Original Article

Access this article online

Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_502_21

The knowledge assessment and reducing the errors of medical certificate of cause of death with sensitization training of physicians: A quality improvement intervention study

Swapnil Prabhakar Akhade, Shreemanta Kumar Dash[1], Kiran Swapnil Akhade[2]

Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India, [1]Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, Mangalagiri, Andhra Pradesh, India, [2]Department of Community Medicine, Raipur Institute of Medical Sciences, Raipur, Chhattisgarh, India

Address for correspondence:
Dr. Kiran Swapnil Akhade, J-802, Maruti Lifestyle, Kota Road, Mahoba Bazaar, Raipur - 492 099, Chhattisgarh, India.
E-mail: kiran.rohi@gmail.com

Received: 17-04-2021
Accepted: 23-05-2021
Published: 31-01-2022

Abstract:

BACKGROUND: A Medical Certificate of Cause of Death (MCCD) is a vital document issued by a doctor and has a prescribed format published by the World Health Organization. It is an essential tool to obtain scientific and reliable information in terms of the cause of mortality. The aim of this study is to assess the knowledge about MCCD and to evaluate the impact of sensitization training on the MCCD among the physicians working in the trauma and emergency department in a Tertiary Care Centre.

MATERIALS AND METHODS: A quasi-experimental quality improvement hospital-based study executed in Trauma and Emergency Department of Tertiary Care Hospital in Chhattisgarh State, India. The physicians posted in the Trauma and Emergency Department were participated in the study and attended the sensitization training session on MCCD. Statistical analysis used; the data were entered in Microsoft Excel and analyzed with SPSS version 20 statistical software. Mean scores and standard deviation (SD) were used for pre and posttest data while statistical significance was tested using the paired *t*-test. $P < 0.05$ was considered as significant. The technical and medical errors in MCCD forms were depicted in percentages.

RESULTS: A total of 54 physicians completed the study, including 42 junior resident doctors, 6 senior resident doctors, and 6 faculties. There was a significant difference in the scores before (M = 4.39, SD = 1.571) and after (M = 7.5, SD = 0.885) the training ($t = 17.6$, $P < 0.0001$). The participants showed substantial improvement by reduction in technical errors from 28% to 14% while the medical error also slashed down from 42% to 16%.

CONCLUSIONS: Sensitization and educational training should be carried out consistently on regular intervals to improve the knowledge of physicians regarding the appropriate filling of MCCD and minimize the errors in MCCD, ultimately this will enhance usability and comparability of mortality statistics generated from International Classification of Diseases data.

Keywords:

Death certificate, effectiveness of training, errors, medical certification of cause of death

Introduction

A death certificate is an official document in which the medical practitioner primarily records the cause of death sequence, the time interval between the onset of the cause of death and death, and personal details of the deceased. The underlying

How to cite this article: Akhade SP, Dash SK, Akhade KS. The knowledge assessment and reducing the errors of medical certificate of cause of death with sensitization training of physicians: a quality improvement intervention study. J Edu Health Promot 2022;11:19.

cause of deaths mentioned in the Medical Certificate of Cause of Death (MCCD) issued by physicians helps policymakers in planning health policies.[1,2] Since 2016, the Registrar General of India implemented an online birth and death registration system at www.crsorgi.gov.in. With this new online registration system, the correct documentation of cause of death is even more critical because of the automated coding of death causes.[2] Even a small mistake in entering the cause of death may affect the leading cause of death in a particular region/state. It can have crucial implications for policymakers and program managers. It has often been observed that death is reported inappropriately by the expertise physicians as well. The errors are seen in technical and medical parts of the cause of death certificate issued by physicians among various hospitals.[3-7]

The treating physician's responsibility is to issue MCCD correctly and as per the prevailing rules and regulations. To do so, he/she should be aware of its significance, objectives, rules, regulations, and terminologies used in MCCD. The essential purpose of MCCD data is to obtain mortality statistics. Mortality data are needed to know the magnitude of diseases, undertake control measures, and understand the trend and changing mortality pattern and effectiveness of prevention programs. Incomplete or inaccurate entry in this certificate leads to difficulty in obtaining reliable information about causes of mortality. Cause-specific mortality rates are key indicators of the health trends in the population.[2] To ensure correct and appropriate filing of MCCD, the Registrar (Birth and Death) in a Tertiary Care Center conducted this study to assess the knowledge and understanding about rules, regulations, and structure of MCCD among doctors working in the trauma and emergency department. We further assessed the impact of sensitization training on the MCCD among the physicians by determining the accuracy of filled MCCD form in given sample death scenarios both before and after the interventional training for quality improvement in a Tertiary care hospital.

As the trauma and emergency department of tertiary care hospital predominantly caters to critically ill patients referred from another hospital, it faces more deaths than any other wards. Hence, we prefer the study participants as treating physicians from our tertiary care institute's trauma and emergency department.

Materials and Methods

Study design and setting

A quasi-experimental quality improvement hospital-based study conducted at Trauma and Emergency Department of Tertiary Care Hospital in Chhattisgarh state, India.

Study participants and sampling

Junior Residents (MBBS or pursuing postgraduation), Senior Residents (completed postgraduation), and Faculty posted in the Trauma and Emergency Department attended the sensitization training session on MCCD (n = 54). They were requested to complete a survey questionnaire along with a model death certificate using sample cases simulating hospital deaths at baseline and postintervention. The standard MCCD, i.e. Form 4, as per the World Health Organization (WHO) guidelines and International Classification of Diseases (ICD-10th revision) was used to fill the death certificate. A convenience sampling method was used to include the study participants. All participants were volunteers and no financial compensation was provided.

Inclusion criteria

All physicians from the trauma and emergency department who attended the sensitization training and interactive sessions on MCCD and willing to participate in the study were included in the study.

Exclusion criteria

The participants who failed to complete the baseline questionnaire or 45 min interactive sensitization training on MCCD were excluded from the study.

Data collection tool and technique

The pretested, close-ended, and structured questionnaire and five death sample cases were given to study participants.

After the receipt of baseline pretest and death certificate filled by the participants on five sample death scenarios, the errors found mentioning the immediate cause, multiple causes in a single line, incorrect order of causal sequence of events, and duration of causes in the certificate. The errors related to patient's demographic data, date, time, and duration of illness were classified as technical errors. Inaccuracies in the logical sequence of cause of death and contributing factors as mentioned in Part II of MCCD were labeled as Medical errors.

The investigators conducted 45 min of sensitization training about information, knowledge, significance, and purpose of MCCD. The participants were trained to mention the immediate, antecedent, and underlying cause of death along with the causal sequence of the events as per WHO guidelines. The investigators also mentioned the common errors found in baseline assessment and their rectification. To evaluate the effectiveness of the training session, we analyzed the MCCD form 4 on another five death samples after attending the sensitization training as per the WHO guidelines. The intervention in this study did not pose any risk to living subjects and was conducted as a quality improvement activity; therefore,

it did not require institutional review board approval as per Institute ethics guidelines.

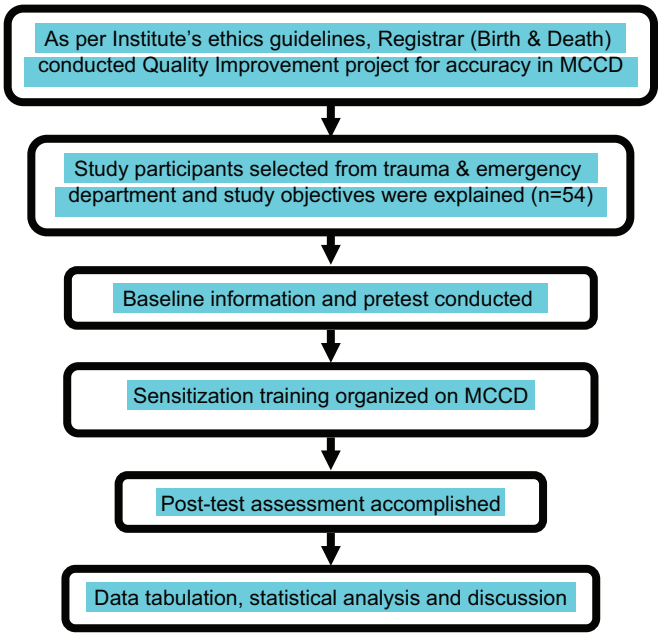
Ethical consideration

The intervention and analysis did not pose any risk to living subjects and was conducted as a quality improvement activity; therefore, study did not require institutional board approval as per institute ethics guidelines.

Statistical analysis

The data are entered in Microsoft Excel and analyzed with SPSS version 20 statistical software (IBM, Chicago, USA). The pretest and posttest data represented as mean scores and standard deviation (SD) and statistical significance were tested using the paired *t*-test. $P < 0.05$ was considered as significant. The technical and medical errors in MCCD forms were depicted in percentages.

Study protocol



Results

We assessed the knowledge about MCCD and filled form 4 (MCCD) on five death samples in hospital settings, of 54 participants from the Trauma and Emergency Department before and after the sensitization training. Out of these 54 participants, 6 were faculties, 6 were senior residents, and 42 were junior residents.

Table 1 shows that the experience of the participant doctors varied from < 1 year (7.4%) to > 6 years (11.11%). Majority of participants (70%) have experienced between 1 and 3 years.

Table 2 depicts the questionnaire used in the study. It shows correct responses and the importance of each question asked in the questionnaire.

Table 1: Distribution according to years of work experience

Work experience after graduation	*n* (%)
<1 year (junior resident doctor)	4 (7.4)
1-3 years (junior resident doctors)	38 (70.37)
3-6 years (senior resident doctors)	6 (11.11)
>6 years (faculty)	6 (11.11)
Total	54 (100)

Figure 1 shows that in pretest 65% of the faculty, 41% of junior residents and 40% of senior residents responded correctly to the questionnaire. We also found that the maximum number of participants knew the current version of ICD but none were aware of the coding professional. Faculties seem to be more aware of the significance of Part I and Part II of MCCD compared to resident doctors. All faculties could differentiate between mode and cause of death, whereas only half of resident doctors answered it correctly. Posttest assessment reveals significant improvement (from 48% to 75%) seen regarding the knowledge about MCCD among all the participants. Still, incessant ventures of sensitization training should be executed time to time

Table 3 displays that a paired-sample *t*-test was applied to compare the scores obtained before and after the sensitization training on MCCD. There was a significant difference in the scores before (M = 4.39, SD = 1.571) and after (M = 7.5, SD = 0.885) and the training (t = 17.6, $P < 0.0001$). Specifically, our results suggest that regular sensitization training improves the knowledge of physicians regarding the appropriate filling of Medical Certification of Cause of Death.

After sensitization training and interactive discussion on various aspects of MCCD, the participants were again given another exercise of five death scenarios and were asked to fill MCCD (form-4). Figure 2 illustrates the comparison between errors observed before and after sensitization training on MCCD. After the accomplishment of training, the participants showed substantial improvement by prominent reduction in technical errors from 28% to 14% while the medical error also slashed down from 42% to 16%.

Discussion

The WHO defined cause of death as "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury."[8] An appropriately completed MCCD is a valuable tool for understanding population dynamics and planning effective health-care program. The correct completion of the MCCD form is dependent on the certifying doctor adhering to the ICD-10 rules, and the registrar of birth and death ensures that data retrieved from the MCCD are

Table 2: Questionnaire to assess the participants' knowledge about medical certificate of cause of death

Serial number	Questions	Significance/ importance of question
Q1	In India according to the registration of birth and death act 1969, death has to be reported to the appropriate authority within a. 7 days b. 14 days c. 21 days d. 28 days	Information about death registration
Q2	Form number-2 is filled up for reporting of a. Death b. Still birth c. MCCD d. Birth	Knowledge of form number 2
Q3	Form number-4 and 4A is used for a. Noninstitutional and institutional death, respectively b. Institutional and noninstitutional death, respectively c. Institutional and noninstitutional still birth, respectively d. Noninstitutional and institutional still birth, respectively	Knowledge of form number 4 and 4A
Q4	In MCCD form, cause of death has a. One part b. Two parts c. Three parts d. Four parts	
Q5	How many lines are present in Part-I of the MCCD form? a. 1 b. 2 c. 3 d. 4	Significance of Part I and Part II of MCCD
Q6	Part-(II) of cause of death statement in MCCD form constitute a. Conditions directly related to the cause of death b. Conditions not directly related to cause of death but contributed to such outcome c. Used for statistical purpose d. It is detached from the form and handed over to the party	
Q7	Which of the following condition (s) mentioned in form 4 and 4A are considered as irrelevant according to MCCD? a. Cardiopulmonary arrest b. Shock c. Asphyxia d. Old age	Knowledge about mode and cause of death
Q8	Which ICD version are you currently using? a. 7 b. 8 c. 9 d. 10	Knowledge of ICD
Q9	Who selects the underlying cause of death on the medical certificates and assigns ICD codes? a. A certifier (doctor) b. A clinical coder c. Statistical officer d. Medical record officer/health information manager	
Q10	In Part I and Part II of cause of death statement in MCCD form a. Mode of death is written b. Cause of death is written c. Both are written d. None of the above	Significance of Part I and Part II MCCD

MCCD=Medical certificate of cause of death, ICD=International classification of diseases

appropriately mentioned in the civil registration system at www.csorgi.gov.in. In our study, participants were physicians working round the clock at the Trauma and Emergency department of tertiary care hospital. Patients with severe medical conditions are referred from other smaller hospitals at this center. At the baseline survey, we observed the knowledge about various components of the MCCD and also marked the errors done by the physician by giving five different hospital death scenarios. The errors noticed by the investigator were avoidable. During interactive training sessions, we discuss the basic concepts and importance of each line mentioned in the MCCD form and the causal sequence of events leading to the death of a person. Later posttest was conducted that showed significant improvement regarding the knowledge about MCCD. We further analyzed the sample MCCD forms filled by these physicians after training session and found that the technical information was appropriately mentioned in majority of cases. The overall accuracy in cause of death was also significantly improved. In our study, most of the medical errors were observed in the immediate cause of death, i.e. "cardiorespiratory arrest" terminology mentioned by more than half participants

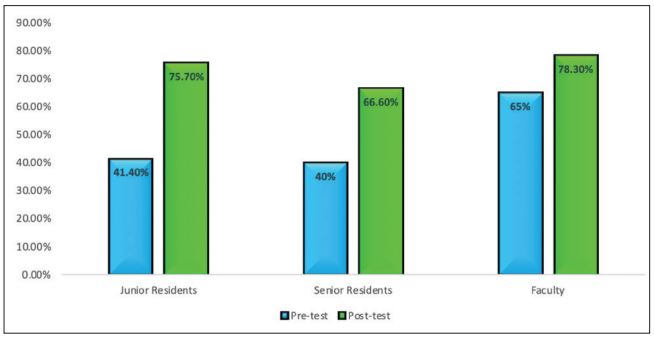


Figure 1: Distribution of accuracy in pretest and posttest of assessment

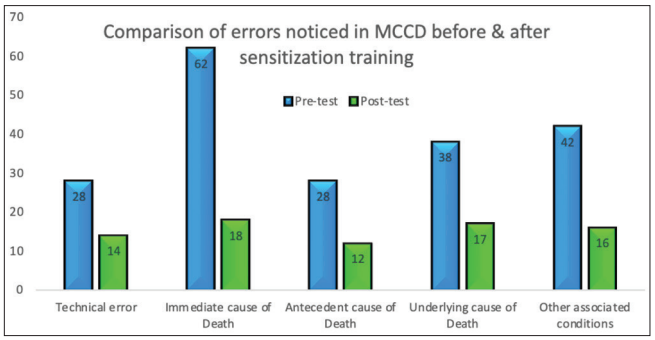


Figure 2: Distribution of errors in death certification before and after sensitization training

Table 3: Pre and posttest scale scores and their comparisons for knowledge assessment

Topic	Pretest score	Posttest score	*t*	*P*
Information regarding death registration	0.41	1	8.8	<0.0001
Knowledge about form number 2	0.43	0.85	6.3	<0.0001
Knowledge about form number 4 and 4A	0.49	0.86	5.4	<0.0001
Significance of Part I and Part II	0.40	0.62	3.7	0.1
Knowledge about mode and cause of death	0.59	0.98	5.8	<0.0001
Knowledge about ICD-10	0.39	0.53	3	0.01
Total	4.39	7.5	17.6	<0.0001

ICD=International classification of diseases

followed by cardiac failure. The pretest medical error for antecedent and underlying cause of death was significantly reduced. The most common technical error in this study was absence of time interval between onset of disease and death followed by the time of death.

Possible explanations for the errors during discussion with physicians in training session were:

1. Lack of awareness among junior physicians of the requirements and significance of MCCD Form. The physician certifying death must know that data generated is useful in providing mortality statistics, surveillance of specific diseases, and evaluation of disease control programs in specified areas (Part 1 and Part 2 of Form4/4A)
2. Inappropriate documentation problems are because senior consultants rely on junior doctors for documentation of death. Due to heavy patient workload, they often ignore the crucial importance of stipulation
3. A shorter hospital stay and incomplete information on referral slips creates a dilemma regarding the causal sequence of disease events and makes it more likely that the cause of death is mentioned inappropriately
4. The differences between modes, manner, and cause of death need to be clarified in such education interventional training program.

The study by Miki *et al*. in 2018[9] conducted a study comprised of online intervention and training intervention and concluded that after an online intervention, the average error score declined by 38% and further 26% due to the online and training intervention. The results were in accordance with that shown by our study. Similarly, in our study, it was found that technical errors reduced by 14% while medical errors are reduced by 26%.

In 2020, study was done to assess the effectiveness of an educational seminar targeting common errors identified in death certification. It was observed that error occurrence rate before educational seminar found to be 72% while immediate posttraining and 2-month posttraining participants demonstrated significantly lower error occurrence rate 34% and 24%, respectively ($P < 0.05$).[10]

A multicentric study with three training strategies implemented in five countries evaluates the impact on quality of medical certification of cause of death. The training strategies were training of trainers, direct training of physicians, and implementation of an online and basic training strategy. This study indicates that a variety of training strategies can produce benefits in the quality of certification.[11]

A study was executed to analyze the impact of an educational intervention on errors in death certification and observed a significant decrease in major errors such as mechanism without underlying cause of death, competing causes, and improper sequencing ($P < 0.001$).[12]

A study conducted in New York City to evaluate the immediate and long-term effects of a cause of death educational program at 8 hospitals that overreported heart disease deaths, by sharing hospital-specific data on cause of death reporting, holding conference calls with key hospital staff, and conducting in-service training. It was observed that errrors in the death certificate significantly reduced from 68.8% preintervention to 32.4% postintervention ($P < 0.001$).[13]

From a public health perspective, the mortality statistics form a basis for an effective strategy is to prevent the initiating disease or injury that precipitated the chain of events leading to death. The primary purpose of death certification is for governmental agencies to compile vital statistics.[14-16]

The advantages of our educational interventional study are combined participation and flexibility.

Interactive educational training on death certification should earnestly be considered for all genres of doctors working in an emergency department. Regular such sessions at frequent intervals should be followed; otherwise, these issues will continue to linger for the next batch of doctors joining the department.

Limitations: This interactive educational intervention was limited to our institute's trauma and emergency department. Another limitation is that only small groups can be covered to strengthen interactive sessions and clarify doubts. This study design limits our capacity of testing the participant's performance over a longer duration and directs further need for re-education after periodic auditing of MCCD.

Conclusions

Increased education and better documentation lead to reduction in errors and improve legitimacy of cause of death certificates. Cause of death certification is a very important skill that all physicians should master to improve the accuracy of mortality statistics of a population. Our study shows that simple educational intervention can improve the accuracy of physicians. Death certification should be included in the induction and sensitization training program of postgraduate students in the 1st year of postgraduate training and also to the Junior Resident doctors posted in emergency departments.

Recommendations

The sensitization and interactive educational training should be carried out consistently on regular intervals to minimize the errors in MCCD, ultimately this will enhance usability and comparability of mortality statistics generated from ICD data. Regular auditing of MCCD should be done, and physicians certifying deaths should be made aware about the available resources for guidance on appropriate death certification.

Acknowledgment

We thank to honorable Director, Prof. Dr. Nitin M. Nagarkar, Director AIIMS, Raipur, for valuable support and encouragement. We are also thankful to the faculties and residents of Trauma and Emergency department for participating enthusiastically.

Ethical moral code

This educational intervention was conducted by Registrar-Birth and Death (scientifically qualified person for MCCD training). All the participants were adequately informed about the aims, objectives, methodology, institutional affiliations of the researcher, and anticipated benefits. All the study participants enrolled in the study voluntarily.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Madadin M, Alhumam AS, Bushulaybi NA, Alotaibi AR, Aldakhil HA, Alghamdi AY, *et al*. Common errors in writing the cause of death certificate in the Middle East. J Forensic Leg Med 2019;68:101864.
2. Physicians Manual on Medical Certification of Cause of Death. Office of The Registrar General, India Government of India, Ministry of Home Affairs, 2 A, Man Singh Road, New Delhi. Available from: https://ncdirindia.org/emor/Download/Physician's_Manual_MCCD.pdf.[Last accessed on 2021 Apr 05].
3. Hazard RH, Chowdhury HR, Adair T, Ansar A, Quaiyum Rahman AM, Alam S, *et al*. The quality of medical death certification of cause of death in hospitals in rural Bangladesh: Impact of introducing the International Form of Medical Certificate of Cause of Death. BMC Health Serv Res 2017;17:688.
4. Maharjan L, Shah A, Shrestha KB, 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.
5. Garg A, Singh SV, Gupta VK. Accuracy of medical certification of the cause of death in a rural non-teaching hospital in Delhi. Natl Med J India 2012;25:185-6.
6. Patel Amul B, Hitesh R, Himanshu R, Viren P. Assessment of medical certificate of cause of death at a new teaching hospital in Vadodara. NJCM 2011;3:349-53.
7. Aung E, Rao C, Walker S. Teaching cause-of-death certification: Lessons from international experience. Postgrad Med J 2010;86:143-52.
8. Rampatige R, Mikkelsen L, Hernandez B, Riley I, Lopez AD. Systematic review of statistics on causes of deaths in hospitals: Strengthening the evidence for policy-makers. Bull World Health Organ 2014;92:807-16.
9. Miki J, Rampatige R, Richards N, Adair T, Cortez-Escalante J, Vargas-Herrera J. Saving lives through certifying deaths: Assessing the impact of two interventions to improve cause of death data in Perú. BMC Public Health 2018;18:1329.
10. Wood KA, Weinberg SH, Weinberg ML. Death certification in Northern Alberta: Error occurrence rate and educational intervention. Am J Forensic Med Pathol 2020;41:11-7.
11. Hart JD, Sorchik R, Bo KS, Chowdhury HR, Gamage S, Joshi R, *et al*. Improving medical certification of cause of death: Effective strategies and approaches based on experiences from the Data for Health Initiative. BMC Med 2020;18:74.
12. Azim A, Singh P, Bhatia P, Baronia AK, Gurjar M, Poddar B,

et al. Impact of an educational intervention on errors in death certification: An observational study from the intensive care unit of a tertiary care teaching hospital. J Anaesthesiol Clin Pharmacol 2014;30:78-81.

13. Madsen A, Thihalolipavan S, Maduro G, Zimmerman R, Koppaka R, Li W, *et al.* An intervention to improve cause-of-death reporting in New York City hospitals, 2009-2010. Prev Chronic Dis 2012;9:E157.
14. World Health Organization. International Statistical Classification of Diseases and Related Health Problems. 10th Revision. Volume 2. Available from: http://www.who.int/classifications/icd/en/. [Last accessed on 2021 Apr 05].
15. Adeyinka A, Bailey K. Death Certification. 2020 Apr 30. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2021.
16. Brooks EG, Reed KD. Principles and pitfalls: A guide to death certification. Clin Med Res 2015;13:74-82.