ORIGINAL ARTICLE

ANZJSurg.com

Surgical mortality audit data validity

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Key words
clinical audit, mortality, surgery, validation.

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Accepted for publication 16 November 2015.

doi: 10.1111/ans.13416

Abstract

Background: Surgical audits provide constructive feedback to individual surgeons, hospitals and other healthcare sector professionals. Audits identify deficiencies in treatment processes, evaluate practice trends and detect practice gaps. The credibility and validity of the Queensland Audit of Surgical Mortality (QASM) relies on the accuracy of its data.

Methods: To determine the validity of routine reporting of surgical information to QASM, surgical case forms were compared against medical records (considered the gold standard). Data were extracted by a trained medical research assistant. QASM forensically reviewed 896 of a total of 5636 deaths in 20 Queensland public hospitals between 2008 and 2013. Concordance between the surgical case form and the relevant medical record was determined for 27 objective items.

Results: Overall concordance was 98.2%. The median concordance was 100% (interquartile range 87–100%). Cases with discordance were few and in these, most had only one discordant item. Discordances were mainly omissions.

Conclusion: The QASM surgical case form is a reliable data collection tool that provides high-quality data. QASM objective data can be confidently regarded as accurate and therefore reliable for use in publications, reports and case studies.

Introduction

Surgical audits are an important strategy used in health care to maintain quality standards and to improve surgical care delivery.[1–7] Audits provide a means to identify deficiencies and gaps in practice, evaluate practice trends and provide constructive feedback to surgeons and others working in the healthcare sector.[5,8] The validity of any audit relies on the accuracy of their data.[9,10] For this reason, formal evaluation may be performed to determine data accuracy compared with a gold standard.[5] Studies evaluating the quality of audit data in the United States,[7,11] New Zealand[12] and Canada[13] compared administrative audit data against medical records, which were treated as the gold standard.

The Royal Australasian College of Surgeons conducts the Australian and New Zealand Audit of Surgical Mortality (ANZASM), a nationwide audit of surgical mortality. Each Australian State and Territory has its own independent external peer-reviewed audit.[14] Central to all the audits within ANZASM is the standard surgical case form. Surgeons' accurate recording of data on the form is vital for the reliability of the audit data for its further use.

The aim of this study was to investigate the concordance between the Queensland Audit of Surgical Mortality (QASM) audit data, as recorded by surgeons with hospital medical record data.

Methods

Audit process

QASM is a protected quality assurance activity under Part VC of the *Health Insurance Act 1973* (gazetted August 2011). It commenced in July 2007 and is supported by the Queensland Department of Health. In Queensland, it is a declared quality improvement committee under the Hospital and Health Boards Act 2011 and the Regulation 2012. All deaths occurring in-hospital where the patient was under the care of a surgeon at the time of death are reported by the hospital to QASM. Reporting is independent of the surgeons to eliminate

possible reporting bias. The audit methodology and governance have previously been reported.[14]

Audit data are systematically collected using a standard surgical case form which was designed by surgeons. Sixteen questions on the form record objective information and 13 record subjective opinions. The objective aspects of perioperative care include patient characteristics, diagnosis and treatment information. The majority of forms are completed by the treating surgeon and some are completed by surgical trainees and registrars.[15]

Every case reported to QASM is assessed by a first-line reviewer after de-identification. First-line reviewers may request further investigation, due to lack of information on the surgical case form or when an area of care requires clarification. Approximately, 14% proceed to a more forensic assessment by second-line reviewers.[15] First-line reviewers rely on information in the form to determine if appropriate care was provided to the patient, while second-line reviewers have access to the patients' medical records. Due to limited resources, only cases forwarded to second-line review, for which the corresponding medical records were available, were selected for this study.

Concordance process

The concordance between data extracted during an independent assessment of medical records was compared with objective data contained within the surgical case forms. The medical records were considered to be the gold standard. The medical records were selected from the available medical records of surgical deaths included in QASM between 2008 and 2013. The surgical case form corresponding to each selected case was identified. One author (RS), a trained research assistant (a medical professional), extracted the relevant data from the medical records and forms. Details in the medical records were compared with the forms. Agreement or disagreement for each item was recorded, as were anomalies in the cases (e.g. when answers on the form were illegible). Concordance between medical records and surgical case forms was calculated for the 16 objective questions and their sub-questions (total of 27 items). For post-operative complications, concordance was considered positive if the item was answered that complications had occurred, even if they were not all described. Concordance is expressed as percentages with 95% binomial confidence intervals. Data were analysed with SPSS version 19 (IBM, Armonk, NY, USA).

Results

Between 2008 and 2013 there were approximately 1 million surgical episodes of care in public hospitals in Queensland, Australia. During this period QASM was notified of 5636 deaths from 20 public hospitals (an approximate mortality of ~0.57%). Of the notified deaths 896 had undergone a second-line review. The 100 cases included in the concordance study are 11% (100/896) of cases that had undergone second-line review. They represent 2% (100/5636) of all QASM cases.

The average concordance was 98.2% (2651/2700). There were 67 cases with complete concordance, 26 cases differed on one item, six cases on two items and one case on four items. Items most commonly discordant were definable post-operative complications, co-existing risk factors increasing the risk of death and the descriptions of operations (Table 1). The most common class of discordance on the surgical case form was that of omission. There were 13 omissions in the item of post-operative complications in the 100 cases.

Medical complications were omitted more frequently ($n = 12$) than surgical complications ($n = 7$). These included pneumonia ($n = 4$) and fluid balance ($n = 4$). Other omitted surgical complications included successfully controlled surgical site haemorrhage, surgical site haematoma and ileus.

Not all co-existing risk factors that 'increased the risk of death' were recorded, especially cardiovascular disease, diabetes and chronic kidney disease. The wrong information was given for one patient and in two instances this item was unanswered.

When multiple teams were involved in patient care, not all procedures were recorded. Notable omissions included endoscopic retrograde cholangiopancreatography, below knee amputation and laparoscopic cholecystectomy. One omitted surgery had been reported in the free-form text that described the course to death. A separate but important finding was incomplete or missing operation reports in some medical records.

Discussion

The overall agreement between the QASM surgical case forms and hospital medical record data were high (98.2% concordance) with 67% of cases in full agreement. In the majority of the remainder, discordance was observed in only one question. This demonstrates high data reliability in surgeons' reports to the audit. QASM data are used in a wide range of applications including reports to surgeons, individual hospitals, state health departments and academic research. These reports are then used by many sources and are expected to be a reliable reflection of surgical conditions in Australia based on accurate data. The high agreement observed in this study confirms that the data underlying publications emanating from QASM are accurate, reliable and robust.

The lack of recording of co-existing risk factors, complications and operations on the surgical case forms is not unique to this audit.[16] Published literature notes that pre-existing conditions are documented only when they assist clinicians in making clinical care decisions[17] or when they are judged to be important.[18,19] Reporting of different complications of treatment may also be based on the surgeon's judgment of severity or relevance, and surgeons' opinions may differ.[20] It would appear from our study that surgeons responsible for completing the data may omit procedures that were performed by other surgical specialties.

This study represents successful internal validation of QASM data. The concordance obtained (98.2%) was higher than that published by Xian *et al*.[7] (90%) and Magee *et al*.[10] (94.9%). Xian *et al*. used the same methodology as this study but Magee *et al*. used a different methodology (double extraction) although the sample size was larger.

Three earlier studies used re-abstracted medical record data as a gold standard to assess the validity of data contained in the New Zealand Cancer Registry,[12] the Paul Coverdell National Acute Stroke Registry[11] and the Canadian Niday Perinatal Database.[13] Their find-

Table 1 Concordance for individual items between the form and medical records (n = 100)

Items	Percentage concordance	(95% CI)	Differences
Patient age	98	(93, 100)	2
Patient sex	99	(95, 100)	1
Was the patient admitted by surgeon?	100	(96, 100)	0
Aboriginal/Torres Strait Islander descent	95	(89, 98)	5
Admission type	100	(96, 100)	0
Hospital status (public/private)	100	(96, 100)	0
Main surgical diagnosis on admission	96	(90, 99)	4
Confirmed main surgical diagnosis	99	(95, 100)	1
Final cause of death	96	(90, 99)	4
Was malignancy present, even if not the main diagnosis?	99	(95, 100)	1
Nature of the malignancy, if present?	99	(95, 100)	1
Were co-existing risk factors present, increasing the risk of death?	94	(87, 98)	6
Was the patient transferred pre-op?	98	(93, 100)	2
Was the patient treated in ICU or HDU?	100	(96, 100)	0
Was an operation performed within the last 30 days or during the last admission?	100	(96, 100)	0
Description of operations performed	94	(87, 98)	6
Timing of operation (immediate/emergency/scheduled emergency)	100	(96, 100)	0
Was an anaesthetist present at the operation?	100	(96, 100)	0
Was the operation abandoned on finding a terminal situation?	99	(95, 100)	1
Was there a definable post-operative complication?	87	(79, 93)	13
Was there an unplanned return to theatre?	100	(96, 100)	0
Was there an unplanned admission to the CCU?	100	(96, 100)	0
Was there an unplanned readmission within 30 days of surgery?	100	(96, 100)	0
Was fluid balance an issue in this case?	98	(93, 100)	2
Was there an issue with communication at any stage?	100	(96, 100)	0
Did the patient die of a clinically significant infection?	100	(96, 100)	0
Was trauma involved? (fall/road traffic accident/violence?)	100	(96, 100)	0

CI, confidence interval; HDU, high dependency unit; ICU, intensive care unit.

ings suggested excellent reliability of the methodology. Areas identified that lead to disagreement included clarity of information,[12,13] inaccurate documentation[11,13] and human error.[13] Omission in QASM surgical case forms could be reduced if items were more clearly defined or if use of the electronic surgical case form was made mandatory.

The strengths of this study include the high number of cases reviewed and the independent review by a medically trained researcher. The majority of data collection and recording on the form were carried out by the treating surgeon. Because surgeons are the key source of information, it can be considered that the information in the form is at the level of expert data.

One limitation is that the use of medical records is taken to represent the gold standard. We assumed that medical record information was complete and accurate but found incomplete data in some medical records. Identifying and quantifying inconsistencies recorded in the medical records were beyond the scope of this study. Confounding may be present, as surgical complications rarely occur in isolation. Anonymity in the audit process does reduce but never eliminates reporting bias.

To improve data collection in QASM, data could be downloaded directly from the health department files into the form for items that do not require surgical judgement (i.e. age, gender, operation date and time and surgical procedures). The surgeons and assessors could then limit their reporting to areas that require surgical judgment. This is the most efficient use of surgical resources and should be considered in the future. Until this is available, we recommend that surgeons review the patients' charts as they complete the QASM forms, especially for the three areas identified with most omissions.

The concordance obtained in this study may be generalizable to all the ANZASM audits. The same standard surgical case form is used by all the states and territories for data collection. A nationwide concordance study conducted in a similar fashion would confirm this.

Conclusion

The high degree of concordance between the 100 surgical case forms and medical records indicates that the QASM surgical case form is a reliable data collection tool. It provides surgeons who assess QASM cases with high-quality information upon which they decide whether the case should progress to a second-line assessment. It also provides users of QASM data with accurate data to underpin publications, reports and case studies using QASM data. To complete the picture, this work needs to be extended to testing the validation of the subjective sections of the surgical case assessments.

Acknowledgements

The authors acknowledge Associate Professor Wendy Babidge for her valued input during the preparation of this manuscript. The authors appreciate the feedback provided by the audit managers of the other states and territories.

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