January - June 2026 Volume 35 Issue 1 PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

Official Publication of Medicolegal Association of Maharashtra

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MULTISPECIALITY, MULTIDISCIPLINARY, NATIONAL
PEER REVIEWED, OPEN ACCESS, MLAM (SOCIETY) JOURNAL
Indexed with Scopus (Elsevier)

Editorial Office Address
Department of Forensic Medicine & Toxicology, Third Floor, Mortuary Building, Lokmanya Tilak Municipal Medical College & LTMG Hospital, Sion, Mumbai, Maharashtra, India. Pin-400 022. Email id: mlameditor@gmail.com Phone: 022-68660000/ +91-9423016325.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Evaluation of Medical Certification of Cause of Death (MCCD) at Tertiary Healthcare Centre, Mumbai: A Retrospective Observational Study

B.G. Chikhalkar[a], Rahul Wagh[b*], Rupam Bhanarkar[c], Prashant Howal[d], Harshal Shingne[c]

[a]Professor & Head, [b]Assistant Professor, [c]Junior Resident, Department of Forensic Medicine and Toxicology; [d]Associate Professor, Department of Community Medicine, Grant Govt. Medical college & Sir JJ Hospital, Mumbai, Maharashtra, India.

Article Info

Received on: 10.11.2025
Accepted on: 11.03.2026

Key words
Death certificate,
Errors,
ICD-10,
MCCD.

Abstract

Background: Medical Certification of Cause of Death (MCCD) constitutes a critical medico-legal document and a primary source of mortality statistics. Deficiencies in certification practices diminish the interpretability and utility of death records. **Objective:** To evaluate the completeness and accuracy of MCCDs and identify common certification errors. **Materials & Methodology:** A retrospective observational study of 200 MCCDs selected using non-probability consecutive sampling from certificates registered between January and February 2025. Errors were classified using WHO and Registrar General of India guidelines. Data were analysed using descriptive statistical methods. **Result:** Inaccurate cause-of-death terminology was observed in 98% of certificates. Mechanism-only entries and symptom-based documentation were identified in 99% of cases. ICD-10 codes and time intervals were absent in all certificates. A statistically significant association was observed for Immediate Cause of Death ($p < 0.001$). **Conclusion:** Errors are common in the completion of death certificates issued by various physicians in Tertiary Healthcare Center, Mumbai. Educational interventions can improve the accuracy of reporting in death certificates.

1. Introduction

Mortality data are essential for monitoring health trends, shaping public health policy, and allocating healthcare resources.[1,2] The Medical Certification of Cause of Death (MCCD), based on WHO and ICD-10 guidelines (Form No. 4/4A in India), offers a standardized approach to documenting causes of death.[1,2] However, frequent documentation errors, such as incomplete entries, diagnostic inaccuracies, illegibility, and inappropriate terminology, compromise the reliability of these data.[3,4,5]

This study aims to evaluate the accuracy of MCCD forms and identify common errors, highlighting the urgent need to strengthen physicians' competence in proper death certification.[6,7]

How to cite this article: Chikhalkar BG , Wagh R, Bhanarkar R , Howal P, Shingne H. Evaluation of Medical Certification of Cause of Death (MCCD) at Tertiary Healthcare Centre, Mumbai: A Retrospective Observational Study. J Forensic Med Sci Law. 2026;35(1):4-8. doi: 10.59988/jfmsl.vol.35issue1.2

***Corresponding author:** Dr. Rahul R. Wagh, Assistant Professor, Dept of Forensic Medicine & Toxicology, Grant Govt. Medical college & Sir JJ Hospital, Mumbai, Maharashtra, India. Email Id: waghr143@gmail.com

2. Materials And Methods:

During the study period (January 2025 to February 2025), a total of 348 Medical Certificates of Cause of Death (MCCDs) were registered at the Death Certification Department of the tertiary healthcare centre. The required sample size for the study was predefined as 200 MCCDs based on feasibility and study objectives. A non-random consecutive sampling method was adopted, wherein the first 200 eligible MCCDs received during the study period were included sequentially until the target sample size was achieved. No selection was made based on department, diagnosis, physician designation, or cause of death.

The remaining 148 MCCDs were not included solely because the predetermined sample size had already been reached, and not due to any systematic exclusion criteria. For alpha of 0.05 and 6% margin of error along with 73% prevalence of major errors according to previous literature we deemed that this non-random consecutive sample would be adequate. Including consecutive cases avoided selective inclusion and provided a pragmatic alternative to random sampling in record-based studies. The selected forms, completed in accordance with WHO guidelines, were evaluated using a pre-tested proforma containing a checklist of all variables included in the MCCD.[8] Institutional Ethics Committee exemption was obtained prior to commencement of the study.

Operational Definitions:

a. **Inaccurate Terminology:** use of non-etiologic, ill-defined or non-specific terms in any part of the cause-of-death statement that prevent correct selection or coding of an aetiologic underlying cause of death
b. **Improper Mentioning:** any entry on the certificate that violates accepted rules of causal sequencing or specificity like: (a) reporting only unspecific causes on the lowest used line, (b) reporting two or more separate causal sequences on Part I, (c) incorrect causal sequence (temporal order reversed or biologically implausible), (d) placing mechanism/underlying/contributory
c. **Errors in immediate cause:** any incorrect, missing, non-specific or mechanism-only entry recorded in the Immediate Cause of Death (ICOD / Part I line a) that results in (a) inability to identify the antecedent/underlying cause or (b) a category of error known to materially affect UCOD selection
d. **Incorrect mentioning:** any error, omission, or internal inconsistency in the recorded data on the death certificate (including age, gender, date of death, date of certification, or interval inconsistencies) that conflicted with hospital records or rendered the certificate temporally inaccurate.

The errors were classified as major and minor errors (Table 1).

Table 1: Major and minor errors.

Error Type	Definition
Major Errors	Errors affecting validity of cause-of-death determination
1.Mechanism-only cause	Use of terminal events (e.g., cardiac arrest) without etiology
2. Incorrect causal sequence	Violation of WHO causal chain rules
3. Unrelated conditions	Independent diseases listed as causal
4. Missing underlying cause	Absence of etiologic disease/injury
Minor Errors	Errors affecting completeness but not fundamental validity
1. Missing time interval	Failure to record duration between onset and death
2. Abbreviations	Use of non-standard short forms
3. Overwriting	Corrections reducing document clarity
4. Incomplete demographics	Missing age, sex, etc.

Statistical Analysis:

Data were entered into Microsoft Excel (2024) and analyzed using Jamovi (Version 2.6). The analysis was primarily descriptive in nature. Documentation errors and certification deficiencies were categorized according to predefined criteria, and their frequencies and proportions were calculated. The audit-based retrospective design is given and minimal variability observed in several completeness indicators. Inferential statistical testing was not considered appropriate.

Findings were therefore interpreted using descriptive statistical methods to characterize the distribution and patterns of certification errors. The analytical approach focused on estimating error prevalence rather than evaluating inter-variable associations. It consistent with the audit-based retrospective design, inferential statistical testing was not emphasized. Errors were therefore interpreted using descriptive distribution analysis. The extremely high prevalence of Immediate Cause of Death deficiencies indicates systematic certification patterns.

3. Results:

A total of 200 Medical Certificates of Cause of Death (MCCDs) were evaluated (**Fig.1 & Table 2**). Core demographic variables were largely complete. The full name of the deceased was correctly documented in 199 (99.5%) certificates, while 1 (0.5%) certificate contained incomplete identification details. Date and time of death were recorded in 198 (99%) certificates, whereas 2 (1%) certificates lacked this information.

Figure 1: Department-wise Distribution of Medical Certificates of Cause of Death (n = 200).

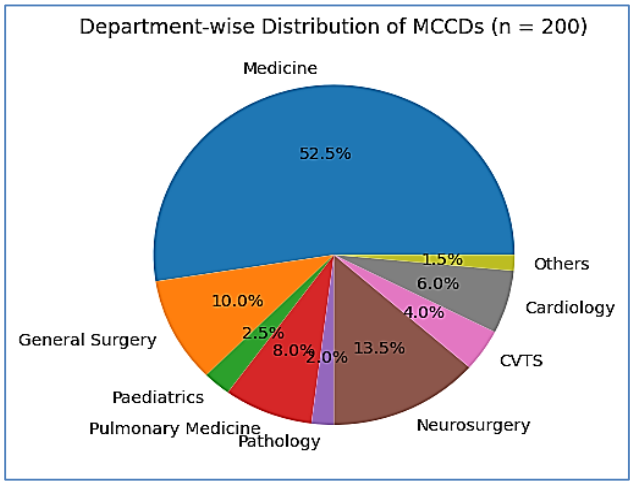
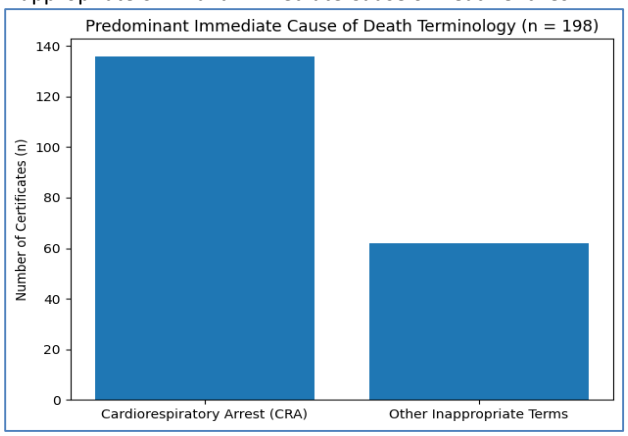


Figure 2: Distribution of Frequently Documented Inappropriate Immediate Cause of Death Terminology (n = 198). The denominator represents certificates demonstrating inappropriate or invalid Immediate Cause of Death entries.



Gender was correctly mentioned in 190 (95%) certificates and was missing or incorrectly recorded in 10 (5%) cases. None of the certificates documented the time interval between onset of illness and death (0%). ICD-10 codes were absent in all evaluated certificates (0%).Physician-related variables demonstrated high completeness. The treating physician's name was present in 192 (96%) certificates. Physician signatures were observed in 199 (99.5%) certificates, while 1 (0.5%) certificate lacked a signature. The physician's registration number or official seal was present in 199 (99.5%) certificates (**Table 3**).

Table 2: Distribution of Cause-of-Death Certification Variables (n = 200).

Sr. No.	Cause-of-Death Variable	Observation	Frequency n (%)
1	Antecedent Cause	Mentioned	189 (94.5%)
		Not mentioned	11 (5.5%)
2	Other Significant Conditions	Mentioned	182 (91%)
		Not mentioned	18 (9%)
3	Manner of Death	Marked	173 (86.5%)
		Not marked	27 (13.5%)
4	Gender of Deceased	Correctly documented	190 (95%)
		Missing / incorrect entry	10 (5%)

Table 3: Distribution of Technical and Certification Variables (n = 200).

Sr. No.	Variable	Observation	Frequency n (%)
1	Pregnancy-related death (Females 15–49 yrs, n = 19)	Mentioned	15 (78.9%)
		Not mentioned	4 (21.1%)
2	Treating physician name	Mentioned	192 (96%)
		Not mentioned	8 (4%)
3	Physician signature	Present	199 (99.5%)
		Absent	1 (0.5%)
4	Registration number / seal	Present	199 (99.5%)
		Absent	1 (0.5%)
5	ICD-10 code	Mentioned	0 (0%)
		Not mentioned	200 (100%)
6	Overwriting / cancellations	Present	20 (10%)
		Absent	180 (90%)
7	Abbreviations used	Yes	6 (3%)
		No	194 (97%)
8	Time Interval (Onset to Death)	Mentioned	0 (0%)
		Not mentioned	200 (100%)

Table 4: Distribution of Documentation Deficiencies Across Certification Variables.

S. No.	Certification Variable	Deficiency Observed n (%)
1	Gender documentation errors	10 (5%)
2	Incomplete name documentation	1 (0.5%)
3	Missing Date & Time entry	2 (1%)
4	Missing treating physician name	8 (4%)
5	Missing physician signature	1 (0.5%)
6	Missing registration number / seal	1 (0.5%)
7	Overwriting / cancellations	20 (10%)
8	Abbreviations used	6 (3%)
9	Manner of death not specified	27 (13.5%)
10	Missing antecedent cause	11 (5.5%)
11	Missing underlying cause / OSC	18 (9%)
12	**Immediate Cause of Death errors**	**198 (99%)**

Abbreviations were identified in 6 (3%) certificates. Overwriting or cancellations were observed in 20 (10%) certificates. The manner of death was not specified in 27 (13.5%) certificates.

Deficiencies related to cause-of-death documentation were frequent. Immediate Cause of Death (ICOD) entries were found to be inappropriate or invalid in 198 (99%) certificates. Inaccurate or non-specific terminology was identified in 196 (98%) certificates (**fig. 2**). Antecedent causes were not documented in 11 (5.5%) certificates. Underlying causes or other significant conditions were absent in 18 (9%) certificates (**Table 4**). The majority of certificates were issued by the Medicine department (52.5%), followed by Neurosurgery (13.5%) and General Surgery (10%). Cardiorespiratory Arrest (CRA) was the most frequently documented Immediate Cause of Death terminology.

4. Discussion:

Accurate completion of the Medical Certificate of Cause of Death remains fundamental to medico-legal documentation and mortality surveillance frameworks. Certification deficiencies compromise the analytical validity of mortality data and may carry administrative or legal implications.[1, 2, 10] The present study identified a predominant reliance on mechanism-based expressions within cause-of-death statements. Many certificates reflected terminal physiological events rather than etiologically meaningful disease conditions. According to established certification principles, such documentation restricts appropriate identification of the underlying cause of death and reduces the interpretative value of mortality records. Similar patterns of certification errors have been reported in previous audits conducted in different hospital settings, highlighting persistent systemic deficiencies in death certification practices.[3, 5, 11, 12, 13]

Another notable finding was the absence of ICD-10 coding and temporal interval documentation in several certificates. Proper recording of these parameters forms an integral component of standardized death certification and is essential for accurate epidemiological analysis and mortality statistics. Failure to document these elements diminishes the statistical utility of death records and limits their contribution to national health information systems.[10, 12]

In the present study, errors were most frequently observed in the Immediate Cause of Death section. This clustering of errors suggests a systematic pattern of documentation behavior rather than isolated inaccuracies. Such findings likely reflect limited familiarity with the principles of causal sequencing and underlying cause selection among certifying physicians, a problem that has been reported in multiple institutional audits.[4, 5, 6, 14, 15] Improving the quality of death certification requires a multifaceted approach involving structured training programs, periodic institutional audits, and adherence to standardized documentation protocols.[16,17] Educational interventions have been shown to significantly enhance physicians' competence in completing death certificates.[18-20] Additionally, the implementation of electronic death certification systems incorporating mandatory validation checks may substantially reduce preventable documentation errors and improve the overall quality of mortality data.[7, 21-23]

Limitations:

This study has certain limitations. The analysis was conducted using a predefined non-probability consecutive sample, which may limit the generalizability of the findings beyond the evaluated certificates. Although consecutive sampling minimized investigator-driven selection, the possibility of sampling bias cannot be entirely excluded.

The study was retrospective and relied exclusively on available records. Therefore, the observations were dependent on the accuracy and completeness of documented information. The evaluation focused on certification practices and documentation deficiencies rather than independent clinical verification of causes of death. Furthermore, the study was performed at a single tertiary care teaching hospital, and variations in certification practices across different institutions or healthcare settings may exist.

5. Conclusion:

Accurate death certification is an essential professional responsibility of medical practitioners. The present study demonstrates a high prevalence of certification deficiencies, particularly within cause-of-death documentation, including reliance on mechanism-based terminology and omission of critical certification elements.

Structured training initiatives, standardized certification protocols, and periodic forensic audits are necessary to improve the medico-legal reliability of MCCDs. Without corrective measures, persistent documentation errors may continue to compromise the validity and utility of mortality data systems.

Acknowledgements: The authors acknowledge the assistance of the Death Certification Department staff of Tertiary Healthcare Center, Mumbai.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.
Contributor ship of Author: All authors equally contributed.
Conflict of interest: None to declare.
Source of funding: None to declare.

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