

Comparison of the Victorian Audit of Surgical Mortality with coronial cause of death

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Key words

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Abstract

Background: The Victorian Audit of Surgical Mortality (VASM) is designed to improve the level of patient care by educating surgeons of areas for improvement in patient management during a surgical admission. Coronial data obtained via the National Coronial Information System were used as an independent method to validate the cause of death as determined by the treating surgeon.

Method: The audit prospectively collected 4905 cases that underwent peer assessment and 842 (17%) received an in-depth second-line assessment of which 200 (24%) also underwent a coronial review. Using the coronial assessment as the reference standard, retrospective comparison of coronial diagnoses compared with the audit case outcomes was conducted to determine the overall accuracy of the stated cause of death. The degree of agreement was also analysed based on whether the patient received a full autopsy (internal examination) or an external examination only. The time taken to obtain the coronial and audit case closure was also analysed.

Results: Overall, 195 of the 200 cases had a cause of death identified by the coroner. In 82%, the cause of death reported to VASM by the treating surgeon matched the cause of death determined by the coroner. Concordance was not affected by the extent of post-mortem performed. Time taken to finalize cases was slightly shorter for the coronial process, but unclosed coronial findings resulted in the exclusion of 103 cases.

Conclusion: The causes of death data in VASM are accurate when compared with the coronial data independent of whether the coronial investigation included a complete autopsy.

Introduction

The Victorian Audit of Surgical Mortality (VASM) is a single-blinded peer review audit designed to highlight adverse trends and system and process errors that may affect the delivery of safe and effective surgical care. VASM is part of the Australian and New Zealand Audit of Surgical Mortality, which comprises a network of regionally based audits of surgical mortality. In order to ensure that the peer-review process remains an accurate assessment, it is important to verify its findings against an external independent investigative body. This verification allows stakeholders in the VASM to maintain confidence in the findings it presents, the efficiency of the peer review assessment and the effect these findings have on driving health policy. The Victorian Coronial data obtained via the National Coronial Information System (NCIS) database allows comparison of its findings with the cases collected by VASM. Coronial reports can be considered an independent, gold standard against which key

findings of case reports and assessments might be examined and compared with the VASM peer-review assessment reports. The treating surgeon nominates a cause of death and it was thus hypothesized that the VASM cause of death data would match the NCIS data.

The coronial reports aid VASM assessors to further investigate cases that require an in-depth specialist surgical peer review assessment where an area of concern or adverse event is identified during the audit process. The role of the coroner is to examine the root cause of death drawing any relevant systemic lessons from the death and to implement recommendations aimed at preventing future deaths. Mortalities are reportable to the Coroner's Court of Victoria when one or more of the following criteria are met: where the deceased was held in care or custody or in the process of being detained, admitted or committed to an assessment centre for treatment or was a mental health patient; where the death appeared to have been unexpected, unnatural or violent or to have resulted directly or indirectly from accident or injury; where the person's identity was

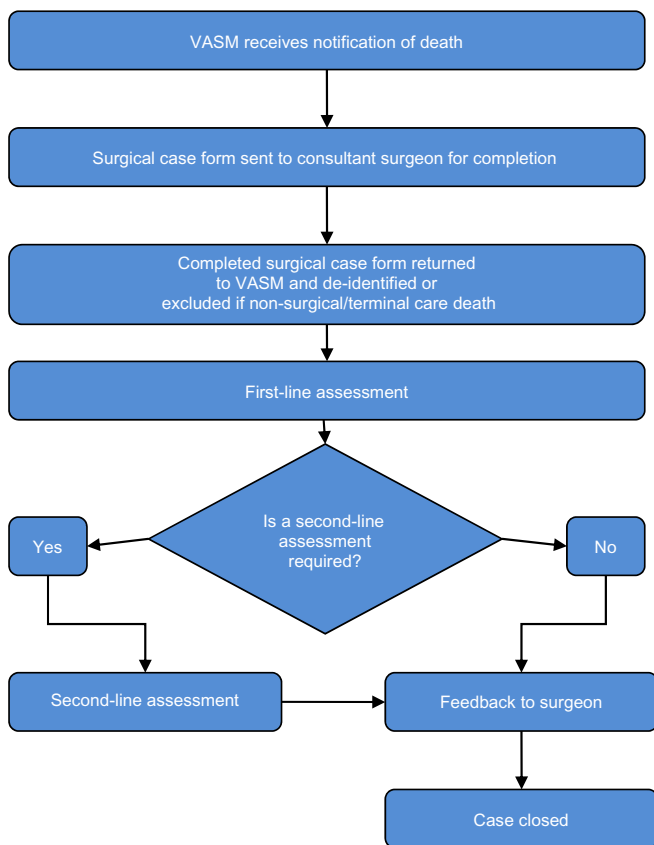


Fig. 1. The Victorian Audit of Surgical Mortality (VASM) audit process.

unknown; where the death occurred during a medical procedure or following a medical procedure which was causally linked to the death and a medical practitioner would not immediately before the procedure was undertaken, have reasonably expected the death.¹

VASM investigates mortalities that occur while a patient was under the care of a surgeon, within 30 days of a surgical procedure being performed, or if the death occurred during the hospital admission in which a procedure was performed. The VASM audit process comprises two levels of peer review: first-line assessment (FLA) and second-line assessment (SLA). The VASM methodology is shown in Figure 1. All cases that meet VASM inclusion criteria undergo FLA, which consists of an assessor reviewing the case information provided by the treating surgeon on a standardized surgical case form. The first-line assessor can close the case or can recommend it undergo SLA, which involves a review of the patient's de-identified case notes. A SLA may be recommended due to the unexpected death of a patient, a lack of information on the surgical case form or the belief that errors have been made that contributed to the patient's death.²

The cause of death in VASM is that nominated by the treating surgeon, taking into account all information available at the time of completing the form, including a post-mortem, if performed by the coroner or the hospital. It is expected that treating surgeons who utilize post-mortem reports when completing VASM forms would be able to supply a more accurate cause of death. This study was conducted in order to assess the accuracy of the treating surgeon's

diagnosis with the findings of the coroner with a subanalysis of the accuracy of the concordance whether or not a full internal autopsy was performed by the coroner.

Method

Study design

This study is a retrospective observational study. Cases were identified that had been subject to both a VASM SLA and coronial review. An overall percentage of agreement was used to reflect the degree of concordance between VASM and the coroner as to the cause of death. This was calculated by ascertaining the total number of cases in which the listed cause of death was the same for both VASM and the coroner, compared with the total number of cases reviewed by both VASM and the coroner. Due to qualified privilege legislation and privacy constraints, the VASM clinical director compared the datasets to determine whether the cause of death identified by the treating surgeon in the VASM data matched the cause of death identified by the coroner. The two fields 'surgical diagnosis' and 'cause of death' were used to establish the cause of death by the treating surgeon submitted in the returned data forms. The coroner's autopsy reports were obtained from the NCIS database and the cause of death as determined by the coroner was extracted, along with the finding from the inquest. Some coroner cases were associated in their database with more than one cause of death field completed and therefore any field that contained the VASM cause of death was considered a match.

All cases that completed the full audit process from VASM's inception in 2007 until 7 August 2014 were compared with cases that had a completed review by the Coroner's Court of Victoria, irrespective of whether the case was subjected to a full autopsy or not. The cases were divided into two groups based on the extent of the post-mortem examination. The first group comprised cases in which a full internal examination of the body was performed, while the second group consisted of cases in which an external inspection was performed supplemented by a computed tomography (CT) scan of the body. The Fisher's exact test was used to analyse the agreement between the VASM and coronial review for cause of death in cases where the coroner performed either an internal examination or external examination without full autopsy. The Mann-Whitney test was used to analyse the difference in the time taken to finalize cases by both organizations. To test concordance further, potential bias was assessed in cases where the treating surgeon had access to the coronial report and these were excluded from the analysis.

Data sources

Two different data sources were utilized: the Bi-national Audit System used by VASM and the NCIS database, which contains coronial data from cases reported to Australian and New Zealand coroners. Ethics committee approval for the use of the NCIS data was granted by the Justice Human Research Ethics Committee. Cases investigated by both VASM and the Victorian Coroner were identified by a comparison of the two datasets as they existed on 16 September 2014.

The dataset from VASM included all closed cases that underwent the full SLA peer-review process from 1 January 2007 to 7 August

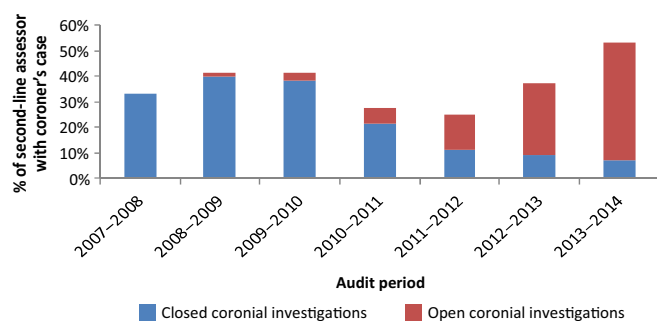


Fig. 2. Victorian Audit of Surgical Mortality second-line assessments with a coronial investigation.

2014 as these contained more detailed information and had another clinician's review based upon scrutiny of the patient records from the treating hospital. The coroner's autopsy reports were obtained from the NCIS database and the cause of death as determined by the coroner was extracted, along with the finding from the inquest.

Results

Fifty-seven per cent of the mortalities reported to VASM (4905 of the 8645) had completed the peer-review process. Of these, only 17% (842) were deemed necessary to undergo a SLA review for an in-depth investigation. Comparison of the datasets showed that the coroner had performed an investigation for 36% of the cases (303 of the 842) that had undergone a VASM SLA. Figure 2 shows the changes in coronial reporting compared to VASM SLAs, which has reduced over time. In total, 24% of cases (200 of the 842) were eligible for comparison, having a closed coroner's investigation with both autopsy (internal or external) and coroner's reports available. The coroner indicated that the cause of death was 'unascertained' in five cases and these were excluded from the analysis as no comparison was possible. The average length of time for the VASM to complete the full audit process was 13.9 months (standard deviation (SD) 10.1) for the SLA cases that were eligible for comparison in this review. The average length of time from the date of the patient's death to the conclusion of the coronial investigation was 11.1 months (SD 11.8). The shorter time taken to finalize the same cases by both bodies was significant in favour of the coroner ($P = <0.001$). The coronial investigation was still open in 103 cases, which were excluded from the analysis. For these open cases, the average time between the date of the patient's death and the date on which the NCIS database was searched was 24.7 months (SD 14.5), reflecting the significant period of time for the coroner to process a sizeable proportion of potentially eligible cases. The cause of death reported to VASM by the treating surgeon and the cause of death identified by the coroner matched in 82% of cases (160 of the 195). There were 35 cases for which no match was found based on the cause of death information provided by the treating surgeon. However, in nine of the 35 cases, the cause of death identified by the second-line assessor was the same as that identified by the coroner. With the inclusion of the nine cases, the cause of death identified by VASM matched that of the coroner in 87% of cases (169 of the 195) but as the focus of

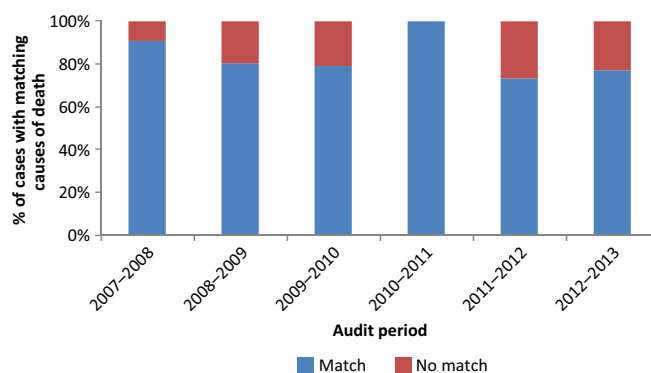


Fig. 3. Cases with matching causes of death by financial year.

this study is the accuracy of the cause of death identified by the treating surgeon, these nine cases do not form part of the following analyses.

The percentage of cases with a matching cause of death is shown by financial year of death in Figure 3. The 2013–2014 period was excluded as it contained only four cases. The coroner performed an internal examination of the body in 44% of the cases (85 of the 195). Cases where an internal examination was performed had a lower match rate of 79% (67 of the 85) than the 85% match where no internal examination occurred (93 of the 110). This difference did not reach statistical significance ($P = 0.349$).

The treating surgeons indicated awareness of a post-mortem being performed in only 58% of cases (116 of the 200). In 16% (18) of these cases, the treating surgeon indicated that they had read the post-mortem report and, as would be expected, there was concordance in all 18 cases in terms of the cause of death. Excluding these 18 cases does not significantly reduce either the accuracy of the comparison between diagnosis and type of post-mortem examination ($P = 0.343$) or overall concordance (80% versus 82%; $P = 0.691$).

Discussion

VASM and the Victorian Coroner both aim to improve public health and safety by way of investigation of mortality.^{3–9} However, it is important to note that their different approaches result in different patient populations, as evident by the relatively small crossover population available for this study. Nonetheless, the analysis of the crossover population allows for the examination of the reliability of the cause of death data reported to VASM by the treating surgeon independent of the results of the post-mortem examination in the vast majority of cases. This therefore validates a reliable, accurate and unbiased peer-reviewed process.

Decreasing rates of hospital post-mortems is a well-documented trend.^{9,10} This is undesirable as autopsies make important contributions in providing information to medical staff, the bereaved as well as to the society.^{8,10,11} However, coronial post-mortem rates are increasing.^{11,12} In only 58% of VASM cases was the treating surgeon aware that a post-mortem had been performed and in only 16% of these cases did the surgeon read the report before completing the

VASM form as there can be considerable passage of time before the availability of the coronial reports. In nine of the 35 cases in which the cause of death identified by the treating surgeon did not match the coronial finding, the second-line assessor was able to correctly identify the cause of death. Although the VASM SLA process does not specifically require the second-line assessor to determine a cause of death, this information had been provided by the assessor. The initial concordance analysis including these nine cases demonstrates that the entire VASM process accurately identified the cause of death in 87% of cases. A limitation of this study is the potential for bias because the VASM Clinical Director performed a non-blinded analysis of the concordance. This has to be performed by a clinician and because of the strict quality privilege legislation covering VASM processes, there was no alternative clinical staff available to do the comparison apart from the Clinical Director.

In 2013–2014, 46% of all cases admitted to the Victorian Institute of Forensic Medicine had external inspection performed without full autopsy. All bodies are subjected to a CT scan and review of clinical documentation (where available) as part of the admission process.¹² Cause of death concordance is high regardless of whether a full post-mortem examination was performed and gives credence to the idea referred to by some that non-invasive investigations such as systematic review of case notes with a presumptive cause of death diagnosis could be used to offset the dwindling number of autopsies being performed.^{13,14} The current analysis validated the VASM in correctly identifying the cause of death as stated by the treating surgeon distinct from the coronial process. The FLA and SLA peer-review process allows further verification of potential adverse events surrounding the patient's death.

The average length of time from the date of the patient's death to the date of case closure was similar for both organizations but slightly shorter for the coroner's cases. Current literature suggests that for the more complex coronial cases, which include the formulation of recommendations, the average length of time taken to close a case is much higher.⁴ This is supported by the current study, which found that at the time of the dataset comparison, 34% of the crossover cases had not been closed by the coroner. On average, these 103 open cases had been pending for a period of 24.7 months at the time of the comparison. While the population in the Sutherland paper is different to that of this paper, Figure 2 does demonstrate a delay in the closing of coronial investigations, showing a smaller number of closed coronial cases in later audit periods. This experience has been shared in the Western Australian Audit of Surgical Mortality.¹⁵

The methodology used was in keeping with the previous methodology in applying scrutiny of medical records by clinicians to compare causes of death with death certificate records.^{16,17} Studies that have examined comparisons between the clinically estimated cause of death and what appears on the death certificate may be flawed because of failure to adequately explain the methodology that allows reproducibility of the study.¹⁸ The current study is unique in that it compares the diagnosis of a peer-reviewed mortality audit confined to deaths occurring under the care of a surgeon with coronial findings to allow a measure of validation of the audit. This is in addition to a previous external evaluation of the VASM by an independent body which concluded that it was a robust and mature process.¹⁹

Conclusion

The cause of death identified by the coroner's office and by VASM has shown a high degree of concordance when the coronial diagnosis is used as the gold standard. One limitation of the analysis is that the two types of reviews have different purposes and should be considered complementary rather than parallel assessment tools in order to avoid erroneous interpretations. Furthermore, the limitations imposed by the qualified privilege status of the audit meant that the VASM Clinical Director was the only clinician able to compare the cause of death data. In combination, the two types of inquiries add a valuable source of professional scrutiny to validate quality assurance activity data. This will improve the confidence of stakeholders in the audit by validating the VASM diagnosis of cause of death. This article clearly demonstrates that coronial data provide independent verification of VASM data, even when a full internal post-mortem examination has not been performed.

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