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Amended Cause and Manner of Death Certification: A Six-Year Review of the New Mexico Experience*

ABSTRACT: Little is known about the amendment of death certificates (DCs) issued by medical examiners and coroners. This retrospective study examined why, how, and with what frequency cause and manner of death were amended on DCs issued by forensic pathologists over a 6-year period at the New Mexico Office of the Medical Investigator. Approximately 1% of DCs had either cause or manner of death amendments, with arteriosclerotic cardiovascular disease and intoxicants the most commonly amended and resulting causes of death, respectively. There was a significant association between manner of death and number of DCs amended ($p < 0.001$). By percent, natural and suicide DCs were the most frequently amended. The way in which manner of death changed was significantly associated with the amount of time elapsed between DCs ($p = 0.04$). Toxicology was the most common reason for DC amendment.

KEYWORDS: forensic science, death certificate, cause and manner of death, autopsy, amendment

In addition to documenting the fact of death and generating information for statistical analysis, research, and clinical-pathologic correlation, a death certificate (DC) provides a statement of the cause and manner of death (1). Although in some cases they may appear beyond question, both cause and manner of death remain opinions based on the information available at the time of certification. In cases where the cause and manner of death can be reasonably formulated based on facts already known, the DC is often completed immediately after the autopsy or external examination. Inevitably, this practice leads to situations in which information from other sources—toxicology, histology, investigations, medical records—comes to belie the conclusions proffered on the already-issued DC. Furthermore, the subjective nature of cause and manner of death determination invites dispute from third parties, particularly in cases where the conclusions may be personally, socially, or financially damaging. With such dispute may come pressure to change the DC (2). The situation is complicated further by the lack of standard criteria for cause and manner of death certification, particularly in the case of manner of death (3,4).

Despite all of these variables, little is known about how often or why medical examiners and coroners (ME/Cs) amend DCs. Most reviews of death certification have concentrated on the way in which clinicians certify deaths and how their conclusions compared with the findings at autopsy (5–9). The few studies that have focused on ME/Cs either compared external examination to autopsy (10,11) or employed panels of experts to review the “accuracy” of ME/C determinations of cause and manner of death (12–17). Discrepancies were noted in all cases, but information about what, if anything, was done to resolve these discrepancies was not presented.

A greater understanding of DC amendment would benefit both ME/Cs and those parties with whom they interact. Through a review of 6 years of DCs issued and later amended by New Mexico Office of the Medical Investigator (OMI) forensic pathologists, the present study examined why, how, and with what frequency cause and manner of death were changed.

Methods

In June 2003, the OMI computer database was searched for all amended DCs signed by OMI forensic pathologists from 1997 through 2002. Each case file was reviewed in order to identify only those DCs with amended cause and/or manner of death fields. Cases that were initially external examinations and subsequently became autopsies, DCs initially signed out by someone other than an OMI forensic pathologist, “brain only” research-oriented autopsies, and DCs initially signed out as “pending” were excluded from the study.

The original and amended cause of death (COD), the original and amended manner of death (MOD), the time elapsed (TE) between the original and amended DCs, the age of the decedent, and the underlying reason for change were recorded for each qualifying case. Because of the nearly infinite number of possible combinations of toxins, all acute intoxication deaths were grouped together under one cause: “intoxicant(s).” Changing a COD from one combination of toxins to another was considered an amendment. TE was measured in months, and DCs amended within the first month were recorded as “0 months.” The underlying reasons for change were assigned to the following categories: medical records, histology, toxicology, investigations, family concerns, microbiology, and error. “Investigations” included those conducted by external agencies, the OMI’s own investigators, or the forensic pathologists themselves. For convenience of reporting, “family concerns” included family members as well as third parties such as friends, caretakers, or family physicians. “Toxicology” included a few cases where chemistries such as vitreous electrolytes proved important.

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The underlying reason for change was considered to be the factor that initiated the chain of events that led ultimately to the amendment of the DC. For example, if a family member contacted the OMI to question a death signed out as “natural” because the decedent was a heroin abuser, information not known previously, and the pathologist requested a drugs-of-abuse screen, which returned with a positive result, “family concerns” was recorded as the reason the DC was amended. However, if a drug screen was pending when the family member contacted the pathologist, “toxicology” was recorded as the reason for the amendment. In this scenario, the family member’s insight did not change the way in which the case was handled. Rather, the time involved in completing the final toxicology report was the reason for DC amendment.

Statistical analysis was performed using SAS version 8.02 statistical analysis software for Windows and EpiInfo 2002. These included χ^2 tests for homogeneity to determine any association between year and proportion of DCs amended as well as between manner of death and proportion of DCs amended. One-way analysis of variance (ANOVA) was used to compare the mean ages of decedents with amended DCs by reason for change. As TE was not normally distributed, the Kruskal–Wallis test was used to compare mean TE with year, underlying reason for change and direction of change. Results were considered statistically significant when the *p*-value was 0.05 or less, and nonsignificant if the *p*-value was greater than 0.1. *p*-values greater than 0.05 but less than or equal to 0.1 were deemed “marginally significant.”

Results

The database search identified 12,516 cases with DCs signed by OMI forensic pathologists from 1997 to 2002. This total included 9875 full or partial autopsies (henceforth collectively described as “autopsies”) and 2641 dictated external examinations (DEs). Of the total, 739 cases had amended DCs. Records for six of the 739 cases could not be located in the files. Of the remaining 733 cases, 108 had cause and/or manner of death field changes and were included in the study, including 81 autopsies and 27 DEs. Of all OMI cases certified over the 6-year period, 0.86% had DCs that were amended as to cause and/or manner of death, with 0.82% of autopsies and 1.02% of DEs similarly amended. The mean age of the decedents with amended DCs was 46 years (range: 0–96 years; $SD \pm 22$ years).

The DC for one of these 108 cases was amended twice, increasing the total number of amended DCs to 109. Of these 109 DCs, only the COD was changed in 36, only the MOD was changed in 48, and both COD and MOD were changed in 25. In 23 of these last 25 cases, one reason was the impetus behind the change in both COD and MOD; however, in the other two cases, COD and MOD were each changed but for two separate, unrelated reasons. Thus, for analyses related to underlying reason for change, the total number of “events” was 111. For 10 of these cases, the OMI forensic pathologists who signed the original and amended DCs were different.

Cause of Death

Sixty-one of the 109 DCs had COD amendments. Twenty-three different CODs were originally cited on these 61 DCs; the most commonly amended CODs are listed in Table 1. The 15 DCs originally signed-out as ASCVD were subsequently amended as follows: intoxicant(s)—seven; carbon monoxide—two; diabetes mellitus with hyperglycemia, acute pyelonephritis, non-Hodgkin

TABLE 1—Most common cause-of-death-related changes.

Most Commonly Amended from		Most Commonly Amended to	
ASCVD	15	Intoxicant(s)	19
Intoxicant(s)	8	COPD	4
Chronic alcoholism	6	Carbon monoxide	3
Diabetes mellitus	5	Pneumonia	3

lymphoma, aspiration pneumonia, chronic obstructive pulmonary disease, and fracture of pelvis—one each. Twenty-nine different amended CODs were listed on these same 61 DCs (Table 1). The 19 DCs changed to intoxicant(s) were originally signed-out as follows: ASCVD—seven; different intoxicant(s)—six; chronic alcoholism—three; diabetes mellitus, natural gas exposure, and rheumatoid arthritis—one each.

Manner of Death

For all 12,516 cases, “accident” was the most frequent MOD, followed closely by “natural” (Fig. 1). When DEs and autopsies were examined separately, “accident” remained the most common MOD for autopsies, while “natural” was the most common MOD for DEs. Subsequent DC amendment did not change this order (data not shown). By MOD category, the percentage of cases amended was greatest for “natural,” followed by “suicide” (Table 2). This remained true for autopsies alone but reversed for DEs, followed by “natural” deaths. There was a significant association between manner of death and the number of DCs amended ($p < 0.001$). Compared with DCs with “homicide” as the manner of death, “natural” DCs were 16 times more likely, “suicide” DCs 14 times more likely, “accident” DCs 5.4 times more likely, and “undetermined” DCs three times more likely to be amended.

Seventy-two DCs had amended MODs. “Natural” to “accident” (N-A) was the most frequent direction of change, followed by “suicide” to “undetermined” (S-U), N-U, and A-S (Fig. 2). For all 27 DEs with amended CODs and/or MODs, “natural” and “suicide” DCs were significantly more likely to be amended than deaths originally certified as “accident” ($p = 0.0002$ and 0.019 , respectively). Fourteen of the 18 DEs for which MOD was amended were originally signed out as “natural,” including eight cases changed from “natural” to “accident.” For autopsies, N-A again was the most common change in MOD (20 of 54 cases), followed by S-U (13 of 54 cases).

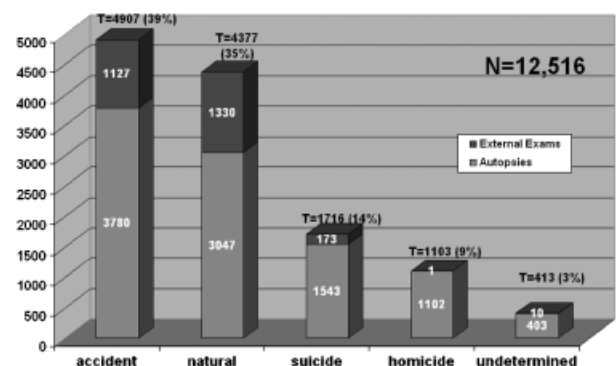


FIG. 1—Manner of death on unamended New Mexico Office of the Medical Investigator death certificates, 1997–2002.

TABLE 2—Percent of cases amended by manner of death category.

Manner of Death	Autopsies Amended (%)	DE Amended (%)	Overall Amended (%)
Natural	1.28	1.65	1.39
Accident	0.58	0.18	0.49
Suicide	1.17	1.73	1.22
Homicide	<0.01	0	<0.01
Undetermined	0.24	0	0.24

DE, dictated external examination.

Underlying Reason for Change

Toxicology was the most common underlying reason for both overall DC amendment and MOD amendment, followed by family concerns and investigations (Figs. 3 and 4). For COD, toxicology and histology were the most common reasons for amendment (Fig. 5). By underlying reason for change, there was no significant association with the mean ages of the decedents ($p = 0.44$).

Of the 40 DCs amended secondary to toxicology, 30 were originally assigned a manner of “natural.” Twenty-eight of these “natural” deaths were changed to a different manner, including 21 from “natural” to “accident.” One case was reassigned a manner of “natural” after the toxicology results demonstrated drugs and ethanol did not contribute to what was originally thought to be an accidental death. The cause of death on five of these 40 DCs was originally one or more intoxicants as identified on a preliminary toxicology report. In three cases, the final toxicology report included more agents than identified on the original DCs, and in two cases, the final toxicology report failed to confirm the presence of agents identified on the original DCs.

Of the 14 cases that changed from “suicide” to “undetermined,” 11 were due to family concerns, with the other three due to investigations. Eighteen cases had MOD changed from “suicide,” 14 of which had family concerns as the underlying reason. Of these 14 cases, 10 involved gunshot wounds of the head, two involved intoxicant(s), and two involved blunt force injuries. Of the 12 cases in which MOD was amended secondary to investigations, nine moved to “undetermined.” Four of the six DCs that changed from “accident” to “suicide” were changed because of error, with all four of these cases receiving an autopsy.

TE

The mean TE between the original and amended DCs was 3.83 months (range: 0–57; SD \pm 6.6). DCs amended secondary to in-

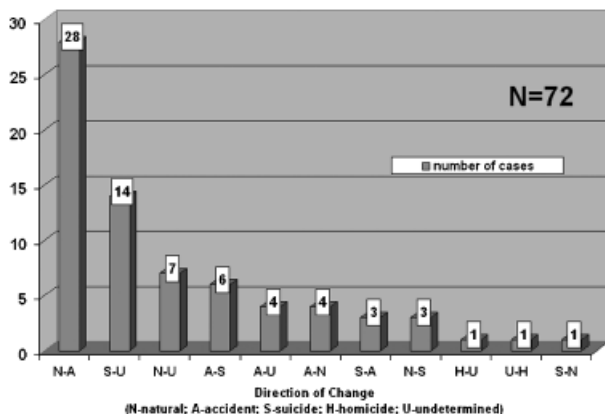


FIG. 2—Changes in manner of death.

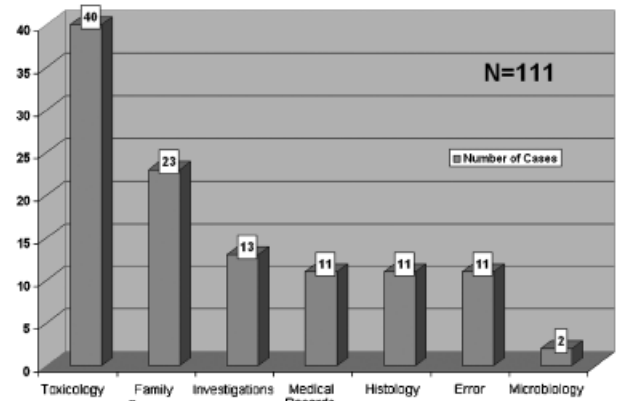


FIG. 3—Underlying reasons for death certificate amendment.

vestigations went the longest between signatures at an average of 8 months (Table 3). Neither year nor the underlying reason for amendment was significantly associated with time to amendment ($p = 0.13$ and 0.39 , respectively). With respect to MOD, the mean time for amending a DC from “accident” to “undetermined” was the greatest (Table 4), but this result was skewed by a case that was amended nearly 5 years after the original DC was issued. The direction of MOD change was significantly associated with TE ($p = 0.04$). The directions most strongly associated with an increasing TE were N-S, U-H, N-U, A-U, S-U, and N-A.

Gunshot Wounds of the Head

Twelve of the 109 DCs had “gunshot wound of head” as the original COD, all but one of which had “suicide” as the original MOD. Eight of these “suicide” MOD cases were subsequently amended to “undetermined,” one was changed to “accident,” one to “natural” and one was left as “suicide.” The case with the unchanged MOD had an amended COD; an error in the location of the injury had been made, and COD was changed to “gunshot wound of chest.” For the 10 remaining suicide “gunshot wound of head” cases, family concerns was the underlying reason for change. The 12th case was originally signed out as “undetermined” and then amended to “homicide” secondary to investigations.

Discussion

The production of an accurate and timely DC complete with a cause and manner of death is one of the most important fruits of

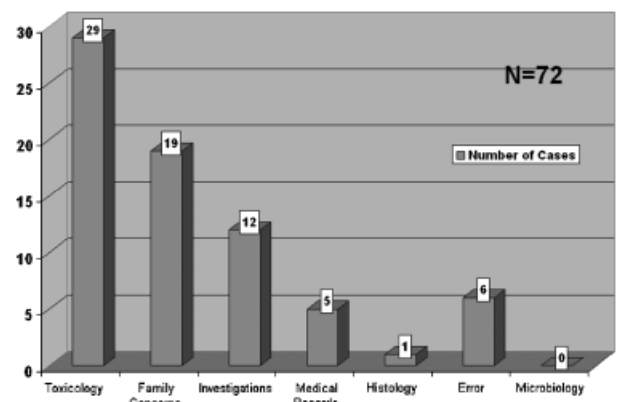


FIG. 4—Underlying reasons for amending manner of death.

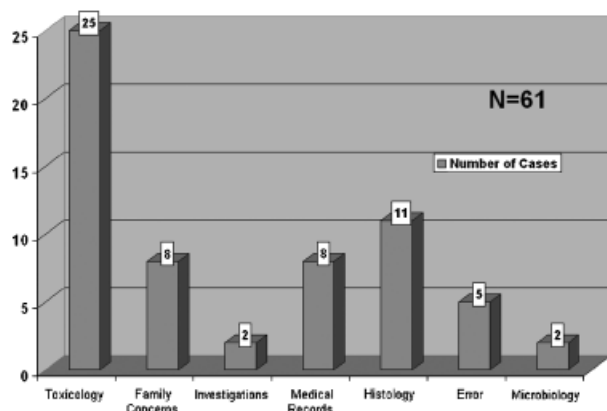


FIG. 5—Underlying reasons for amending cause of death.

the labor of ME/Cs. To this end, ME/Cs utilize a variety of tools, including toxicology, medical records review, investigations, microscopy, and microbiology (10). Each of these studies takes time to complete, sometimes months, and occasionally the results are unexpected. In addition, statements of cause and manner of death are opinions, and the inherent subjectivity involved in the generation of these statements can invite dispute from third parties. With such dispute can come pressure to change the DC (2). The problem is exacerbated by the absence of uniformly accepted definitions for the various manners of death (3,4).

With all of these variables, one might expect that cause and manner of death would have to be amended frequently. However, the present study revealed that over a 6-year period at the OMI, c. 1% of DCs signed by OMI forensic pathologists were amended as to cause and/or manner of death, with external examinations amended slightly more frequently than autopsies. ASCVD was the most commonly amended COD, while intoxicant(s) was the COD to which DCs were most commonly amended. Of all the possible motivations, toxicology was the most common underlying reason for DC amendment. The second most common reason was family concerns, with almost half of these cases involving amending a DC from “suicide” to “undetermined.” In fact, all but three of the cases that were amended from “suicide” to “undetermined” were done so secondary to family concerns.

Almost 75% of the cases amended because of toxicology were “natural” deaths that became “accidents.” This may be due in part to a greater willingness of ME/Cs to hold DCs pending toxicology in cases that appear to be other than “natural.” If a DC was issued only after the completion of toxicology, then it would be unlikely that subsequent amendments due to toxicology will become necessary. Not all cases that come through ME/C offices undergo such screening; this is particularly true for apparently “natural” deaths. Certainly, more amended DCs would be issued if toxicology were performed on every case, particularly those thought to

TABLE 3—Time elapsed between original and amended death certificates by cause.

Reason for Change	Mean Time to Change (months)
Error	1.55
Family concerns	3.27
Histology	4.73
Investigations	8
Medical records	2.82
Microbiology	3
Toxicology	3.74

TABLE 4—Time elapsed (months) between original and amended death certificates by manner.

MOD Change	Mean Time Elapsed	Number of DCs	MOD Change	Mean Time Elapsed	Number of DCs
N-A	4.11	28	S-U	4.14	14
N-N	3.09	23	A-A	1.70	10
N-S	8.3	3	A-N	1.75	4
N-U	3.86	7	A-S	2.50	6
S-A	2.00	3	A-U	15.5	4
S-N	0	1	H-U	1	1
S-S	2	4	U-H	6	1

MOD, manner of death; DC, death certificate; N, natural; A, accident; S, suicide; H, homicide; U, undetermined.

be “natural.” However, performing toxicology on every ME/C case would tax the resources of many offices.

That family concerns about suicide determinations would feature so prominently is not surprising, as suicide as a manner of death is a label that families often seek to avoid for personal, religious, social, or financial reasons. Families challenging a classification of suicide is a situation commonly encountered by ME/Cs (2). Some authors have expressed concern that the desire of some ME/Cs to avoid confrontation with relatives over a “suicide” determination can influence even the original manner of death (13). The fact that most cases amended from “suicide” to “undetermined” secondary to family concerns involved gunshot wounds may be because it is easier to introduce plausible ambiguity into gun-related deaths than into some other methods of suicide. One might also suggest that plausible ambiguity could easily be introduced into deaths secondary to intoxicant(s), as well. However, only two deaths in which manner of death was changed from “suicide” to “undetermined” secondary to family concerns involved intoxicant(s). The reason for this difference is unclear, although a public perception of toxicology being more objective and “scientific” than the interpretation of gunshot wounds may play a role.

A significant association between manner of death and the number of DCs amended was found, with “natural” and “suicide” DCs many times more likely to be amended than “homicide” and “undetermined” DCs. For external examinations, “natural” and “suicide” DCs were also significantly more likely to be amended than “accident” DCs. Because there were very few “suicide” determinations reached after external examination, the more interesting comparison was between “accident” and “natural,” which had comparable case totals, each over 1000. The explanation for the difference in DC amendment between these two manners may be that, in general, the index of suspicion for involvement of intoxicants in apparently “accidental” deaths is much higher than for those initially thought to be “natural.” Because of this, a ME/C may be more likely to hold the DC pending toxicology for cases presumed to be accidents. Of the cases in the present study, 41% of the originally “natural” and none of the originally “accident” external examination DCs were changed secondary to toxicology. However, as there were only two originally “accidental” external examination deaths, the comparison is not statistically reliable.

Those deaths originally ascribed an “undetermined” manner had the second-lowest amendment percentage next to “homicide.” One might suspect that over time more of these “undetermined” deaths would shift to another category; instead, “natural,” “accident,” and “suicide” determinations were two to five times more likely to be amended than were “undetermined” deaths. In a sense, it appears that a ME/C assigns an “undetermined” manner

with greater certainty than any other manner except "homicide"; the ME/C is certain that he or she does not know what happened. Furthermore, more than a third of the DCs on which manner of death was amended became "undetermined," while nine of the 12 cases amended secondary to investigations were changed to "undetermined." Rather than clarifying matters, occasionally time and new information complicate cases, leaving a position on a more specific manner of death no longer tenable.

The way in which manner of death changed was significantly associated with increasing length of time between the production of the original and the amended DCs, while year and reason for amendment were not. The TE between DCs was longest for cases that were changed to "undetermined," from "natural" to "suicide" or "accident," and from "undetermined" to "homicide." Most of the cases that were changed to "suicide" or "accident" were done so after toxicology was completed, a process that can take weeks or months. It is also understandable that changing a manner to "undetermined" would take more time than other directions of change, in large measure because of the nature of these cases and the impetus for change. Most of the cases that were changed to "undetermined" were complicated, and involved either concerns raised by the family or new information uncovered by investigators. Reluctance to change a manner of death to "undetermined" may also contribute to the longer time taken to amend a DC to "undetermined."

None of the case files associated with these amended DCs contained any reference to legal action—threatened, perceived, or actual—playing any role in the decision to review and ultimately to amend the DC. This finding is remarkable in light of the fact that in one survey, up to 40% of ME/Cs reported that they have been at least threatened with a lawsuit over a manner of death determination, and 9% reported actually being sued on at least one occasion (2). In addition, a review of lawsuits against ME/Cs arising from DCs (18) suggested that such legal action may be on the rise. If some of the cases amended secondary to "family concerns" involved threats of legal action, these threats were not documented. One might suspect that legal action related to death certification was at least threatened if not undertaken over some of the nearly 13,000 cases handled at OMI over the 6-year study period, but such disputes must have been resolved by means that did not result in an amended cause or manner of death.

The present study has several limitations, some of which point to future directions for additional work in this area. Missing from the current study was the number of DCs for which the cause and/or manner of death was reconsidered but ultimately left unchanged. This information could not be captured in the database search, and a lack of resources and reliable documentation precluded any attempt to gather this information by case file review. Another limitation was the small number of amended cases. Of nearly 13,000 cases captured in the study period, only 108 had cause and/or manner of death amendments. While this small number may be admirable, such a paucity of cases does little to facilitate statistical analysis. This was compounded by the variety of causes of death cited in these cases. More informative data analysis could be performed on the relatively tidy categories of manner of death and reason for change. However, the lack of areas ripe for meaningful statistical analysis should not detract from the data, which remain novel and informative.

Another potential limitation of the study is that for 10 of the cases, different forensic pathologists signed the original and amended DCs, respectively. No attempt was made to analyze these cases separately. While it is well known that different pathologists handling the same case may certify death differently (2–

4), this potentially confounding effect was minimized in these instances. For most of the 10 cases in question, the changes were made after consultation with the original forensic pathologist. In addition, two of the cases were amended by a forensic pathologist who performed the autopsy as a pathology resident and later inherited the cases from the original attending pathologist.

The TE from the date of the autopsy or external examination to the date on the original DC was also not recorded. Comparing this information for both amended and nonamended cases would likely shed light on whether delaying death certification reduces the number of amended DCs. Finally, an analysis of the characteristics of the cases amended from "natural" to another manner of death secondary to toxicology was not performed. Such an analysis may provide ME/Cs with useful criteria for selecting which seemingly "natural" deaths should not be certified before the completion of toxicology studies.

In conclusion, this 6-year retrospective analysis of DCs completed by OMI forensic pathologists found that *c.* 1% of DCs were amended as to cause and/or manner of death. Arteriosclerotic cardiovascular disease was the most commonly amended cause of death, whereas intoxicant(s) was the cause of death to which certificates were most often amended. There was a significant association between manner of death and amendment, with "natural" and "suicide" more likely to be amended than "homicide" or "undetermined." For more than a third of the amended DCs, manner of death was changed to "undetermined," and three quarters of DCs amended secondary to investigations were changed to "undetermined." Manner of death was significantly associated with increasing TE between original and amended DCs, with "undetermined," "suicide," and "accident" cases taking the longest to amend. Toxicology and family concerns were the most common underlying reasons for DC amendment. The manner of death for almost three quarters of the cases amended secondary to toxicology changed from "natural" to "accident." Eleven of 14 DCs that were changed from "suicide" to "undetermined" were done so after the family expressed concern about the way in which the manner of death was certified. Most of the cases amended to a manner of "undetermined" involved gunshot wounds of the head.

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