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The Impact of Proper Use of the Death Notification System on Health Statistics: The Case of İstanbul

Ölüm Bildirim Sisteminin Doğru Kullanılmasının Sağlık İstatistiklerine Etkisi: İstanbul Örneği

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Abstract

Objective: This study aims to evaluate how death reports submitted to the death reporting system in İstanbul province affect statistics, investigate the reasons for improperly completed documents, and identify areas requiring improvement for more accurate use of the system, thereby facilitating further work in these areas.

Method: In this study, death certificates reported to the death notification system in İstanbul province in 2023 were accessed on May 12, 2024, with institutional permission. A sample of 2.351 documents was examined. The documents were selected from the 2023 DNS database using simple random sampling. Documents requiring correction were exported to Excel, and each section was analyzed separately. For documents deemed unsuitable, the returned sections and their percentages, the reasons for return, the correction times for returned documents, and the total completion time for these documents were examined. The study was conducted in 2024 at the Public Health Directorate in İstanbul.

Results: Of the documents examined, 70.7% were found to be correctly issued, while 29.3% were incorrect or incomplete. Of the incorrect documents, 11 were found to have been returned to the same physician. The most common errors or omissions on death certificates (80%) were found in the cause of death section.

Conclusion: Several areas need to be addressed to ensure more complete and accurate death certificates. It is important that these improvements be carried out jointly with all relevant institutions. Efforts

Öz

Amaç: Bu çalışmada İstanbul ilinde ölüm bildirim sistemine yapılan ölüm bildirimlerinin incelenerek uygun düzenlenmeyen belgelerin nedenlerinin araştırılması ve sistemin daha doğru kullanılması için ihtiyaç duyulan konuların tespit edilmesi, bu konularda çalışmalar yapılmasının sağlanması amaçlanmıştır.

Yöntem: Yapılan bu çalışmada İstanbul ilinde 2023 yılında ölüm bildirim sistemine bildirimi yapılan ölüm belgelerine 12.05.2024 tarihinde alınan kurum izni ile ulaşılmıştır. Örneklem olarak 2,351 adet belge incelenmiştir. Belgeler 2023 DNS veri tabanından basit rastgele örnekleme ile seçilmiştir. Belgelerden düzeltme talep edilen belgeler Excel'e aktarılarak belgelerdeki her bir bölüm ayrı birer parametre olarak incelenmiştir. Uygun bulunmayan iade edilen belgelerde, iade edilen bölümler ve bunların oranları, iade nedenleri, iade edilen belgelerin düzeltme süreleri ve bu belgelerin toplam tamamlanma süreleri incelenmiştir. Çalışma İstanbul ilinde Halk Sağlığı Başkanlığı'nda 2024 yılında yapılmıştır.

Bulgular: İncelenen belgelerden %70,7'sinin doğru düzenlendiği, %29,3'ünün hatalı ya da eksik düzenlendiği görülmüştür. Hatalı olan belgelerden aynı hekime 11 kez iade edilen belge olduğu tespit edilmiştir. Ölüm belgelerinde en çok ölüm nedenleri kısmında (%80) hata ya da eksiklik olduğu görülmüştür.

Sonuç: Ölüm belgelerinin daha eksiksiz ve hatasız düzenlenebilmesi için bazı konularda çalışmalar yapılmasına ihtiyaç vardır. Bu iyileştirmeye yönelik çalışmaların ilgili tüm kurumlar ile ortak yapılması önemlidir. Bu

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Abstract

to achieve this should be directed at individuals and institutions involved in the process from the inception of the document to its registration.

Keywords: Death certificate, death notification system, health statistics

Öz

yönde yapılacak çalışmaların belgenin düzenlenmesinin başlangıcından tescil edilmesine kadar olan süreçte rol alan kişi ve kurumlara yönelik olması gerekir.

Anahtar kelimeler: Ölüm belgesi, ölüm bildirim sistemi, sağlık istatistikleri

Introduction

Determining a country's level of development, establishing health policies and priorities, and planning, organizing, controlling, and implementing intervention programs are related to statistical data. For this reason, it is essential that health statistics be based on accurate and regularly collected data. One of the most important of these statistics is mortality. Death certificates contain important information such as age, gender, manner of death, place of death, and causes of death. Accurate determination of causes of death is particularly important for identifying mortality trends, analyzing diseases causing death, and identifying preventable causes of death (1,2). Cause-of-death statistics are an important source of data for explaining mortality patterns with respect to time and place, establishing population projections, supporting public health programs, and generating hypotheses for research. In addition, these data are necessary for public health evaluations and form the basis of the public health statistics system (3). These results guide health managers and policymakers.

Mortality statistics have been compiled by Turk Stat since 1931. Until the end of 1949, 25 provincial centers were included; between 1950 and 1956, all provincial centers were included; and after 1957, all provincial and district centers were included. Since 2009, cause of death statistics have been published separately. During the European Union (EU) harmonization process, the Turkish Statistical Institute and the Ministry of Health initiated a project entitled "Cause of Death Statistics" to harmonize cause-of-death statistics with EU standards. The aim of this project is to improve the quality and reliability of cause-of-death statistics, ensure comparability between countries, and produce cause-of-death statistics in accordance with international standards. In this context, a new death certificate was developed in accordance with the World Health Organization (WHO) standards. Effective January 1, 2009, the new death certificate was implemented. With the new document, information on infant and maternal deaths, as well as on the causes and duration of those deaths, has begun to be compiled. Coding of diseases in the sections used to determine the cause of death follows the International Classification of Diseases (ICD)-10, and the underlying cause is determined by applying the rules of the WHO. Accurate recording of deaths has become a problem for many countries. The 2007 study reports completeness and accuracy sufficient to enable comparisons between most European countries (4).

In 2012, the death notification system (DNS) was developed by the Ministry of Health; it enables the electronic registration of death certificates, collects data in a common pool, and authorizes only physicians to issue death certificates. It entered into force on 01/01/2013. Since 2013, death certificates have been issued electronically via the DNS (5).

The reliability of the information in death certificates, which constitute the data for death statistics, is of utmost importance. The information on death certificates is based on the individuals who issued the certificates and on the nature of the data they provided. The issuing physician is responsible for the accuracy of the information in the form. When not all sections of death certificates are completed as intended, mortality statistics may be affected. In the cause-of-death section of death certificates, the actual cause of death is often not recorded; instead, a result related to the cause is recorded, rather than the primary cause (6,7).

Death certificates contain sections A, B, C, D, E, F, G, and H. Section A contains the identity and residence information of the deceased. Part B consists of the date, hour, minute, and place of death. Section C records the manner of death. This section must correctly state whether the manner of death was due to an infectious disease and whether it was a forensic death. For deaths resulting from diseases within the scope of the Notifiable Diseases included in Annex-1 of the Communiqué on the Notification and Notification System of Infectious Diseases, published by the Ministry of Health in the Official Gazette dated 06.11.2004 and numbered 25635, the type of death should be recorded as "infectious disease" (8). If the manner of death is considered forensic, it must be specified in this

section. Because the forensic process typically begins with the physician's suspicion of death, this examination is perhaps the most important for clarifying forensic cases involving death (9).

Section D indicates whether the death occurred as a result of injury; Section E indicates whether an autopsy was performed and, if so, provides autopsy information. Following Section E, information about the person who provided details about the deceased must be recorded. It is considered inappropriate for persons under the age of 18, who are ineligible to carry out official transactions without a parent or legal guardian, to serve as the informant on the death certificate valid for official transactions (10). However, when no first-degree relatives are available, other officials involved in the event of a death, such as hospital health workers, nursing-home staff, police, security guards, the gendarmerie commander, and a mukhtar, may also be recorded.

The information provided by the authorized person filling out the document includes the physician's details. Section F opens to the infant death information form interface. If the person who died is a woman and between the ages of 15-60, section G must be filled in, which is the section

that includes information on whether the death is a maternal death. Section H is the section where the causes and duration of death are written.

Since the information on death certificates directly affects death statistics, inaccurate cause-of-death statistics in a country are an important source of concern. According to the latest mortality data announced by the Turkish Statistical Institute, the total number of deaths in Turkey in 2022 was 504,839 (11). In İstanbul, it is 87,252 (ÖBS, 2022). Approximately 18% of the total deaths in Turkey occur in İstanbul. Therefore, accurate death notification in İstanbul significantly affects Turkey's mortality statistics. Because these results are derived from the physicians who prepare death certificates, those physicians play a central role in the formation of death statistics. Correcting the causes of death in incorrectly or incompletely prepared documents is important, as it affects mortality statistics.

This study aimed to examine death notifications made to the DNS in İstanbul province and to evaluate how they affect the statistics; to investigate reasons for documents not being issued appropriately; and to identify issues requiring attention to improve the accuracy of system use and to ensure that further studies address these issues.

Materials and Methods

A total of 82,287 deaths occurred in İstanbul in 2023. Death statistics are obtained from data in documents reported to the DNS. In this study, death certificates that were reported to the DNS in İstanbul in 2023 were accessed retrospectively after institutional permission was obtained from the İstanbul Provincial Health Directorate on May 12, 2024. The sample size was calculated as $n = (82.287 \times 1.96^2 \times 0.5 \times 0.5) / [(0.05^2 \times 82.286) + (1.96^2 \times 0.5 \times 0.5)] = 383$, using the sampling method formula and taking into account a 95% confidence level and a 5% margin of error. This calculated sample size was deemed sufficient to represent the population. In the study, a total of 2.351 documents were examined, exceeding the predetermined sample size intended to increase analytical power and further reduce the margin of error. The documents were selected from the 2023 DNS database using simple random sampling.

The study was conducted in 2024 at the Public Health Directorate in İstanbul. The study was approved by the Üsküdar University Non-Interventional Research Ethics Committee at its meeting No. 3, held on March 26, 2024, and institutional approval was obtained on May 12, 2024.

Results

According to DNS data, examination of sample documents revealed that 70.7% (1.662) of the sample documents were completed correctly, whereas 29.3% (689) were completed incorrectly or incompletely. Documents prepared incorrectly or incompletely were not approved and were returned to the physicians who prepared them. Of the documents that were not approved, 52.7% (363) were legal documents. 47.3% (326) were documents from other institutions (Table 1).

Of the 434 physicians whose documents were examined as a sample, 54.8% (238) had their documents returned for correction. Analysis of the number of documents returned to physicians showed that between one and eleven documents were returned to the same physician (Table 2).

A total of 122 institutions issued 2,351 documents. documents were returned for correction to 114 institutions (93.4%); no documents were returned to 8 institutions. Each of the institutions to which documents were returned received between 1 and 16 documents (Table 2).

Eighty percent of the retrieved documents addressed correction of causes of death. The documents returned in

the causes of death section are usually those in which the ICD code for the actual cause of death was not written, the ICD codes were not ordered according to cause and effect, or the durations of the diagnoses were not written correctly.

The rate for other reasons is 20%. The rates of corrections were 8.2% in the address section and 1.5% in the informant section; in addition, 2.5% of the infant death certificates were returned to add the Turkish ID number to the system. One of the most important sections of death certificates is the manner of death. The rate of documents returned for the manner of death section is 6%. In the documents examined for this research, the deceased's educational level and occupational information were not provided (Table 3).

Among the sampled documents, none were returned to physicians for correction of more than one parameter.

Discussion

Although 12 years have passed since the DNS was implemented—developed to increase the quality and reliability of cause-of-death statistics, to facilitate comparisons between countries, and to conform to the WHO standards—many problems continue to be

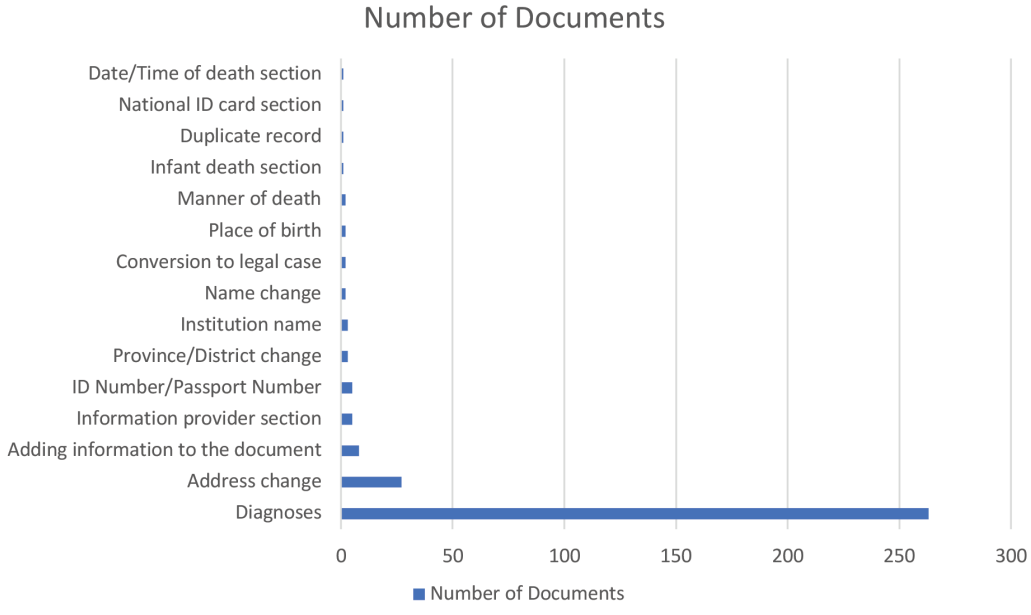
Table 1. Approval and return status of documents

Document status	Number	% (Total)	% (Subcategory)
Approved documents	1.662	70.7	-
Unapproved documents	689	29.3	-
- Documents returned to doctor	326	-	47.3
- Legal documents	363	-	52.7
Total	2.351	100	100

Table 2. Distribution of returned documents by physician and institution

	Number	%	Min	Max	Median
Number of physicians who issued documents	434	100	-	-	-
Number of physicians to whom documents were returned	238	54.8	1	11	1
Number of institutions where documents were issued	122	100	-	-	-
Number of institutions to which documents were returned	114		1	16	2

Table 3. Return reasons for returned documents



encountered in the issuance of death certificates. This study found that 29.3% of the sampled documents were not approved for various reasons. The extent to which these documents, if approved, could affect health statistics warrants investigation.

Identifying issues related to document organization and developing solutions are crucial to preventing these errors from recurring. Furthermore, 11 documents were returned to one physician and 16 to the same institution, suggesting a problem specific to the physician or institution. For this reason, it is necessary to examine the causes of incorrect or incomplete death certificates from multiple angles.

Another important type of information derived from death records is demographic data. Incorrect recording of demographic data, which are important for mortality statistics, can lead to miscalculations of life expectancy in a region. Life tables calculated from mortality data are the most important indicators of differences in demographic and health conditions across countries. Hoşgör's (12) study reports that death records are insufficient or inaccurate because of underreporting; that research is being conducted, particularly in developing countries, to inform the development of appropriate policies; and that efforts are underway to eliminate the causes of underreporting. The success of these efforts is also related to countries' level of development (12). 20% of the documents returned to physicians for correction in Turkey concern demographic data.

In 2019, To prevent potential gaps or inaccuracies in demographic data, the Ministry of Health, the General Directorate of Population and Citizenship Affairs (NVİGM), under the Ministry of Interior, and the Turkish Statistical Institute collaborated to integrate their systems. When a death certificate is issued and the deceased person's Turkish ID number is entered into the system, the demographic data registered with the NVİGM are automatically retrieved. In this case, entering the Turkish ID number correctly or ensuring that the information in the population records is accurate is sufficient to access accurate demographic data. A 2022 study found inconsistencies between demographic information on 14.8% of death certificates and corresponding records in the Central Population Administration System (MERNİS) (13). The same study reported inconsistencies between death certificates and MERNİS records for 72.6% of addresses, 8.4% of death dates, 1.7% of parents' names, and 0.5% of ages. The rate of documents returned to physicians for address changes in the documents covered by this study was 8.2%. In this case, the information in the MERNİS records for İstanbul province can be assumed to be more accurate. One document was returned regarding the date of death, and no documents were returned for the parents' names and age information. This further supports the conclusion that the population records for İstanbul province contain accurate information.

That the deceased person's educational status and occupation information were not filled in suggests that these sections are not mandatory. In particular, the inclusion of occupational information in the documents will provide important data for linking the cause of death to occupational groups. The same situation occurs in Beirut, where the literature shows that occupational information is missing from almost all death certificates (14). Information on educational status, on the other hand, enables comparison of individuals' educational levels with their ages at death.

Following integration with the NVİGM, physicians register documents electronically. If corrections to demographic data are required after registration, NVİGM must cancel the registration. Corrections can be made to the documents after the registration has been removed. Since this situation requires multiple steps to approve the documents, the approval process is time-consuming. It is also thought that physicians may not notice the returned documents in the system, may not know how to correct them, or may experience delays in correcting them because of technical issues. Documents requiring urgent correction can be addressed promptly with appropriate communication and support. Article 11(d) of the DNS circular states that "Returned documents must be corrected and updated by the physician who completed them within one (1) business day at the latest" (15). One of the most important parameters in mortality data is the cause of death. The cause of death must be correctly recorded and ranked. Determining the leading cause of death in a country depends on the correct organization of this section. A study on this subject noted that records should be maintained using internationally accepted diagnostic classifications to ensure reliable analysis of death statistics (16).

This study found that 80% of the sections requiring correction in documents that were incorrectly or incompletely organized concerned causes of death. In a study by Çilingiroglu et al. (17), the rate of inconsistency between the causes of death listed in patients' discharge summaries and those in death certificates was 36.72%. The study by Shantibala et al. (18) found major errors between

death certificates and causes of death in 38.3% of cases. A study evaluating death records at the Isparta provincial center reported a 16.8% inconsistency in the recorded cause of death (13). Errors in the cause-of-death section were mainly due to inconsistencies between the ICD code for the actual diagnosis and the ICD code for the cause of death. In a study comparing the ICD codes of diagnoses in the hospital automation system with the ICD codes on death certificates [Korkmaz and Balaban (19)], it was noted that the highest consistency between the ICD codes and the causes of death on death certificates was found in MI cases, and that the highest inconsistency was also found here because "cardiopulmonary arrest" was still listed as the cause of death. In this study, the high rate of errors or omissions in the cause-of-death section may be due to a lack of information, insufficient sensitivity to the subject, or physicians' heavy workload.

Another element to examine on death certificates is the cause-of-death section. Recording the cause of death as an infectious disease when it is not, or as a non-infectious disease when it is, is misleading for the management of pandemics or endemics within a country. In this study, the return rate for correction of cause-of-death information (0.6%) is low. Particular attention has been paid to ensuring the correct recording of this section during the pandemic.

Another important issue to consider regarding the cause of death is the role of forensic cases. Of the certificates returned to physicians for correction, 52.7% are forensic. There appear to be different practices among physicians regarding the recording of death certificates for forensic cases. Article 9 of the DNS circular dated 2021/7 states: "If the death is determined by the physician to be judicial, it is recorded as such in the DNS and a judicial incident report is made" (15). Particularly in cases of judicial deaths occurring in emergency departments, physicians prepare only judicial reports and do not create a DNS record. In such cases, deaths in which the body is not sent to the forensic medicine institution for autopsy and burial is carried out solely on the basis of a prosecutor's report are not recorded in the system. Because documents are not recorded electronically in the system, deaths go unrecorded and, consequently, the person appears to be alive. This process needs to be clarified in practice. Cases in which a deceased person appears alive in the records, or a living person appears dead in the system, present significant problems. The DNS has standardized mortality data. Sustaining this standard requires that all relevant institutions to clearly and completely record data in the system. Furthermore, keeping the system constantly updated will ensure rapid access to accurate data (20).

The accuracy of death statistics depends on the quality of the data provided by the physician who issues the death certificate. Therefore, solutions must be developed to ensure that physicians are thoroughly informed about the system's content and technical aspects and made aware of their duties and responsibilities in accordance with the DNS circular.

Study Limitations

The use of only 2023 data and the examination of deaths occurring in İstanbul province can be considered limitations of the study. The documents were first categorized as either suitable or unsuitable. Unsuitable documents were transferred into Excel, and each document section was examined as a separate parameter. For documents rejected as unsuitable, the rejected sections and their proportions, the reasons for rejection, the correction periods, and the total completion periods were examined.

Conclusion

While education is the primary solution, the specifics and significance of issuing death certificates must be planned carefully, such as whether they should be taught as a course in medical schools, covered during residency, or whether physicians should be required to review training documents before being granted basic permissions to access the DNS. It is particularly important that physicians working in emergency and intensive care units have a thorough understanding of this issue.

It is also important to ensure that physicians have a clearer understanding of the process of reporting forensic cases to prevent discrepancies in practice. To ensure deaths buried with a prosecutor's report are recorded in the death reporting system, the cemetery administration could be required to request a burial certificate in addition to the prosecutor's report.

The system progresses when the mandatory fields on death certificates have been completed. If the deceased's education and occupation are also included in the mandatory fields, death statistics will be evaluated from this perspective.

The system can be configured to issue warnings when a single cause of death is listed, or when diagnoses that cannot be considered the sole cause of death are listed. In cases of death at home, the physician issuing the death

certificate can access their e-pulse information to ensure that the cause of death is determined accurately.

Death certificates issued by physicians are approved by authorized controller physicians at Provincial or District Health Directorates. To prevent incorrect or incomplete documents from being approved by controller physicians without detection, an algorithmic guide could be developed.

Ethics

Ethics Committee Approval: The study was conducted in 2024 at the Public Health Directorate in İstanbul. The study was approved by the Üsküdar University Non-Interventional Research Ethics Committee at its meeting No. 3, held on March 26, 2024, and institutional approval was obtained on May 12, 2024.

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Concept: K.K., S.P., A.S.E., T.Ü.S., S.Ç., Design: S.P., A.S.E., Data Collection or Processing: K.K., T.Ü.S., S.Ç., Analysis or Interpretation: K.K., A.S.E., T.Ü.S., Literature Search: K.K., S.P., A.S.E., S.Ç., Writing: K.K., S.P., A.S.E.

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