Death certificate accuracy in a Tunisian Emergency Department

Etude de la qualité des certificats médicaux de décès dans un service d'accueil des urgences tunisien

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RÉSUMÉ

Objectif : Analyser la qualité de rédaction des certificats de décès délivrés dans le service d'accueil des urgences d'un Hôpital Universitaire de Tunis.

Méthode : Il s'agit d'une étude descriptive. Nous avons inclus tous les certificats délivrés au service d'accueil des urgences de l'Hôpital La Rabta de Tunis sur une période de 17 mois (entre octobre 2013 et mars 2014). Au total 21 erreurs ont été identifiées et ont été classées en « Erreurs de forme » et « Erreurs de fond », puis ont été divisé en erreurs majeurs et mineurs dans les deux groupes.

Résultats : 757 certificats ont été étudiés. Tous les certificats contenaient au moins trois erreurs avec un nombre moyen d'erreurs de 6,92±1,55 erreurs. La cause de la mort était « inacceptable » dans 21% des cas.

Conclusion : Les résultats de notre étude similaires aux données de la littérature mondiale. De ce fait, il ressort un besoin urgent de poursuivre régulièrement des formations pratiques en matière de rédaction de certificats de décès pour les étudiants et les médecins diplômés.

Mots-clés

Certificat de décès, Qualité, Mortalité, Epidémiologie, Santé publique

SUMMARY

Objective: Assess Death Certificates accuracy (DCs) issued by a teaching emergency department in Tunis.

Methods: It is a descriptive study. We included all death certificates issued in the Emergency Department of a teaching Hospital in Tunis over 17 months period (October 2013 - March 2014). Twenty-one errors have been predefined and classified as "Editing errors" or "Medical analysis error" then as major or minor errors.

Results: 757 certificates were studied; all DCs had at least three errors with an average number of errors of 6.92±1.55. The mechanism of death was inadequate in 20% of the DCs. The cause of death was "unacceptable" in 21% of the DCs.

Conclusion: The results are similar to those reported in international literature. Therefore, it is urgent to start working on further and regular training on how to fulfil a death certificate for undergraduate and postgraduate medical students.

Key-words

Death certificate, Accuracy, Mortality, Epidemiology, Public health

Death rate statistics is of big interest in the public health sector. Establishing and assessing the exact causes of death are important elements in any health policies and health system strategies, either to adapt specific preventive actions or to detect emergent illnesses [1]. Thus, Death Certificates (DCs), are an important tool allowing to have exact and exclusive data, hence should be written with the highest accuracy [2,3]. Fulfilling a Death Certificate is also a medico-judicial act, besides stating the cause of death, it also indicates whether there is a need of autopsy or any other medical intervention before inhumation [2,4].

In Tunisia, only Medical Doctors are able to issue Death Certificates. Since 1999, the typical model of a DC is fixed by decree, inspired by the World Health Organization (WHO) guidelines.

Various studies focused on the evaluation of the quality of the DCs. The drafting error rate ranges between 25% and 78% among the DCs issued in the Hospitals [2,5–7] and between 16% and 56% among the DCs issued by both public hospital doctors and private practice doctors [8,9].

Assessing the quality of Death Certificates in Tunisia is compulsory. The National Institute of Public Health reported that the medical part of the certificates wasn't accurately filled or was missing in two-thirds of the cases and therefore the DCs could not be included in the national mortality statistics. Among the analysed DCs, 10,7% were unusable and 44,1% did not contain the cause of death [10,11].

In the United States of America, the death rate is about 0.1% of the overall number of the consultants [12]. In the Emergency Department, death accounts for approximately 0.5% of the consultants. Doctors working in this Emergency departments are more frequently exposed to delivering DCs since the Mortality is higher in such departments.

The aim of our study was to assess the quality of Death Certificates issued in the ED of the teaching-hospital "La Rabta" Hospital in Tunis, Tunisia.

METHODS

Study design and setting

Our study was conducted in the ED of "La Rabta" Hospital which accommodates between 300 and 320 patients per day.

A descriptive study has been conducted. Data were retrospectively collected from the carbon copies of all the Death certificates issued in the ED between October 21st, 2013 and March 20th 2014.

Inclusion criteria

We have included all the DCs issued by the ED.

Since 1999 in Tunisia, a new typical model of DCs inspired from the WHO guidelines were in practice. It was made of two sections. The upper section, reserved for the civil registrar, contains the identification of both the deceased person and the Doctor, the date and time of death and two checkboxes to state the existence of a need of a medico-legal autopsy or to place the body into a hermetically sealed casket.

The lower section of the DCs which is the medical part, was confidential and reserved for the National Institute of Public Health, it contains one part stating the order between the immediate, intermediate and underlying causes of the death. The second part deals with other significant conditions that had indirectly influenced the death especially when an autopsy had to be performed.

Primary Data Analysis

We identified all the existing errors in drafting a death certificate based on the recommendations of the WHO and the errors previously raised by several authors [2,5,13–15].

We only focused on how the certificates were fulfilled (wording and statements).

Twenty-one errors were identified and classified under two main groups. The first group included 13 errors focused on the causes of death and their consequences (obstacle to the burial of the body, need for an immediate hermetically sealed casket). This group of errors was qualified as "medical analysis errors".

The second group included 10 "editing errors". Editing errors were related to missing identification elements of the deceased or the Doctor or the non-use of the certificate typical model.

Each group of errors was subdivided into major and minor categories according to their impact on the validity of the medical certificate.

Major editing errors were defined as errors that affect the use of the certificate either because of the misidentification of the deceased or the traceability of the certificate.

Major medical analysis errors were focused on the cause of death section and are represented by the errors that could affect the accurate coding of the cause of death.

Minor editing and medical errors are errors that don't meet the standard guidelines of the death certificate that can lead to a misclassification of the certificates.

The errors studied were listed in the Table I

The absence of the doctor's personal stamp was considered a major error but was not accounted for, in our study as we only analysed the carbon copies of the certificates, and it was not clearly stated in the certificate standard model whether or not the stamp should be present on both the carbon copy and the issued certificate delivered to the deceased's families.

Statistical analysis

We calculated the mean number of errors in each category (Medical analysis and editing error as well as major and minor errors).

We calculated for each type of error the proportion of the existence or not of the error specified.

Legal and ethic considerations

The access to deceased's files was authorized by the Director of the Hospital and the data collection from the carbon copies was carried out within the hospital administration.

The ethics committee of "La Rabta" Hospital approved the study.

Table 1 : Errors identified in issuing death certificates

Editing errors	Medical analysis errors
Major errors	**Major errors**
i. The non use of the model of Death Certificate fixed by Decree	i. Mechanism of death not followed by a proper cause of death
ii. Absence of the exact identity of the deceased	ii. Unacceptable cause of death
iii. Absence of the gender of the deceased	iii. Competing causes of death
iv. Absence of the age/birth date of the deceased	iv. Incorrect order between the immediate, intermediate and underlying causes of death (incorrect sequencing).
v. Absence of the identity of the Doctor	v. The absence of order between the immediate, intermediate and underlying causes of death (absence sequencing)
vi. Absence of signature of the Doctor	vi. The box relating to the existence of a medico-judicial obstacle to the burial of the body left vacuum.
vii. Absence of the title of the doctor	vii. The box relating to the need for an immediate beer setting of the body left vacuum.
Minor errors	**Minor errors**
i. illegible writing	i. The absence of the time interval between onset of the condition and death.
ii. Absence of the exact time of death	ii. The absence of the factors of co-morbidity.
	iii. Narrating the immediate, intermediate and underlying causes of death in a paragraph instead of one event per line.
	iv. Mentioning more than one event (immediate, intermediate or underlying cause of death) per line.
	v. The use of abbreviations

RESULTS

During the period of study, 757 death certificates were collected. Twenty-three different doctors filled out DCs. The average age of the deceased was 67.3±15.6 years (range 6-101 years-old)

All the DCs enclosed errors at an average number of 6.9±1.5 (range, 3-12). Most of DCs had more "Medical analysis" errors than "Editing errors" (average number respectively 6±1.2 against 0.9 ±1.1 per certificate).

Editing errors (Table II)

All certificates were fulfilled according to the official model. All of them enclosed the correct identity of the deceased. The deceased gender was missing in one of the DCs, the age or date of birth of the deceased was missing in 11 DCs. The name of the doctor was clearly mentioned in 57.7% of the certificates. The doctor's signature was missing in 7 DCs and was not clear in the other cases. The title of the doctor was missing in 41.7% of the certificates. Twenty-two percent of the DCs were delivered by medical students who were performing their internship in the Emergency Department.

The exact time of death was not mentioned in 3 DCs. In 2.9% of the certificates the writing was illegible.

Table 2 : Distribution of the editing errors

Editing errors		
Major errors	**n**	**%**
Non-use of the DC model	0	0
Absence of the exact identity of the deceased	0	0
Absence of the gender of the deceased	1	0.1
Absence of the age/birth date of the deceased	11	1.4
Absence of the exact identity of the Doctor	320	42.3
Absence of signature of the Doctor	7	0.9
Absence of the title of the Doctor	324	42.8
Minor errors	**n**	**%**
Absence of the exact time of death	3	0.4
Illegible writing	22	2.9

"Medical analysis" errors (Table III)

In 20% of the certificates, the mechanism of death was not followed by a proper cause of death. One of the most mentioned mechanism was "Road traffic accident".

Improper sequencing was observed in 31.2% of the DCs. There were some examples to illustrate this kind of error:

"Coma leading to cranial trauma leading to subdural hematoma"

"Decompensation of a chronic obstructive pulmonary disease leading to an acute respiratory failure leading to a respiratory acidosis".

The absence of sequencing was an error observed in 38.2% of the DCs. Two examples were observed and can illustrate this error

- "Sepsis leading to brain cortical atrophy leading to epilepsy".
- "Urinary sepsis leading to pulmonary sepsis leading to coronary syndrome".

In 21% percent of the DC (n=159), the cause of death was unacceptable. In some of these cases, the cause of death

mentioned was “Medico-legal autopsy” or “sudden death”. In 8% of the DCs, several causes of death were mentioned in each line. We will find above one example to illustrate this error: “severe sepsis + pneumonia leading to weakness + hypertension + coma”.

Table 3 : Distribution of the “Medical analysis” errors

Medical analysis errors		
Major errors	**N**	**%**
Mechanism of the death not followed by a proper cause of death.	149	19.7
Incorrect sequencing.	236	31.2
Absence of sequencing.	289	38.2
Unacceptable cause of death mentioned	159	21
Competing causes of death	60	7.9
The box relating to the existence of a medico-judicial obstacle to the burial of the body left vacuum.	3	0.4
The box relating to the need for an immediate beer setting of the body left vacuum.	4	0.5
Minor errors	**n**	**%**
Absence of the time interval between onset of the condition and death was the most observed error.	726	95.9
The use of abbreviations	477	63
Narrating the immediate, intermediate and underlying causes of death in a paragraph instead of one event per line.	42	5.6
Mentioning more than an event per line.	44	5.8
The omission of the factors of co-morbidity.	710	93.8

In three certificates, it was not mentioned whether there was an obstacle to the burial of the body. In four certificates it was not mentioned whether there was a need to an immediate hermetically sealed casket.

The absence of the time interval between onset of the condition and death was the most observed error (96% of DCs).

In 63% of the DCs, abbreviations were used such as: CA (for cardiac arrest); ARF (for acute renal or respiratory failure); RTA (for road traffic accident) and APE (for acute pulmonary Edema).

In 5.6% of the DCs (n=42), the cause of death was formulated in a paragraph. In 5.8% of DCs, only the initial cause of death was mentioned and not the immediate cause for example “Lyell syndrom”.

In 710 cases (93.8%), the co-morbidity conditions were not mentioned.

The total number of errors was slightly more important when the deceased was 65 years old and more. However, the use of abbreviation was significantly more frequent in that group (66.1%).

DISCUSSION

All the analysed death certificates contained errors with an average of 6.92 ±1.55 errors. The average number of “Editing Error” was 1±1.042 and the average number of "Medical Analysis Error" was 6 ±1.2 errors.

No editing errors were noticed in 67.2% of the DCs. However, all of the DCs contained either major or minor “Medical analysis error”. The most frequent major errors observed were the absence of the identity of the Doctor (42.3%) and/or his title (42.8%) and the absence of sequencing or an incorrect one (38.2% and 31.2% respectively). The most frequent minor errors were the absence of the time interval between the onset of the condition and death (95.9%) and the omission of the co-morbidities (93.8%).

Different countries published manuals about the way to address a death certificate [2,16–20]. In Tunisia, a guideline was prepared and distributed on 1998, in order to initiate the use of the new DCs model.

Indeed, assessing errors in the DCs has become common all over the world. DCs containing errors varies from 20 to 100% according to international literature (Table IV).

Table 4 : Literature data comparison concerning Death Certificates errors

	Total number of death certificates analyzed	**Frequency of certificates without any error (%)**	**Study period**
Lu et al. (14)	4123	61	1994
Cheng et al. (21)	2520	80	2009
Pattaraarchachai (31)	2232	49	2005
Nojilana et al (25)			2004
Armour et al (8)	943	66,4	1994
Burger et al (13)	844	9	2003-2004
Katsakiori et al (15)	516	39,4	1999-2006
Slater (6)	500	71	1991
Jordan et al (5)	426	44,6	1993
Agarwal et al (22)	296	14	2008-2009
Haque et al (2)	202	1	2009
Pritt et al (23)	50	4	2002-2003
Patel et al (24)	40	0	2011
Our study	757	0	2013-2014

We can explain the high level of DCs containing errors in our study by the fact that we identified 21 possible errors comparing to four to 11 errors in the other studies [2,5,6,8,13–15,21–25]. However, this level is still high even if we include only the 11 errors assessed in the literature (87% rather than 100%) (Data unpublished).

We can also interpret the high level of errors by the workflow in the ED and the lack of information about the deceased medical history as death might occur a short time after the person was handled or upon arrival [23].

In our study, all the DC were filled out according to the standard model and contained the exact identity of the deceased but the age/date of birth was missing in 1,4% of the certificates. The identity of the doctors was absent in 42.3%. In several studies conducted in low-income

countries, authors reported the absence of the deceased's age with rates varying between 45% and 92.8% [2,13,26]. They reported also the frequent absence of the doctor's identity, example 50% in Lebanon [26]. The absence of the identity of the deceased and his exact age is a major error that can have legal and socio-demographic implications. Besides, the absence of the exact identity of the certifying doctor can lead to a refusal to issue a burial permit. The identity of the doctor is also important to ensure a traceability of the certificate in case further details about death circumstances are requested. Likewise, missing the age of the deceased, will affect all the epidemiological analysis and their interpretations toward Public Health.

Undergraduate junior doctors in residence performing their internship issued 20.9% of certificates. Within the Tunisian law, doctors in residence and interns have the permission to work in public hospitals; however, issuing death certificates should only be achievable by graduated doctors. In France, the same observation was reported and was subject to criticism [27].

Minor editing errors were observed in less than 3% of the certificates. It was essentially the illegible writing of doctors and the absence of the exact time of death. Clear writing is mandatory when filling out DCs. In fact, once issued, a death certificate may have multiple usages especially legal and epidemiologic use.

Medical analysis errors were observed in all the certificates, those results were comparable to a study in Sudan [28]. Mentioning the mechanism of death without a proper cause of death was a common error reported in the literature with rates varying between 7% and 62% [2,5,6,14,15,28,29].

This error shows confusion between mechanism and cause of death. It is even confusion between the cause and the definition of death. It also highlights a lack of knowledge of the international classification of diseases (ICD), according to the WHO guidelines; every cause of death should be coded following the ICD-10. The mechanism of death is a non specific entity defined by physiological or biochemical disturbance that would have contributed to death, when the cause of death is a specific aetiology that led to death [30]. The same death mechanism can be related to different causes. One explanation to the high level of this error in our study (20%) could be the fact that in an Emergency Department, it is common to receive a person who already died or who will die few hours after being handled. Even though, doctors should mention in those certificates "the cause of death is unspecified"; and precise the existence of a medico-legal obstacle to recommend a judicial autopsy.

In our study, an incorrect sequencing was observed in 31.2% of the certificates. It was also a frequent error reported by most of the authors and varying between 9% and 55% [5,9,13–15,24,31]. There was an absence of sequencing in 38.2% of the certificates. This error was also reported as major and represented 7.5 to 15.7% of certificates for Myers and Nojilana and al [7,25]. Having an incorrect or a not sequencing certificate will bias the epidemiological statistics.

In our study, 21% of causes of death mentioned were unacceptable. This error was also reported with frequencies varying between 4 and 19% of the death certificates [13–15]. Mentioning an unacceptable error means that the death certificates will be useless when coding the causes of death which will alter the epidemiological statistics

In 8% of the cases, several causes were mentioned as being the cause of death. In those cases, the epidemiologist will not be able to make an accurate coding of the causes of death as he is not supposed to know the medical history of the deceased. The doctor should be able to identify which of the causes was most likely the one that led to death. The other causes should be mentioned as co-morbidity factors.

After determining the cause of death, the doctor is supposed to point out whether there is a need to indicate a medico-legal obstacle to the burial which means that a judicial enquiry should be pursued and a medico-legal autopsy to be realized. In fact, those situations were represented by those when a homicide or a suicide or a torture acts were suspected, a case of sudden unexpected death, situations of death in custody or after a police/military act, death engaging the responsibility of a third person or a specific legislation (road accident, iatrogenicity, suspicion of neglect, work-related accident), a natural disaster and unidentified corpses or skeletal remains [4]. The gravity of this error is represented by the fact that the deceased or his family could lose their rights whenever the doctor could omit to clearly indicate if such an obstacle had to be opposed, which was the case in three of our certificates. In Tunisia, which is a Muslim country the corpse should be buried directly in the ground without a casket following the Muslim rules. However, in the case of rabies, cholera, hemorrhagic fevers, there is a legal obligation to indicate the need to an immediate bier setting of the corpse with specific preventive measures. In our study, this information was missing in four cases.

Minor "Medical analysis" errors were most frequently observed, but practically did not alter the quality of the interpretation and the coding of those certificates.

In 5.6% of our certificates we observed narrative paragraphs explaining the sequence of events leading to death. Furthermore, the delay between the events within the sequence leading to death was missing in 96% of our DCs. This error observed with high rates varying between 35.9% and 98.4% in different studies [5,7,13,22,24,25]. It is still useful information that allows the establishment of a logical and precise scenario of the sequence leading to death [9,13].

The use of abbreviations is not recommended for DCs.

We observed this error in 63% of the certificates which is much higher than the rate the one from Patel and al (9.8%) [24].
The factors of co-morbidity were not mentioned in 93.8% of our certificates. This error was frequently observed by Burger and al.[13] (91.5%) and Al Nour [28] (97%). Agarwal and al. [22] in their study noticed that this section was filled in all their death certificates. Doctors seem to be unaware of the importance of this section. In fact, this section allows to have additional information on the medical history (atherosclerosis) or habits (smoking, alcohol consumption…). It is even more important in the cases of maternal and foetal deaths, and in the cases where more than one cause of death is considered, as the second potential cause could be mentioned within this section of the certificate.
In our study, the number of errors was more important when the deceased was 65 years-old and more. Different studies around the world had the same conclusions [13,14,24]. Burger and al.[13] concluded that the number of major errors was proportional to the deceased person age (54.4 %), similar observations were reported by Patel and al (66.7 %) [24] and by Katsakiori and al (63.8 %) [15]. However, for Haque and al [2] there was no difference between the two groups.
Our results can be in part explained by the limits of the fixed DCs model. The same certificate model is used for all deceased. This can undervalue some causes such as the maternal/foetal death which represents a key indicator of the health system quality and one of the Millennium Development goals to be monitored in developing countries. To improve this limit, it is possible to follow the French example consisting of having two kinds of DCs models. The first one is applicable to new-born from a pregnancy of 22 weeks of amenorrhea until 27 days of life (except stillborns) and the second model is applicable to deceased aged more than 28 days [27].
One other limit is that the actual DCs model is definitive and cannot be changed. This will not allow to add new information that the doctor may have found after issuing the certificate.
Doctors reported having inadequate training and lack of practical classes and call for further undergraduate and postgraduate training [2,32]. Among practicing physicians, 50% of general practitioners working in Britain and the United States of America, reported not having enough knowledge to write a Death certificate [33,34].
To achieve this, regular training cycles have been reported to be effective in several countries [3,23,35–38] and this approach should also be adopted in our country. An easy and quick action to perform is to develop pocket guides like those available in the United States of America and some European countries [35]. The model could mention clear and formal recommendations on when to indicate a medico-legal obstacle to the burial of the corpse. This can help the doctors to take the right decision in such a complex environment which is the emergency department.
Our study was exhaustive, it included all the death certificates delivered during the period of study, however, we have only reported a single experience from a teaching-hospital and our results cannot be considered representative of other institutions in the country. These results could be different in case of a population-based study including death certificates delivered by physicians from the private sector.

In summary, our study aimed to analyse the accuracy of death certificate in one of the biggest Emergency Departments in Tunisia. The results are similar to what was reported in international literature both from developed or developing countries. Regular training for undergraduate and postgraduate doctors seems to be a good solution for this errors.

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