Problems With Proper Completion and Accuracy of the Cause-of-Death Statement

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Background: Mortality statistics are largely based on death certificates, so it is important that the data on the death certificate is accurate. At our institution, clinicians complete cause-of-death statements (CODs) prior to autopsy. Since May 1995, separate CODs have been included in autopsy face sheets.

Methods: Clinical and autopsy-based CODs filled out separately on 494 cases between June 1995 and February 1997 were compared for proper reporting and accuracy using the published guidelines and definitions of immediate, intermediate, and underlying causes of death put forth by the College of American Pathologists and the National Center for Health Statistics.

Results: Of the 494 death certificates, 204 (41%) contained improperly completed CODs. Of these, 49 (24%) contained major discrepancies between clinicians' and pathologists' CODs. Of the 494 death certificates, 290 (59%) had properly completed CODs. Of the 290 properly completed CODs, 141 (49%) contained disagreements: 73 (52%) on underlying CODs; 44 (31%) on immediate CODs; and 47 (33%) on other significant conditions (part II).

Conclusions: The reliability and accuracy of CODs remain a significant problem. Despite its limitations, the autopsy remains the best standard against which to judge premortem diagnoses. The CODs of the death certificate may be improved if death certificates are completed in conjunction with the postmortem examination and amended when the autopsy findings show a discrepancy.

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The information from death certificates, specifically the cause-of-death statements (CODs), is the basis for our national mortality database. The National Center for Health Statistics (NCHS) uses this database to help with surveillance of disease and proper allocation of funds for public health programs and research, and to help prioritize governmental decisions and actions in regard to health care. Because health statistics, national mortality and morbidity statistics, and data on disease prevalence in society are largely derived from death certificates, it is important to ensure proper completion and accuracy of the cause-of-death section of the death certificate.1

At The Johns Hopkins Medical Institutions, Baltimore, Md, it is practice of the clinician to complete the cause-of-death section of the death certificate at the time of death of the patient even if an autopsy is to be performed. In 1991, during the Second Workshop on Improved Cause-of-Death Statistics, the NCHS and the National Committee on Vital and Health Statistics (NCVHS) recommended adding CODs to autopsy reports.2 Since May 1995, a cause-of-death section has been included in the autopsy face sheet of all postmortem examinations at The Johns Hopkins Medical Institutions. As a result, residents and faculty in the pathology department have been instructed on the importance of the proper completion and accuracy of the cause-of-death section of the death certificate.

Overall, 204 (41%) of the CODs were improperly completed (Figures 1, 2, 3, 4, 5, and 6). Of these, the CODs improperly completed by clinicians (n = 191) significantly outnumbered those improperly completed by pathologists (n = 27) (Table 2). The most common mistakes made by clinicians included (1) using “mechanisms” as the immediate cause of death in 64 cases (34%); (2) not qualifying nonspecific processes in 90 cases (47%); (3) listing the underlying and immediate causes of death out of order in 35 (18%).
MATERIALS AND METHODS

Completed CODs from 494 autopsies performed at The Johns Hopkins Medical Institutions between June 1995 and February 1997 were selected for study. All clinical and autopsy-based CODs were first evaluated by the first author (A.E.S.) for consistency of reporting and adherence to instructions for proper completion. The CODs were subsequently evaluated by one of us (G.M.H.) for validation and confirmation of the accuracy of the findings. Proper completion of the CODs was determined using the published guidelines and definitions of immediate, intermediate, and underlying causes of death put forth by the College of American Pathologists and the NCHS3 (Table 1).

The "properly" completed clinical and autopsy-based CODs were subsequently compared for accuracy of diagnoses using the postmortem examination in conjunction with clinical information as the standard for comparison. The overall disagreements between clinical and autopsy-based CODs were subclassified into the following categories: disagreement on immediate cause of death, disagreement on underlying cause of death, and/or disagreement on other significant conditions. The categories of disagreement were further subclassified into whether the disagreement involved the same organ system or a different organ system.

The "improperly" completed CODs were further analyzed for the presence of major discrepancies between the clinicians’ and the pathologists’ CODs. These major discrepancies included either (1) a major finding listed in the autopsy as immediate or underlying cause of death that was not listed in the clinician’s cause of death, or (2) a disease or manifestation of disease listed in the clinician’s cause of death that was not validated by postmortem examination.

and (4) placing underlying or immediate causes of death in part II (other significant conditions contributing to death but not resulting in the underlying cause of death given in part I) in 39 (20%). Other mistakes included using abbreviations, listing other significant conditions (part II) in part I, and listing incidental findings in part II.

Of the 494 CODs reviewed, 290 (59%) were properly completed according to the guidelines of the College of American Pathologists and the standards set forth by the NCHS. Of those 290 CODs, 141 (49%) contained disagreements between the clinical and postautopsy versions with many CODs containing more than 1 disagreement. The most common discrepancy involved the underlying cause of death, with 73 CODs (52%) containing disagreements, 35 (48%) of which were assigned to the same organ system and 38 (52%) of which were assigned to a different organ system. Of the 44 CODs (31%) that contained discrepancies regarding the immediate cause of death, 18 (41%) were assigned to the same organ system, and 26 (59%) were assigned to a different organ system. In 47 CODs (33%) there was disagreement on other significant conditions when listed by both clinicians and pathologists. Of the CODs improperly completed, 49 (24%) contained major discrepancies, including either a major finding listed in the pathologists’ immediate or underlying COD that was not listed by the clinician, or an entity listed by the clinician that was not validated by postmortem examination (eg, pulmonary embolus) (Table 3).

Based on the results of this study, CODs are not reliable or accurate sources of information on which to base national mortality statistics (Figures 7, 8, 9 and 10). Several studies from around the world have addressed this topic and reached similar conclusions.1-13 In each of these studies, it is emphasized that information gathered from death certificates plays a key role in determining disease prevalence in society and ultimately has a significant effect on decision-making processes regarding the distribution of resources in the fields of medicine and health.

In a study done in London, Ontario, Jordan and Bass2 reviewed 426 death certificates to determine if they met the criteria for proper completion. In addition, the authors looked at which clinical department each death occurred in, whether staff physicians or residents completed the death certificate, and whether a coroner was involved and an autopsy was performed. Of the 426 certificates reviewed, 45% were filled out correctly and 23% contained only minor errors (inappropriate informa-
Of the 32% of death certificates with major errors, the most frequent error was incorrect sequencing (22%), which resulted from recording information out of order or in an illogical fashion when read vertically down the death certificate. The second most common major error was recording 2 causes of death in
part I (17%). The most serious type of error, according to this study, was listing a mechanism as a cause of death without an explanation. This error occurred in 10% of death certificates. In 1993, Hanzlick reviewed 56 death certificates completed over a 10-day period: 35 (63%) of the certificates showed either an omission or underlying COD that was nonspecific or in need of further explanation. In 32 (91%) of the incorrectly completed certificates, the immediate cause of death was cited in terms of a mechanism.
In 1981, Cameron and McGoogan performed a prospective study of 1,152 autopsies and compared the certified clinical diagnoses with autopsy findings to assess the diagnostic accuracy or inaccuracy of death certification. In their study, the main clinical diagnosis was confirmed in 61% of cases. The clinical diagnoses, which were not confirmed at autopsy, were either disproved (27% of cases) or determined to be subsidiary to the cause of death (12% of cases). In a study by Kircher et al., 272 autopsy reports were reviewed of 3884 decedents in Connecticut in 1980. In this study the researchers compared the International Classification of Diseases, Ninth Revision (ICD-9) disease categories of the underlying cause of death listed by the clinicians with that listed by the nosologically coded autopsy. Kircher et al. reported that a major disagreement (underlying cause of death assigned to different major ICD-9 categories) occurred in 29% of cases. In 1991, Nielsen et al. published a study comparing accuracy of death certificates on all autopsies performed in 1976 and 1986 at the University of Iceland, Reykjavik. These authors reported a 50% overall disagreement between the death certificate and autopsy diagnosis with a disagreement on COD in 25% of total cases. Of interest, the authors found that the overall accuracy of premortem diagnoses remained unchanged between the years 1976 and 1986, during which time nonobstetric ultrasound and computed tomography were reportedly introduced into practice in Iceland.

It has been suggested that clinicians may not be aware of the importance of the COD in the generation of health statistics. In Hanzlick’s attempt to improve accuracy of death certificates, he sent form letters to 32 physicians who had improperly completed CODs. The letter included a listing of omissions and the suggestion that the physician consider amending the certificate. Instructions for amending were provided, and a contact number was included. After 30 days, however, only 1 physician had amended a COD. This suggested that clinicians might not consider amendment to be necessary or a priority.

Recently there have also been several publications designed to help educate physicians regarding the proper completion of the death certificate and the standard definitions of immediate, intermediate, and underlying cause of death. In 1987, Kircher and Anderson published a special communication in JAMA to help provide medical students, house staff, and physicians with information regarding the proper completion of the death certificate and the standard definitions of immediate, intermediate, and underlying cause of death. In October 1989, a national conference sponsored by NCHS and NCVHS made several recommendations to improve the accuracy of death certificates. Their suggestions included increasing training of house staff and medical students, developing quality improvement programs, revising the format of the death certificate, and encouraging amendment of death certificates when indicated. Currently, the medical students at our institution receive instruction in death certificate completion during their second-year curriculum as well as during a transitional course given in their last year of training, prior to entering residency. In addition, for the past 5 years, our institution has required that all new members of the house staff receive specific instruction regarding death certification. Third, it has been the practice at our institution that admissions personnel review each completed death certificate to find and address inaccuracies in completion. This latter policy has been in place for approximately the past 10 years. Despite these implementations and attempts at clinician education, the proper completion of the CODs remains a significant problem at our institution, suggesting that further guidance is needed on death certification. In 1993, Hanzlick published a letter emphasizing this fact. In his letter, Hanzlick writes that many problems in CODs may result from inconsistency in wording, variations in certification style, and confusion regarding published examples of recommendations and guidelines. In an effort to educate and provide consistency, Hanzlick and the Autopsy Committee of the College of American Pathologists published The Medical Cause of Death Manual in 1994.

From our present study’s comparison of clinical and autopsy-based CODs, it seems that education of the pa-

<table>
<thead>
<tr>
<th>Completion Characteristic</th>
<th>Clinician Errors</th>
<th>Pathologist Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>290 (59) Properly completed</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>204 (41) Improperly completed†</td>
<td>191</td>
<td>27</td>
</tr>
<tr>
<td>Mechanisms as immediate cause of death</td>
<td>64 (34)</td>
<td>5 (19)</td>
</tr>
<tr>
<td>Do not qualify nonspecific processes</td>
<td>90 (47)</td>
<td>15 (56)</td>
</tr>
<tr>
<td>List immediate and underlying cause of death out of order</td>
<td>35 (18)</td>
<td>4 (15)</td>
</tr>
<tr>
<td>List cause of death in part II</td>
<td>39 (20)</td>
<td>5 (19)</td>
</tr>
<tr>
<td>Other‡</td>
<td>20 (10)</td>
<td>0</td>
</tr>
</tbody>
</table>

*Unless otherwise indicated all data are number (percentage).
†Some cause-of-death statements were improperly completed by both clinicians and pathologists, and some statements had more than 1 error.
‡Used abbreviations, 11 (6%); listed other risk factors (part II) in part I, 8 (4%); listed incidental findings in part II, 1 (0.5%).

Table 2. Comparison of Proper Completion of 494 Separate Clinical and Autopsy-Based Cause-of-Death Statements

<table>
<thead>
<tr>
<th>Completion Characteristic</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Properly completed</td>
<td>290 (59)</td>
</tr>
<tr>
<td>Overall disagreement†</td>
<td>141 (49)</td>
</tr>
<tr>
<td>Disagreement in immediate cause of death‡</td>
<td>44 (31)</td>
</tr>
<tr>
<td>Assigned to same organ system</td>
<td>18 (41)</td>
</tr>
<tr>
<td>Assigned to different organ system</td>
<td>26 (59)</td>
</tr>
<tr>
<td>Disagreement in underlying cause of death</td>
<td>73 (52)</td>
</tr>
<tr>
<td>Assigned to same organ system</td>
<td>35 (48)</td>
</tr>
<tr>
<td>Assigned to different organ system</td>
<td>38 (52)</td>
</tr>
<tr>
<td>Disagreement in other significant conditions§</td>
<td>47 (33)</td>
</tr>
<tr>
<td>Improperly completed</td>
<td>204 (41)</td>
</tr>
<tr>
<td>Major inaccurate or absent clinical diagnoses</td>
<td>49 (24)</td>
</tr>
<tr>
<td>Completion errors precluded meaningful comparison</td>
<td>155 (76)</td>
</tr>
</tbody>
</table>

*All data are number (percentage).
†Some cause-of-death statements had more than 1 disagreement.
‡When listed by both clinicians and pathologists.
§When listed by pathologists or both clinicians and pathologists.
Pathology faculty and house staff does help to improve the proper completion of the CODs. At our institution it is part of the initial training of any house officer in anatomic pathology to receive instruction regarding the importance of the proper completion and accuracy of CODs through the use of a prosector's manual, the COD manual,3 and various didactic methods. In addition, the house officer works closely with a more senior resident in the formulation of the COD. Finally, all completed autopsy-based CODs after release by a faculty member are re-reviewed by the director of the autopsy service for quality assurance. This study suggests not only that education in cause of death is important, but also that the process of coding should be continually revised.
tion of clinical house staff can help to improve the proper completion of CODs but also that pathologists may play an important educational role in promoting standardization and accuracy of death certification.

Based on the findings of this study as well as other studies, the autopsy remains a highly valuable educational and diagnostic tool that plays an invaluable role in the final step in clinical investigation. Ultimately, the reliability and accuracy of CODs may be improved if death certificates were completed in conjunction with the postmortem examination and amended when the autopsy findings show a discrepancy.

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REFERENCES


Correction

Error in Byline and Affiliation Footnote. In the Special Article by Ladenson et al titled “American Thyroid Association Guidelines for Detection of Thyroid Dysfunction” published in the June 12 issue of the ARCHIVES (2000;160:1573-1575), an error occurred in the byline and in the affiliation footnote on page 1573. Harvey D. Cohen, MD, should have been added to the author byline, and Harvey D. Cohen, MD, Rancho Cucamonga, Calif, should have been added to the affiliation footnote.