables can be appended with new records if necessary. Marital status and denomination are recorded in standardized formats that facilitate the normalization of the database. The main table includes personal information (first name, last name, age), as well as details of death circumstances (date, cause, location), demographic data (denomination, marital status), and International Classification of Diseases (ICD-10) and standardized scheme for historical causes of death (ICD10h) codes for causes of death.

The first three headings refer to the source and the patient's identification numbers. The source code is formed by the chronological limits of the records (1888 and 1895). The current number is the actual record number in this register, while, as can be seen in the image representing a register page, the register number (*Törsz-könyvi*) indicates the patient's position in the admission register of that ward. We preferred to keep both register numbers, since these individuals can be identified in the hospital's admission registers in the patients' database. Starting from the fourth field, we have recorded patient data, including first name, last name, and nickname. The nickname is a particularly important variable, especially in the case of women belonging to the Hungarian ethnic group. For these women, a specific community-based naming convention is used, identifying a wife by her husband's name, such as "Józsa Jánosné", meaning "wife of Józsa János." The subsequent fields include sex and age, with age being expressed in years in cases of adults and children, and days, weeks, and months for infants (Figure 4).

Marital status and religion are standardized according to international conventions consistently applied across all databases managed by the Centre for Population Studies (Bolovan et al., 2019). The locality is selected from a list of localities provided in a secondary table, which can be updated whenever a new location appears. The specificity of this database lies in the inclusion of the field "cause of death," which allows, for the first time in this region, a comprehensive analysis of this subject based on medical records. Previous studies relied on data from parish registers, which only occasionally recorded the cause of death according to a medical certificate issued by an authorized institution (Holom & Hegedűs, 2022).

Figure 4 *Entry form for deaths*



Source: TrHD – the register of deaths.

The last three fields relate to the date of death and an observations field, which in most cases includes notes about the number of hospitalization days, or indicates that female patients were admitted from the maternity ward. Occasionally, in cases involving deceased children, the observations field includes the mother's name, often noting that she was hospitalized together with the child. In some instances, it is specified that relatives retrieved the body; in others, the body was sent for autopsy at the anatomical pathology facility.

Moreover, the entire database is flexible and any new type of information can be added and harmonized at any time without compromising the original structure. Another strength of the database is that it allows connections with other sources and potential linkages in the future, making it possible to trace individuals across multiple records and thus complete the information about them. One such example is Albert Blázsi, who died in the Carolina Hospital (Figure 5).

He also appears in the burial register of the Lutheran community of the city of Cluj, where an additional detail about him is recorded: he worked as a *czukrász*/pastry maker (Figure 6). Moreover, in the near future, information about individuals may be further enriched thanks to the automatic transcription of the parish civil registers of the city of Cluj and their subsequent integration into the Historical Population Database of Transylvania (HPDT). In this way, individuals will be traceable across multiple contexts within the parish registers of births, marriages, and deaths, as well as in the patient records of the Carolina Hospital.

The register contains information on 1,307 deceased patients from the period 1888–1895, and a very preliminary descriptive statistical analysis highlights several relevant demographic characteristics of individuals who died at the Carolina Hospital in Cluj. The sex structure shows a clear predominance of men (60.9%) compared to women (39.1%), a distribution linked to the social characteristics of an active urban population, with men being more frequently involved in economic activities. Moreover, connecting the data from this registry with hospitalization records, which in many cases include an occupation variable, may provide new evidence of a relationship between occupation and the likelihood of becoming a hospital patient (Dumănescu & Hegedűs, 2025).

Figure 5 *Entry form for the death of Albert Blázsi*

TransylvaniaHealth

Death Register: Show Record

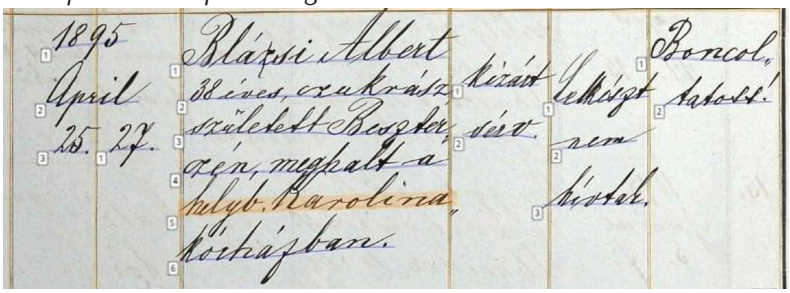
Source Code: 188818950001
Current number: 1331
Register number: 760
Firstname: Albert
Lastname: Blazsi
Nickname:
Gender: male
Age (years): 38
Age (months):
Denomination: Lutheran
Marital status: never married/single
Locality: Beszterce rtv.
Cause of death: 184 incarceratio interna
Death date: 1895-04-25
Observations:
Actions:

Death Register: Edit this record | Death Register: Back to list | Death Register: New record

Death Register: Destroy this record

Source: TrHD – the register of deaths.

Figure 6 *Excerpt from the parish register about the death of Albert Blázsi*



Source: Cluj Branch of the National Archives of Romania, Parish Registers Collection, 71/108.

Table 1 *Descriptive statistics of the individuals who died in Carolina Hospital (1888–1895)*

Sex	**N**	**%**
Female	511	39.1
Male	796	60.9
Missing	0	0.0
Age	**N**	**%**
Under 1	70	5.4
1-10	60	4.7
11-20	160	12.3
21-30	252	19.2
31-40	202	15.4
41-50	170	13.0
51-60	152	11.6
61-70	103	7.8
71-80	31	2.4
Over 80	8	0.6
Missing	99	7.6
Denomination	**N**	**%**
Calvinist (Reformed)	368	28.2
Christian	2	0.2
Greek Catholic	318	24.3
Jewish	97	7.4
Lutheran	39	3.0
Orthodox	47	3.5
Roman Catholic	362	27.7
Source variable left blank	2	0.2
Unitarian	25	1.9
Without religion	1	0.1
Missing/blank	46	3.5
Missing	0	0.0
Marital status	**N**	**%**
Civil union	1	0.1
Source variable left blank	1	0.1
Divorced	8	0.6
Married	391	29.9
Missing/blank	13	1.0
Never married/single	716	54.8
Widowed	177	13.5
Missing	0	0.0
Locality	**N**	**%**
Cluj/Kolozsvár thjv.	430	32.9
Other	835	63.9
Missing	42	3.2
Total	**1,307**	**100.0**

Source: TrHD – the register of deaths.

The age distribution indicates a predominantly young population, with approximately one fifth of the cases under 20 years old, while the largest group consists of young adults aged 21 to 40. Individuals aged over 60 represent only a small share of the studied population (approximately 11%). A recent study indicates that older individuals were less likely to reach the hospital, and even when they did, many ultimately passed away at home (Dumănescu & Hegedűs, 2025). Regarding marital status, the majority of individuals were unmarried (54.8%), whereas almost one third were married at the time of registration (29.9%).

The largest denominational groups among the deceased were Calvinist (Reformed) (28.2%), Roman Catholic (27.7%), and Greek Catholic (24.3%), alongside Lutheran, Orthodox, Unitarian, and Jewish communities present in smaller proportions, reflecting in general lines the denominational realities of the city which, at the 1890 census, counted 32,756 inhabitants, among whom the Calvinist (Reformed) were the most numerous at 12,621 persons (38.5%), followed by Roman Catholics at 11,248 (34.3%), Greek Catholics at 3,279 (10%), Jews at 2,414 (7.4%), Lutherans at 1,432 (4.4%), Unitarians at 1,237 (3.8%) and Orthodox at 489 (1.5%). Furthermore, at the same 1890 census, Cluj had an overwhelmingly Hungarian ethnic character. Out of a total of 32,756 inhabitants, Hungarians numbered 27,514 persons (84%), making Cluj one of the most Magyarized cities in Transylvania, while Romanians accounted for only 3,226 (approximately 10%), followed by Germans with 1,336 (approximately 4%).

Other nationalities, such as Serbs, Slovaks, and others, totalled less than 2%. In 19th-century Transylvania denominational affiliation served as a proxy for ethnicity, with Calvinist (Reformed) and Unitarian denominations associated predominantly with Hungarians, Greek Catholic and Orthodox ones with Romanians, and the Lutheran one with Germans. This ethnic composition was therefore directly reflected in the denominational structure of the city and implicitly in that of the deceased patients of the Carolina Hospital (Varga, 2001). Finally, the analysis of place of origin indicates that only one third of individuals (32.9%) were natives of Cluj. The majority (63.9%) came from other localities within Transylvania or from other parts of the monarchy (Hungary, Austria, Italy, and Croatia). This suggests an extensive regional pull exerted by Cluj, an important economic and medical centre (Table 1).

4 CLASSIFYING AND CODING CAUSES OF DEATH RECORDED IN THE REGISTERS OF CAROLINA HOSPITAL IN CLUJ

In the 18th–19th centuries, states became increasingly concerned with population matters for reasons related to providing soldiers, taxpayers, and a labour force. The population therefore shifted from being regarded as a natural given to being treated as a resource to be governed and optimized. In this context, the state became directly involved in population record-keeping and registration, with parish registers serving in Transylvania, until 1894, as official vital records. These thus occupied a central role and underwent an intense process of legislation, aimed at organizing them as efficiently as possible in the service of administration (Moldovan, 1980).

Along this path, the content of the registers gradually improved, and their categories became more diversified, including with regard to causes of death. However, the completion of parish registers depended to a large extent on the conscientiousness, level of schooling, and cultural background of priests. These factors were also clearly reflected in the way causes of death were recorded (Moldovan, 1958). The limited knowledge of registrars often manifested in vague or imprecise descriptions instead of a diagnosis. They recorded symptoms such as fever, haemorrhage, pain, or generic formulas such as natural death, ordinary illness, or short illness, which do not allow the identification of a clear aetiology. Chronic diseases were systematically under-recorded, as authorities and the population continued to perceive them as forms of natural death, while infectious diseases with epidemic potential were recorded more carefully, for public health reasons (Holom & Hegedűs, 2022).

A trend toward improvement emerged toward the end of the 19th century, with economic progress, the expansion of access to medical services, and the gradual professionalization of record-keeping. However, statistics from 1897 show that physicians determined the cause of death in only 29.3% of cases, predominantly in urban areas. The remaining deaths were certified by death inspectors, recruited from among teachers, merchants, or educated peasants, whose training was conducted under the

supervision of a physician. However, some of them acquired their knowledge exclusively through practice, without any formal training. As a result, their methods were more empirical than scientific, grounded in direct observation and popular practice. They were characterized as "semi-professionals of death," a transitional solution between rural traditionalism and the process of the administrative and medical modernization of Transylvania, which accelerated especially after the adoption of the Sanitary Law of 1876 (Rotar, 2012).

An entirely different picture emerges from the records of the Carolina Hospital in Cluj, where the causes of death were determined by medical professionals, recorded with greater accuracy, and often accompanied by additional details. While deaths from infectious diseases, such as pulmonary tuberculosis, typhoid fever, dysentery, diphtheria, smallpox, and scarlet fever, were more frequent overall, the register also recorded fatalities due to chronic illnesses such as nephritis chronica, diabetes mellitus, polyarthritis rheumatica, epilepsies, and disseminated sclerosis. In addition, there were numerous diagnoses of cancer, many of which included the specific organ affected, such as: *carcinoma hepatis* (liver cancer), *carcinoma labii et maxillae inferioris* (cancer of the lip and lower jaw), *carcinoma oesophagi* (oesophageal cancer), and *carcinoma uteri, vaginae et hepatis* (cancer of the uterus, vagina, and liver). Deaths from rare diseases were also noted, including *morbus Addisoni* (Addison's disease), *morbus Brighti* (Bright's disease), and *morbus maculosus Werlhofii* (Werlhof's disease).

In a smaller number of cases, the records mention symptoms rather than clearly defined causes of death, such as *elvérzés* (haemorrhage), *haematemesis* (vomiting of blood), *rángó görcsök* (twitching spasms), and *húgyvérűség* (haematuria). There were also instances in which the cause of death remained unknown, with entries such as *haldokolva hozatott* (brought to the hospital almost dead) or *causa mortis ignota* (unknown cause of death) appearing in the register. These aspects confirm the inherent limitations of cause of death registration in the past, and the presence of deaths attributed to symptoms rather than specific conditions, or to unknown causes, demonstrates that medical certification did not always guarantee the accurate and consistent reporting of causes of death. This point has also been emphasized by other scholars in the field (Alter & Carmichael, 1996). On the other hand, the fact that most notations specify the causes of death clearly, while only a small number refer to symptoms or unknown causes, reflects the rigor, professionalization, and high standards of the Cluj hospital's medical staff. It also stands as a guarantee of the reliability and historical value of this source.

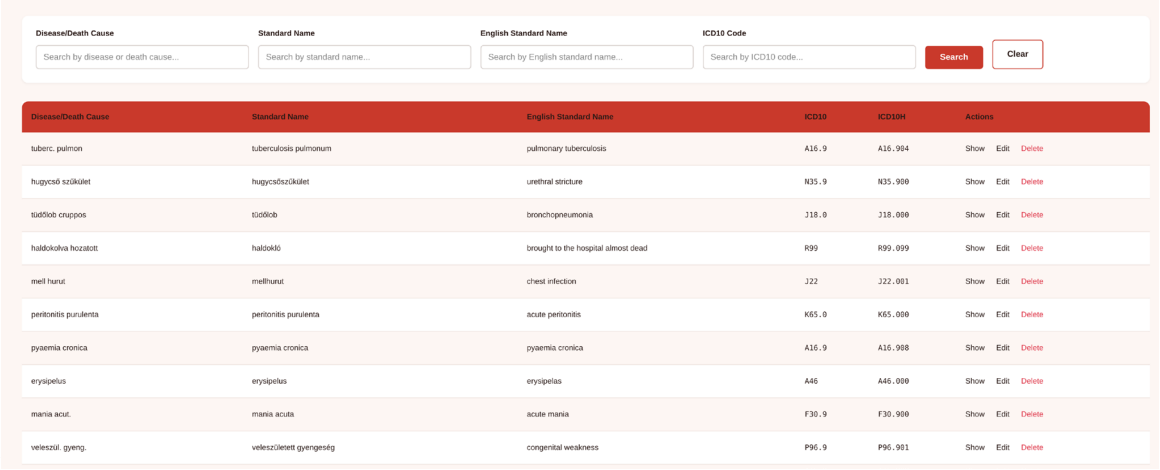
The causes of death extracted from the Carolina Hospital registers were first subjected to a process of linguistic completion and standardization, followed by translation and equivalence in English. Each cause was then assigned corresponding codes from both the ICD-10 and ICD10h classification systems (Reid et al., 2024). To facilitate this process, a dedicated table was created and linked to the other available data on the deceased patients register.

Most causes of death were recorded in Latin or Hungarian, with Latin being more frequent. These entries often required standardization and completion, as many were written in an abbreviated form. For example, pulmonary tuberculosis, one of the most common causes of death at the time (Holom & Hărăguș, 2025), was frequently recorded as "tuberc. pulmon", which was standardized to the correct Latin form "tuberculosis pulmonum" and subsequently translated into English as "pulmonary tuberculosis". This cause of death was then coded as A16.9 in ICD-10, following the 2016 World Health Organization (WHO) classification, thereby enabling investigations and comparison with contemporary medical data.

However, in order to preserve historical specificity and accommodate archaic or outdated terms, the same causes of death were also coded using ICD10h, a system that extends modern ICD-10 codes by adding two additional digits (Reid et al., 2024). For example, "tuberculosis pulmonum" (Latin) and "tüdőgümőkór" (Hungarian) were coded as A16.904 in ICD10h. Similarly, "phthisis pulmonalis," a historical medical term for pulmonary tuberculosis, was coded as A16.9 in ICD-10 and A16.903 in ICD10h. Likewise, "tuberculosis" (Latin) and "tüdővész" (Hungarian) were coded as A16.9 in ICD-10 and A16.905 in ICD10h.

Through the ICD10h system, tuberculosis and its various historical forms were assigned distinct codes, enabling researchers to trace the evolution of the terminology associated with the disease across time and languages but without excluding the archaic terms once used to describe it. This approach, which focuses on codifying the terminology rather than the disease itself (Janssens, 2021), was applied to all causes of death recorded in the Carolina Hospital register (Figure 7).

Figure 7 *Sample of causes of death list*



Subsequently, after assigning all death cases recorded in the Carolina Hospital from ICD10h to the general historical categorization (HistCat) classification, an epidemiological profile strongly dominated by infectious and respiratory diseases emerged. Tuberculosis was the leading cause of death, accounting for 18.4% of all cases in the Carolina Hospital (Table 2). As an untreatable disease at the time, it had a major impact on the population. Together with respiratory diseases, such as bronchitis, bronchopneumonia, and influenza, representing 13.2% of all deaths, respiratory conditions as a whole amounted to more than 31% of overall mortality. The next most frequent causes were digestive diseases and general infections, each responsible for 8.3% of deaths, reflecting the poor sanitary, nutritional, and hygienic conditions. Perinatal mortality, composing 7.5% of all cases, highlighted the fragility of maternal and infant care and the vulnerability of new-borns.

Table 2 *Distribution of deaths at Carolina Hospital by HistCat category (1888–1895)*

HistCat	N	%
Childbirth	13	1.0
Circulatory	62	4.7
Debility	26	2.0
Diarrhoea	90	6.9
Digestive	109	8.3
External	70	5.4
Genitourinary	78	6.0
Ill defined	14	1.1
Infectious	109	8.3
Neoplasms	91	7.0
Nervous system	36	2.8
No cause given/blank	1	0.1
Not a cause of death	36	2.8
Old age	5	0.4
Other	51	3.9
Perinatal	98	7.5
Respiratory	173	13.2
Stated to be "unknown"	4	0.3
Tuberculosis	241	18.4
Total	1307	100.0

Source: TrHD – the register of deaths.

Circulatory diseases made up only 4.7% of deaths, confirming a pre-transitional mortality regime in which most individuals died before developing degenerative conditions associated with old age. Mortality attributed to "old age" was also extremely low (0.4%). Overall, the mortality structure suggested a sociomedical context in which infectious diseases were the dominant causes of death, while the impact of chronic degenerative diseases remained limited, reflecting a population situated before the epidemiological transition. This is consistent with the pre-transitional pattern described by Omran (1971), in which infectious diseases, maternity complications, and malnutrition accounted for the overwhelming majority of deaths.

5 PROSPECTIVE RESEARCH AVENUES AND USES OF THE TRANSYLVANIAN HEALTH DATABASE (TRHD) – THE REGISTER OF DEATHS

The register of the deceased from the Carolina Hospital in Cluj is an original and particularly valuable source, providing an opportunity to conduct a wide range of scientific investigations into medical, social, and demographic history, as it offers detailed information at the individual level. The data enable the analysis of differences and inequalities in mortality, including by cause of death, through the influence of variables such as sex, denomination, age, marital status, and place of residence. At the same time, this information makes it possible to map and spatially visualize the areas of origin of patients who died in the hospital, contributing to a better understanding of the relationship between mobility, disease, and access to medical care.

In the near future, this source can be supplemented with additional data on patients admitted to the hospital, extracted from the Transylvanian Health Database (TrHD). Thus, it becomes possible to study in greater depth the evolution of institutional medical care in historical Transylvania. By analyzing the length of hospitalization and calculating cure, discharge, and mortality rates, it is possible to assess the effectiveness of treatments as well as major transformations in the role of hospitals. In addition, the analysis of the types of diseases treated, as well as of deaths occurring in hospitals, can reveal changes in medical practices as well as institutional and societal priorities.

These sources also constitute an essential tool for understanding the relationship between medical institutions and society. Information on age, sex, occupation, marital status, and place of origin makes possible to identify the social groups that sought hospital care and those who did not benefit from or were excluded from medical treatment. In this context, the influence of patients' social position and the status of the hospital, as well as admission policies and financing mechanisms, on access to medical care can be analyzed.

Patient registers are also fundamental sources for the study of morbidity, epidemiology, and historical mortality. They allow for the identification of disease patterns, changes in specific diagnoses, and seasonal variations in illness and even deaths among individuals in historical Transylvania. Moreover, patient registers provide information on individuals who became ill but survived, as well as on factors that may have contributed to recovery.

These registers can also be linked with data from the Historical Population Database of Transylvania (HPDT), as demonstrated in the article, through the use of automatic handwriting recognition processes (Dumănescu et al., 2025). In this way, detailed life histories can be reconstructed, including individuals' life courses and the family contexts in which illness, hospitalization, and death occurred. Information on family composition, marital status, and children makes possible to analyze the role of support networks and the impact of illness on everyday life.

Furthermore, other similar registers, whether from Cluj or from other localities in historical Transylvania and Romania, can be integrated into this flexible database format. This expansion will allow for relevant comparisons with other European contexts, while the use of the standardized scheme for historical causes of death (ICD10h) will enable a deeper understanding of the historical processes of medicalization and the root causes of health and mortality inequalities over time.

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