

# Audit of common errors in death certificates issued by tertiary care hospitals in Lahore

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## ABSTRACT

**Background:** Death certificate is the last legal document of one's life. It provides not only valuable information about the deceased but also is a source of data required for devising national health related policies. So, this necessitates its completion according to the guidelines issued by World Health Organization (WHO).<sup>1</sup> This study was aimed to determine the types and frequencies of errors during the completion of death certificates by the doctors at tertiary care hospitals of Lahore.

**Subjects and Methods:** It was a retrospective study carried out at 3 tertiary care hospitals of Lahore during a period from Jan 2015 to June 2015. A total of 10359 death certificates of the patients who died during the said period and did not undergo autopsy were included in the study. Errors were abstracted and divided into 7 categories starting from category I to VII.

**Results:** No death certificate was found error free. The highest number (97.4%) of the error was confusion between cause of death and mechanism/mode of death. It was followed by error in underlying cause of death accounting for 81.6% and then immediate cause of death 57.8%. Frequency of errors in the standard WHO recommended format was 49.95%.

**Conclusion:** Most common error observed in this study was confusion of cause of death with mechanism/mode of death sufficient to misinterpret the cause. These errors may be attributed to lack of knowledge, training, and experience of the certifying doctors.

## Keywords:

Death certificates; WHO guidelines; cause; mechanism; mode of death; errors.

## INTRODUCTION

Demographic studies show that the incidence of deaths all over the world is about 50 million each year, of which about 39 million deaths have been estimated to occur in the developing countries.<sup>2</sup> Moment of death is the most important terminal event in the life of an individual which needs its certification by a competent authority for its occurrence and cause in the form of a death certificate.<sup>3</sup> A certificate of death has three purposes; firstly, it contributes to a legal record of death; for insurance, succession matters, property claims, getting gratuity or provident funds, erasing name of the deceased from the voters list. Secondly, it is a source of mortality statistics which have a significant role in medical research, for the safety of the community, prevention of accidents and eradication

programs. The deficient data on causes of death would and not help to design health care policies decisions. Thirdly, it furnishes information to the bereaved family in the form of personal satisfaction as well as awareness about the inherent risk factors for certain diseases. Hence, a death certificate is a legal document as well as a source of vital statistics.<sup>4,5</sup>

Certification of cause of death means issuance of a death certificate by a competent authority mentioning a cause of death.<sup>1</sup> The world Health assembly in 1967 defined the cause of death to be entered on the medical certificate of death as "diseases, injuries and morbid conditions which contributed directly or indirectly to death". The rules to fill the columns of death certificates have been described in the chapter 'Medical Certification and Rules for Classification' of the 10<sup>th</sup> revision of the International Statistical Classification of Diseases and Cause of Death (WHO, 1977) and the 'Instruction Manual', volume 2 of the 10<sup>th</sup> revision (WHO, 1993). A disease or injury which started the

chain is underlying cause of death and is entered on last lines (b) or/and (c) of Part I of death certificate and the subsequent events in the chain are called antecedent cause and immediate cause of death in that order. Immediate cause of death results from underlying cause, occurring

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nearest to time of death and causing death directly. It is mentioned on the top line (a).<sup>1,6</sup>

About 80 countries regularly report detailed cause-of-death data to WHO based on these guidelines. If filling in of death certificate is according to the guideline issued by WHO on the International Statistical Classification of Diseases, Injuries and Causes of Death (ICD), reliable vital statistics can be achieved.<sup>6</sup> WHO statistics are deficient of such data from Pakistan although rules for certifying cause of death in Pakistan are same as being followed in other parts of the world established by the World Health Organization (WHO).<sup>1,7,8</sup>

In Pakistan, although these guidelines are usually available on death certificates but are rarely followed. This might be due to lack of experience and training about how to fill in the death certificates accurately as per WHO recommendations. This result in inaccurate death certificates, thereby incomplete information about health required for a national data base. This leads to failure in the achievement of fruitful planning for health care policies.<sup>5</sup> There is evidence in literature of incorrect filling of death certificates ranging from 25% to 78 % in hospital-based studies.<sup>9</sup> This study aims at determination of errors/omissions in writing death certificates issued by the tertiary care hospitals of Lahore, based on the guidelines prescribed by World Health Organization.

**SUBJECTS AND METHODS**

It was a descriptive cross-sectional study conducted during January - June 2015. Death certificates issued to the patients who died during the study period at Mayo Hospital Lahore, Services Hospital Lahore and Lahore General Hospital Lahore were analyzed. These deceased did not undergo an autopsy. Only component of death certificate concerned with cause of death was evaluated for omissions done by the certifying doctors. Non-medical omissions like biodata, identification of the deceased, signature and stamp of certifying doctor, abbreviations, spelling mistakes, time interval from onset of symptoms till death and cases subjected to medicolegal autopsy were not included in the study. The death certificates were reviewed to find out the types of omissions and frequencies of (a) standardized format of death certificates recommended by World

**Table 1. Categories of errors in death certificates**

Category	Nature of Error Noted
I	Non-recommended format of death certificate

**Table 2. Frequency and percentages of categories of omissions in death certificates of different hospitals**

Error Category	Mayo Hospital Lahore N=5175		Services Hospital Lahore N=1882		Lahore General Hospital Lahore N=3302		Total N=10359	
	N	%	N	%	N	%	N	%
I	5175	100	0		0		5175	49.95
II	0		1734	92.13	2602	78.80	4336	41.85
III	5175	100	182	9.67	633	19.17	5990	57.82
IV	0		865	45.96	196	5.93	1061	10.24
V	5175	100	997	52.97	2280	69.04	8452	81.56
VI	5175	100	1664	88.41	3250	98.42	10089	97.39
VII	5175	100	132	7	452	13	5759	55

II	Immediate cause of death incorrectly placed
III	Immediate cause of death not mentioned
IV	Underlying/ and antecedent cause of death incorrectly placed
V	Underlying/ and antecedent cause of death not mentioned
VI	Only a mechanism/mode of death given as cause of death
VII	Contributory cause of death not mentioned or misinterpreted

Health Organization (WHO) (b) medical data showing immediate, antecedent/underlying and contributing cause of death. A checklist was designed to find out the errors in the death certificates prepared on the basis of guidelines published by International Statistical Classification of Diseases (ICD 10, volume 2, and Page 23) and Physician Handbook on Medical Certification of death by centers for disease control and prevention (CDC 2003).<sup>6</sup> The errors identified in the death certificates were grouped into following 07 categories starting from I to VII on a predetermined form (Table 1) to assess the accuracy of individual death certificate.

Category I meant that the format of the death certificates was not according to the recommendations of WHO. Categories II to V indicated total omission or improper sequence of immediate or underlying cause of death. Category VI described a mechanism/ mode of death as cause of death. Category VII indicated non-mentioning or misinterpretation of contributory cause of death. All 7 categories (I-VII) representing errors found in the death certificates were presented as number and percentages. Frequency and proportions were calculated for categorical variables. Statistical analysis was carried out by using Statistical Package for Social Sciences (SPSS, version 23). The institutional ethical committees reviewed and approved the research protocol.

**RESULTS**

During the study period from January - June 2015, a total of 10359 death certificates from three tertiary care hospitals of Lahore were audited, 5175 death certificates from 2099 bedded Mayo Hospital, 1882 from 1196 bedded Services Hospital and 3302 from 1000 bedded Lahore General Hospital Lahore. No death certificate was found to be error free. WHO recommended format of death certificates was not followed in 5175 cases (49.95%). Immediate cause of death was not mentioned in 5990 cases (57.82%) and incorrectly placed in 4336 cases (41.85%). Underlying cause of death had not been mentioned in 8452 cases (81.56%) and incorrectly placed in 1061 (10.24%) and 5759 certificates (55%) had missed or misinterpreted

contributory cause of death. The most frequent error in the ascertainable data was category VI observed in 10089 cases (97.39%) regarding cause(s) of death being confused with mechanism/mode of death. Table 2 summarizes the frequency of omissions according to various categories (I to VII).

## DISCUSSION

In this study, all death certificates (100%) had some form of error. The highest number (97.4%) of the error was confusion between cause of death and mechanism/mode of death, followed by error in underlying cause of death (81.6%) and immediate cause of death (57.8%). Frequency of errors in the standard WHO recommended format was 49.95%. Similar results were reported by Haque and colleagues from Pakistan and Raje from India where 99% of death certificates were found to be erroneous.<sup>5,10</sup> Maharjan and coauthors reported 78.4 % death certificates to be erroneous from Nepal.<sup>11</sup> Ganasva and coworkers mentioned 98.26% omissions in the death certification in a study from Gujrat, India.<sup>12</sup> In Sri Lankan, US and Canadian work, 62%, 59% and 32% respectively, had unacceptable Cause of Death statements.<sup>13</sup> Haghighi and associates from Iran identified 51.7% accuracy rate of causes of death.<sup>14</sup> Hanzlick identified about 47% of the omission in death certificates in Atlanta, showing errors and incorrect information.<sup>15</sup> In a study by El-Nour and coauthors from Khartoum, such errors were reported in 45% of the death certificates.<sup>16</sup> A study by Pritt and coworkers revealed major errors in 34% death certificates, whereas Jordan and Bass found 31.9% of death certificates to be erroneous at a Canadian tertiary care teaching hospital.<sup>17,18</sup> A study from Taiwan identified 7% of such errors.<sup>19</sup> A reasonable justification for such significant variable results may be due to different criteria used to define major omissions.<sup>16</sup>

It is the legal and ethical duty of the certifying doctor not only to diagnose the occurrence of death but also to certify the cause of death without confusing it with mechanism or mode of death to avoid any ambiguity. The most common and serious error observed in this study was that certifying doctors had confused the cause of death with mode or mechanism of death (97.4%). According to the definition described by 20<sup>th</sup> World Health Assembly 1967, cause of death includes disease, injury or morbid condition which contributes directly or indirectly to death. The cause of death is an etiologically distinct and specific entity; e.g. peritonitis, laceration of femoral vein, tuberculosis and myocardial infarction etc.<sup>6</sup> On the other hand, mechanism of death is a biochemical disturbance or a physiologic derangement resulting from diseases, conditions, or injuries which eventually contributed to death. These are not etiologically specific therefore not taken as an underlying cause of death; e.g. sepsis, cardiopulmonary failure, various arrhythmias, renal

failure; hypovolemic shock etc.<sup>13,20</sup> Mode of death is the terminal event of abnormal physiological state that existed at the time of death. There are three modes of death depending upon the involvement of one vital system; asphyxia is failure of the function of respiratory system; syncope indicates failure of function of heart; coma describes the failure of function of brain. These are no more than signs of death and provide no purposeful information as to underlying disease process.<sup>21</sup> Mechanism of death, like cardio respiratory arrest, respiratory failure and heart failure, is often written as immediate cause of death. In present study, this error accounted for 97.4% of all errors. Patel and coworkers from India reported similar findings in 80% cases.<sup>22</sup> Other authors reported such errors on 7-62% instances.<sup>5,16,18-20</sup> The incidence of this huge error in majority of cases indicates a gross overlook by the certifying doctors as the WHO recommended certificate itself guides the certifying doctor through a written instruction under Part I to mention only disease, injury or complication and not the mode /mechanism of death. Further the MBBS curriculum taught to undergraduates clearly differentiates between cause and mode of death; still doctors get confused.<sup>21,22</sup>

In this study, immediate cause of death was not mentioned on 57.82% occasions, or if written was incorrectly placed on 41.85% times. Underlying or antecedent cause of death was not written in 81.59% certificates or if written was incorrectly placed in 10.24% instances. Contributory cause of death has been missed or misinterpreted in 5759 death certificates (55%). Haque and associates reported that in 62% cases immediate cause of death and in 87% cases underlying cause of death were not mentioned.<sup>5</sup> Patel and group mentioned 55% improper sequencing.<sup>22</sup> Other authors reported this error in 18.2% to 51.4% instances.<sup>11,13,23</sup> Maharajan and coworkers noticed 29% cases deficient in immediate cause of death and 46.4% cases of underlying cause of death.<sup>11</sup> Pritt and colleagues identified 30% cases of not writing immediate cause of death and 34% cases of underlying cause of death.<sup>17</sup> Myers and Farquhar noticed 15.8% cases of both immediate and underlying causes of death individually.<sup>20</sup>

Omissions in death certificates are a universal problem. These inaccuracies arise from deficient knowledge of the certifying doctors who are not competent enough to identify and differentiate among underlying /antecedent and immediate cause(s) of death and mechanism/mode of death.<sup>15</sup> Another reason may be the fact that medical therapy usually aims at modifying or altering the mechanism or treating the physiological parameters rather than cause so mechanism attracts more attention of the treating doctor than the cause so confusion for the certifying doctors is created.<sup>24</sup> Other reasons may include overwork, exhaustion, time constraint, deficient knowledge of the medical history of the deceased, least importance given to the value of the death certificate by

the concerning doctors. A junior busy doctor already deficient in training and guidance from the seniors do not bother to appraise the medical documentation of the departed to arrange the sequence of events in an order accurately involved in causing death. A study conducted by Maudsley and associates revealed that 46.2% of house officers had not studied the instructions book on death certificate.<sup>13</sup> A comparative study revealed a lack of training in the completion of death certificates among the doctors.<sup>25</sup> More than 50% of general practitioners of UK and US have been reported to be insufficiently instructed and trained for the completion of a death certificate.<sup>26</sup> Most commonly mentioned mechanism/modes of death as immediate cause of death in present study is cardiopulmonary arrest, cardiac arrest and sepsis. This commonly happens due to involvement of multiple organs during the pathological process thus creating additional difficulties for a certifier while completing the death certificate.<sup>11</sup> Another reason for such errors is practice of copying provisional diagnosis written on medical record at the time of admission of the patient into hospital as a cause of death on death certificate without analyzing immediate and antecedent/underlying cause of death.<sup>19</sup>

These omissions can be due to incomplete certification, illegible hand writing, and use of abbreviations, ambiguous terms and poorly defined causes and mechanism of death.<sup>27</sup> Cardio pulmonary arrest and other mode/mechanism mentioned as causes of death in death certificate of these tertiary care teaching hospitals are not listed as diseases/causes in ICD. Therefore, when data from this death certificate is attempted to be translated into ICD, it becomes invalid and incomprehensible. So no real accurate data on cause of death becomes available. This data is essential to plan any injury/ disease prevention program.<sup>28</sup>

There are some limitations experienced during the study. As it is retrospective study so it cannot be generalized. In Pakistan and many other developing countries, there are some restrictions of religion, culture or traditional taboos leading to refusal for autopsy by the public so we have to stay dependent upon the medical records solely to certify the cause of death resulting in some degree of misinterpretations.

## CONCLUSION

No single death certificate was found error free. Medical certification of death is an important legal document after death. It is the legal and ethical duty of the attending doctor to prepare this document as per guidelines issued by WHO to avoid any ambiguity so that an accurate data required for genuine vital statistics may be obtained to structure a compatible national health policy.

## REFERENCES

1. World Health Organization. (1979). Medical certification of cause of death: instructions for physicians on use of international form of

- medical certificate of cause of death, 4th ed. Geneva: World Health Organization. <http://www.who.int/iris/handle/10665/40557>.
2. Murray CJ, Lopez AD. Global and regional cause-of-death patterns in 1990. *Bull World Health Organ* 1994; 72(3): 447-80.
3. Kotabagi RB, Chaturvedi RK, Banerjee A. Medical Certification of Cause of Death. *Med J Armed Forces India* 2004; 60(3): 261-72.
4. Brooks EG, Reed KD. Principles and pitfalls: a guide to death certification. *Clin Med Res* 2015; 13(2): 74–82.

5. Haque AS, Shamim K, Siddiqui NH, Irfan M, Khan JA. Death certificate completion skills of hospital physicians in a developing country. *BMC Health Serv Res* 2013; 13: 205.
6. Centers for Disease Control and Prevention, National Center for Health Statistics. Instruction manual, part 9: ICD-10 cause-of-death lists for tabulating mortality statistics (updated 2002 to include ICD codes for terrorism deaths for data year 2001 and WHO updates to ICD-10 for data year 2003); 2002 [cited on sep 2016]. Accessed from: [https://www.cdc.gov/nchs/data/dvs/im9\\_2002.pdf](https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf).
7. Jang JS, Jang SJ, Choi BH, Lee HY, Chung NE, Seo JS. A statistical analysis of legal autopsies performed in Korea in 2014. *Korean J Leg Med* 2015; 39(4): 99–108.
8. Xu J, Murphy SL, Kochanek KD, Bastian BA. Deaths: Final data for 2013. *Natl Vital Stat Rep* 2016; 64(2): 1–119.
9. Weeramanthri T, Beresford B. Death certification in Western Australia—classification of major errors in certificate completion. *Aust J Public Health* 1992; 16(4): 431–4.
10. Raje MG. Evaluation of errors and its etiological relevance with variables associated with death certificate. *Indian Acad Forensic Med* 2011. 33(1):50–6.
11. Maharjan L, Shah A, Shrestha KB, and Shrestha G. Errors in cause-of-death statement on death certificates in intensive care unit of Kathmandu, Nepal. *BMC Health Serv Res* 2015; 15: 507.
12. Ganasva AS, Bariya BR, Damor JR, Mazumdar V. Accuracy in completion of death certificate in Vadodara Municipal Corporation of Gujarat, India. *Int J Med Science Public Health* 2016; 5(6): 1148–52.
13. Maudsley G, Williams EM. Death certification by house officers and general practitioners—practice and performance. *J Public Health Med* 1993; 15(2):192–201.
14. Haghghi MH, Dehghani M, Teshnizi SH, Mahmoodi H. Impact of documentation errors on accuracy of cause of death coding in an educational hospital in southern Iran. *Health Inf Manag* 2014; 43(2): 35–42.
15. Hanzlick R. Quality assurance review of death certificates: a pilot study. *Am J Forensic Med Pathol* 2005; 26(1): 63–5.
16. El-Nour AEAM, Ibrahim YAH, Ali MM. Evaluation of death certificates in the pediatric hospitals in Khartoum state during 2004. *Sudan J Public Health* 2007; 2(1): 29–37.
17. Pritt BS, Hardin NJ, Richmond JA, Shapiro SL. Death certification errors at an academic institution. *Arch Pathol Lab Med* 2005. 129(11):1476–9.
18. Jordan JM, Bass MJ. Errors in death certificate completion in a teaching hospital. *Clin Invest Med* 1993; 16(4): 249–55.
19. Lu TH, Shih TP, Lai HS, Lee LS, Lee MC, Chou MC. Analysis of formative errors and validity of cause-of-death diagnosis in a teaching hospital. *Chin J Public Health (Taipei)* 1996; 15: 373–81.
20. Myers KA, Farquhar DR. Improving the accuracy of death certification. *CMAJ* 1998; 158(10): 1317–23.
21. Knight B 1996. Mode versus Cause of death. In: *Forensic Pathology 2<sup>nd</sup> Edition*, Oxford University Press Inc New York. P 54–55.
22. Patel AB, Rathod H, Rana H, Patel V. Assessment of medical certificate of cause of death at a new teaching hospital in Vadodara. *National Journal Community Medicine* 2011; 2(3): 349–53.
23. Fernando R. Medical certification of cause of death in the General Hospital, Colombo. *Ceylon Med J* 1990; 35(2): 71–4.
24. Kircher T, Anderson RE. Cause of death. Proper completion of the death certificate. *JAMA* 1987; 258(3): 349–52.
25. Rao C, Lopez AD, Yang G, Begg S, Ma J. Evaluating national cause-of-death statistics: principles and application to the case of China. *Bull World Health Organ* 2005; 83(8): 618–25.
26. Lenfant C, Friedman L, Thom T. Fifty years of death certificates: The Framingham Heart Study. *Ann Intern Med* 1998; 129(12): 1066–7.
27. Messite J, Stellman SD. Accuracy of death certificate completion: the need for formalized physician training. *JAMA* 1996; 275(10): 794–96.
28. Wexelman BA, Eden E, Rose KM. Survey of New York City Resident Physicians on Cause-of-Death Reporting, 2010. *Prev Chronic Dis* 2013;10:120288. DOI: <http://dx.doi.org/10.5888/pcd10.120288>.