

Errors Detected in Death Certificates issued in a Medical College of Nepal

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ABSTRACT

Introduction

Death certificate is a medico-legal document required for formulating policies for improving the healthcare system of any nation. Occurrence of errors while filling up these documents has negatively affected on reliability and validity of these pivotal documents.

Methods

This was a cross-sectional study conducted at Gandaki Medical College (GMC), Pokhara. The mortality file records of ICU and ER patients from 14th April 2019 to 14th April 2022 were collected. Errors in the death certificates were noted in proforma. The data was entered in Microsoft Excel and further analysis was done by SPSS 16.0.

Results

A total of 139 death certificates were assessed. The occurrence of errors in death certificates was 97.84% (136/139) with the majority of errors i.e.; 82% (112/136) was noted in the immediate cause of death (ICOD) section of the death certificate followed by 79% (108 out of 136) of errors were noted in other significant conditions (OSC) and 74% (101/136) error was noted in the underlying cause of death (UCOD) section. The most frequent error was 'not reporting the time interval from onset to death', observed in 99.3% (138/139) of cases followed by the 'use of abbreviations' when certifying the cause of death in 64% (89/139) of death certificates.

Conclusion

The findings of this study highlight the need for improved education and training of doctors to ensure accurate documentation of death certificates. Regular training programs and workshops may ultimately contribute to improved healthcare policy formulation and decision making based on these findings.

Keywords

Cause of death; death certificates; error

INTRODUCTION

Death certificate is a medico legal document exhibiting the cause of death of any individual. It helps in providing statistical data for formulating policies for improving the healthcare system of any nation. The medical certification form for death (death certificate) of any patient records the cause of death of that patient. This form which has been recommended by the World Health Assembly indicates morbid conditions leading directly to death and stating any antecedent conditions giving rise to the underlying cause of death.¹

Despite the existence of standard death certificate formats in most hospitals, errors have been noted while filling out these pivotal documents. This has negatively affected data reliability and further policy making decisions. Various studies done in different parts of the world have found errors in the range of 32-100% in the death certificates.²⁻⁹ Haque et al. in his study conducted in Pakistan found 99 % errors in DCs.² Similarly, a study done by Maharjan et al. in intensive care unit of Kathmandu, Nepal found 78.4 % errors in DCs, with the highest number of errors (83%) in giving underlying cause of death (UCOD).³ Atreya et al. stated that 100% error was noted in 139 death certificates reviewed with majority i.e.; 78% of error was noted in the ICOD section of the death certificates.⁴

This study was aimed to detect errors seen in death certificates in Gandaki Medical College, Pokhara.

METHODS

This was a cross-sectional study conducted at Gandaki Medical College (GMC), Pokhara,

after obtaining the ethical approval letter from the institutional ethical review team (reference number 07/078/079). The mortality file record of each patient of the ICU and ER was collected for three years' duration (14th April 2019 to 14th April 2022) from the record department of GMC hospital. GMC uses a standard two-part death certificate form to provide the cause of death. Part I states the disease or conditions that directly lead to death, with section "a" used to describe the Immediate Cause of Death (ICOD) and the antecedent causes written in subsections "b", "c", and so on. The last section of Part I mentions the Underlying Cause of Death (UCOD). Part II states any Other Significant Conditions (OSC) that accelerated the process without a causal link to the underlying cause of death as illustrated in table 1.

Only death certificates from adult deaths (age >18 years) were taken for the study. Deaths due to the corona virus were excluded from the study. The data collection tool used by Maharjan et al. in his study was used as a study tool in this study.³ A purposive sampling method was employed in this study. Errors were categorized as ICOD, UCOD, and OSC, as presented in Table 3. Data were collected by NH and MM, and any discrepancies identified during the process were resolved by GKC. The data was entered in Microsoft Excel and further analysis was done by SPSS 16.0.

RESULTS

The mean age of deceased was 60.42 ± 18.96 years. Males comprised 63.3% (n=74) of the population, while females accounted for 35.3% (n=65). Analysis of the time of death

Table 1. A standard example of death certificate with illustration of cause of death

Cause of Death		
Part I		
Immediate Cause of Death (ICOD)	a) Acute Respiratory Distress Syndrome due to or as a consequence of	2 days
Underlying Cause of Death (UCOD)	b) Pneumonia due to or as a consequence of	
	c) COVID-19	10 days
		10 days
Part II		
Other Significant Condition (OSC)	Diabetes Mellitus, Hypertension	

Table 2. Operational definitions of some terms derived from International Statistical Classification of Diseases and Related Health Problems (ICD-10) and College of American Pathologists (CAP) 1,10

Operational definitions	
Causes of Death	“all those disease, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries”. (Twentieth World Health Assembly, 1967)
Part I	Immediate Cause of Death: The final disease or injury causing the death.
Underlying Cause of Death	“(a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury”. (World Health Organization, 1994)
Part II	Part II is for any other significant condition that contributed to the fatal outcome, but was not related to the disease or condition directly causing death. “Due to (or consequences of)”: after these word on the certificate, should be included not only the direct cause or pathological process, but also indirect causes, for example where an antecedent condition has predisposed to the direct cause by damage to tissues or impairment of function, even after a long interval. Sequence: refers to two or more conditions entered on successive lines of Part I, each condition being an acceptable cause of the one entered on the line above it. If there is more than one cause of death in a line of the certificate, it is possible to have more than one reported sequence.
Part III-	Defined conditions: I46.9 (Cardiac arrest, unspecified); I95.9 (Hypotension; unspecified); I99 (Other and unspecified disorders of circulatory system); J96.0 (Acute respiratory failure); J96.9 (Respiratory failure, unspecified); R00-R94 and R96-R99 (Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified).

Table 3. Classification of types of error in cause of death statement of death certificate

Parts of cause of death statement	Types of Errors	Examples
Examples Part I Immediate Cause of Death (ICOD)	Not listed	Incorrectly attributed/Trivial conditions
	Inappropriate information	Such as asystole, cardiopulmonary arrest, electromechanical dissociation, ventricular fibrillation
	Mechanism of Death (terminal events)	Such as arrhythmia, coagulopathy, congestive heart failure, hepatic encephalopathy, hypotension, ketoacidosis, multi-organ failure, pneumothorax, renal failure, sepsis, shock
	Mechanism of Death (nonspecific physiologic derangements)	Such as anoxic encephalopathy, cirrhosis, gastrointestinal hemorrhage, hemothorax, peritonitis, pulmonary embolism, subarachnoid hemorrhage
Part I Underlying Cause of Death (UCOD)	Nonspecific anatomic processes	Such as headache, chest pain, dyspnea, asterixis, pain abdomen, hyperkalemia, hypercalcemia
	Symptoms, signs, abnormal clinical and laboratory findings	
	Not listed	Incorrectly attributed/Trivial conditions
	Inappropriate information	Ill-defined conditions, nonspecific and incomplete description of known specific conditions such as neoplasms, infectious diseases, injuries
Part II Other Significant Conditions (OSC)	Incomplete information	2 or more unrelated conditions listed
	More than 1 competing UCOD	Sequence of events doesn't make sense, UCOD not listed on the lowest completed line of Part I
	Improper sequence	
	Not listed	OSC present but not listed
Part II Other Significant Conditions (OSC)	Inappropriate information	Incorrectly attributed/Trivial conditions
	Incomplete information	Not all the known significant conditions are listed

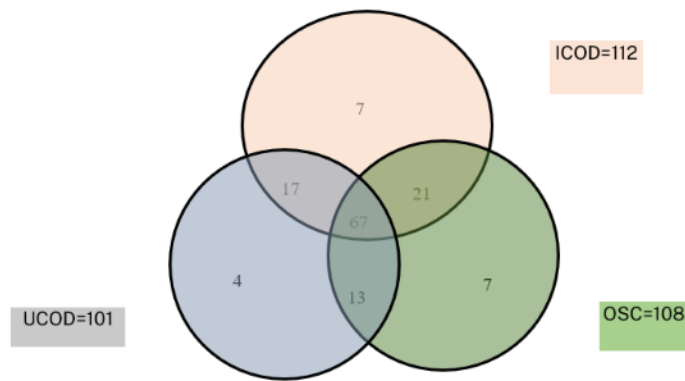


Figure 1. Venn diagram showing distribution of errors in different parts of death certificates

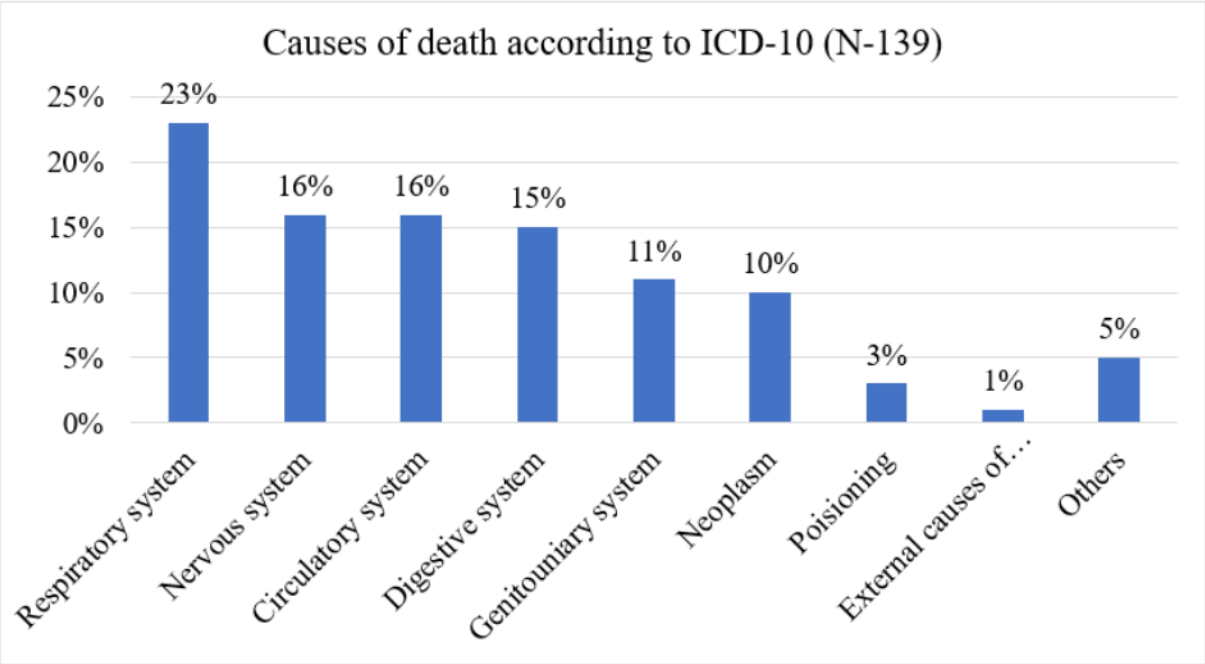


Figure 2. Cause of Death according to ICD-10

revealed that the majority of deaths occurred during the late night, morning and afternoon hours, accounting for 77.4% compared to the evening and early night hours (22.6%). Sixty-three percentage (88 out of 139) of the deceased exhibited no evidence of sepsis, 35.3% (49 out of 139) were classified as having infection, systemic inflammatory response syndrome (SIRS), or sepsis, and 5.8% (8 out of 139) developed multiple organ dysfunction syndrome (MODS). Fifty-two of the patients (71 out of 139) stayed in the ICU for a duration of 2–7 days, followed by 38.1% (53 out of 139) staying for <1 day and 10.8% (15 out of 139) stayed for more than a week in

the hospital. Seventy-seven patients (107 out of 139) were admitted to the Medical Intensive Care Unit (MICU), followed by 22.3% (31 out of 139) in the Surgical Intensive Care Unit (SICU) and 0.7% (1 out of 139) in the Emergency Department (ED).

The occurrence of errors in death certificates prepared at Gandaki Medical College was 97.84 % (136 out of 139 death certificates), with the majority of errors i.e.; 82% (112 out of 136 death certificates) were noted in the Immediate Cause of Death (ICOD) section of the death certificate followed by 79% of error (108 out of 136 death certificates) was noted in Other Significant Conditions (OSC) and 74% error (101 out of 136) was noted in the Underlying Cause of Death (UCOD) section.

Among the other errors found in death certificates, the most frequent error was 'not reporting the time interval from onset to death', observed in 99.3% (138 out of 139 death certificates) of cases. Other common errors included the 'use of abbreviations' when certifying the cause of death was found in 64% (89 out of 139) and the 'entry of ill-defined conditions as the underlying cause of death (UCOD)' was found in 61.2% (85 out of 139). Less frequent but still notable issues were illegible handwriting in 25.9% (36 out of 139) and leaving blank lines within the chain of events in 16.5% (23 out of 139).

Table 4. Frequency of errors in different parts of death certificates (N = 139)

Cause of Death	Types of Errors	Number (n)	Percentage (%)
Part I Immediate Cause of Death (ICOD)	a. Not listed	0	0.0
	b. Inappropriate information	6	4.3%
	c. Mechanism of Death (terminal events)	50	36.0
	d. Mechanism of Death (nonspecific physiologic derangements)	43	30.9
	e. Nonspecific anatomic processes	14	10.1
	f. Symptoms, signs, abnormal clinical and laboratory findings	4	2.9
Part I Underlying Cause of Death (UCOD)	a. Not listed	11	7.9
	b. Inappropriate information	14	10.1
	c. Incomplete information	30	21.6
	d. More than 1 competing UCOD	48	34.5
	e. Improper sequence	35	25.2
Part II Other Significant Conditions (OSC)	a. Not listed	98	70.5
	b. Inappropriate information	10	7.2
	c. Incomplete information	0	0

Table 5. Association between error types and ICU types

Error types	MICU n (%)	SICU n (%)	Chi-square value	p-value
ICOD	82 (73.9)	29 (26.1)	4.36	0.037
UCOD	78(78)	22 (22)	0.045	0.832
OSC	84 (78.5)	23 (21.5)	0.256	0.612

P value significant at <0.05

The table showed the significant relationship between ICD error and ICU type (p=0.037).

Table 6. Other errors encountered in death certificates

S.No.	Other Errors in Death Certificates	Frequency (%)
1.	Documenting multiple causes per line in Part 1	62(44.6%)
2.	Not reporting the time interval from onset to death	138(99.3%)
3.	Leaving blank lines within the sequence/chain of events	23(16.5%)
4.	Use of abbreviations when certifying the COD	89(64%)
5.	Illegible handwriting	36(25.9%)
6.	Incorrect/clinically improbable sequence of events leading to death	50(36%)
7.	Ill-defined condition(s) entered as the UCOD	85(61.2%)

DISCUSSION

Error rates in death certificates prepared at Gandaki Medical College similar to the study done in Pakistan by Haque et al. He reported 99 % error with the majority of error being seen in the patients' demographics (92%) and in the cause of death sections of on 202 death certificates(87%).² The error rate in the study done by Maharjan et al. was 78.4% with the highest number, i.e.; 83% of error in UCOD section of 204 death certificates whereas his study had the majority of error in ICOD section of the death certificate(82%) followed by OSC (79%) and UCOD (74%).³ In this study 74% error (101 out of 136) was noted in the UCOD section. The reason for this higher percentage could be due to the selection of the study participants from the MICU in this study, and the majority of the deceased (84.8%) had infection, SIRS, or sepsis, and developed MODS. Atreya et al. in his study conducted on 139 death certificates found 100% error with most common error was in the ICOD section(78%).⁴ Qaddumi et al. in his study done in Palestine have reported 59% error in death certificates with 51% error in ICOD section, 29% error in UCOD .¹¹ About 4% (47 out of 1267) of the errors were encountered in death certificates in a study conducted by Hanzlick et al. in 2003-2004 in Atlanta, Georgia with most common errors were misspellings in causes of death or poor or incomplete wording in injury-related information.¹² Raje MG found that 99 % of 353 death certificates were incorrectly written while 21 % were incompletely written in a study conducted in India in 2006-2007.¹³ Srinivasan et al. in his study conducted on 1147 death certificates found that only 119, i.e.; 10.38% of the documents were correctly filled with 858 (74.8%) were major errors whereas 810 (70.66%) were minor errors.¹⁴ Hazard et al. in his study found that 95.6% of death certificates did not indicate the time interval between onset and death whereas it was 99% in this study and the study done by Qaddumi et al. and 99.2% in the study of Sharma et al.^{11,15,16} Hazard et al. stated that 41.5% used multiple causes per line whereas it was 44.6% in this study. Ill-defined condition as the underlying cause of death was 33.2% in Hazard et al.'s

study, 7.9% in Sharma et al.'s study whereas it was almost double in this study (61.2%).^{15,16} Qaddumi et al. found that 84% physicians using abbreviations in death certificates, 50.7% used abbreviations in the study done by Hazard et al. whereas it was 64% in this study and 58% in the study conducted by Atreya et al.^{4,11,15} Illegible handwriting was noted in 6.7% in study done by Qaddumi et al. whereas it was much higher in this study (26%) and 22.3% in Atreya et al.'s study.^{4,11} Incorrect sequencing of the cause of death was noted in 15% of the death certificates in study of Qaddumi et al. whereas it was 36% in this study and 11.2% in study conducted by Sharma et al.^{11,16}

Medical education in Nepal lacks structured courses emphasizing the importance of proper documentation of patient records. Greater emphasis is placed on the diagnosis and management of diseases, while documentation practices receive comparatively lesser attention. Medical students are introduced to fill a death certificate during the third year of medical school; however, no mandatory training or reinforcement is provided thereafter. Consequently, death certificates are often filled by junior doctors with no any supervision, frequently relying on imitation of previously completed forms. This lack of formal training and oversight increases the risk of errors in death certification.

Hands-on training of medical doctors is considered the most effective approach to improving the quality of death certificate documentation.¹⁷⁻¹⁹ Additional measures, such as verification of death certificates by a senior consultants and structured discussions with feedback during hospital mortality review meetings, may further help reduce these errors. Furthermore, sensitization of hospital administrations to establish standard hospital records departments and digitalization of medical certificates can minimize issues related to illegible handwriting. This also can facilitate quicker retrieval of these forms when required.

LIMITATIONS

This was a single-centre study conducted at Gandaki Medical College; therefore, the findings may not be generalizable to other institutions in Nepal. Beside this, as the study was limited to assessing errors in death certificates, the accuracy of the recorded causes of death was not validated against treatment records.

CONCLUSION

The findings of this study highlight the need for improved education and training of doctors to ensure accurate documentation of death certificates. Regular training programs and workshops may ultimately contribute to improved healthcare policy formulation and decision making based on these findings.

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CONFLICT OF INTEREST

The authors do not have any conflict of interest involved in the research and publication.

AUTHOR CONTRIBUTIONS

Dr. Neelu Hirachan: Research concept, Research design, Literature review, Data collection, Manuscript preparation

Dr. Nirmala Shrestha: Data analysis, Statistical analysis, Manuscript preparation

Dr. Mani Raj Maharjan: Research concept, Research design, Manuscript preparation

Dr. Gopal Kumar Chaudhary: Research concept, Research design, Manuscript preparation

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