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Outcomes of completed quality activities in an Australian tertiary hospital 2015-2019

Abstract

Background: Quality activities including quality assurance (QA) and quality improvement (QI) are an integral part of safety and quality (S&Q) governance for hospitals. Previous studies identified that (1) majority are for QA and knowledge-acquiring purposes; (2) adherence to the quality cycle as well as impact on patient-related outcomes at the hospital level are unclear, neither associated costs.

This study aims to (1) assess adherence to quality cycle for quality activities in a large Australian tertiary hospital; (2) report outcomes of quality activities at the hospital level, including impact on patient-related outcomes measured by the occurrence of hospital acquired complications (HACs); and (3) estimate time and costs for data collection.

Methods: This quantitative study utilised three data sources. First, the hospital's electronic quality management system Governance, Evidence, Knowledge and Outcome (GEKO) that identifies completed quality activities over a five-year period; second is Tableau dashboards for HAC performance; third Microsoft Teams Forms used to capture time of data collection for bedside observations and retrospective notes reviews. Median sample size and median hourly rates in 2018 were used for calculations.

Results: A total of 1,768 quality activities were completed over a five-year period representing an average of 353 per year, of which 87.8% were initiated by clinicians, 12.2% planned and coordinated by S&Q or equivalent. Activity reports indicated that less than a fifth (17.1%) brought about improvement in process measures and only 7.1% improved outcome measures. Two thirds of quality activities (66.3%) provided recommendations based on their findings, but evidence of action plan was available in 14.1% of the reports only. No association was found between number of activities completed and hospital's overall HAC performance.

Retrospective data collection (64.7%) was common. Estimated time and cost for data collection averaged at 3,490 hours per year, equivalent to 1.8 full-time employees, for a cost of $171,000 at nursing rate, $280,000 at medical rate, and $200,000 at the Health Service Union rate.

Conclusion: Most quality activities were clinician-initiated. Implementing change, achieving and sustaining improvement were the two challenging stages in the quality cycle. No clear association between activities completed and improvement in patient-related outcomes were observed although some improvement in processes. A paradigm shift may be needed to engineer quality activities in hospitals to be more outcome oriented. Opportunities exist for hospitals to consider how quality activities can be organised to maximise returns from investment.

Key words: quality activity, hospital, improvement, outcome

Introduction

Quality activities are an integral part of safety and quality (S&Q) governance in hospitals, including quality assurance (QA) for compliance monitoring and quality improvement (QI) to bring about changes in practice. A study undertaken by Li et al. (1) identified that QA in the form of clinical audits accounted for 86.9% of quality activities in a large Australian tertiary hospital. It is believed that if utilised appropriately, such activities will produce change and catalyse internal QI by becoming a continuous cyclical process which is embedded in clinical practice (2, 3). However, studies have shown that implementation of suggested improvements from clinical audits often fails to close the quality gap they exposed (4-6). For example, studies by Hamskamp-Sebregts et. al (4, 5) found that only 21% of intended improvement actions from internal auditing within eight departments of a university medical centre in the Netherlands were implemented at 15 months, 79% partially implemented or not implemented, without confirmed effect on reducing adverse outcomes. Partially responsible to this phenomenon is the focus on data collection and analysis without a well-developed approach to the action section of the quality cycle (6, 7). Cost of time and effort involved in data collection for such activities is considered to be high (8), but values are not defined. Infrequent inclusion of outcome measure in activity planning is another area that requires attention for the need of value-based healthcare, efficient resource allocation and the increasing focus by healthcare policy makers and providers to improve patient-related outcomes (9, 10). Comparison with agreed standards is at its core of clinical audit therefore a focus on process measures (11), resulting in less frequent reporting of impact on patient-related outcomes. Some national audits on specific disease management such as hip fracture and lung cancer have outcome measures (30-day mortality rate) included and reported (3, 12). However, there is paucity of information in the literature regarding outcomes of quality activities at the hospital level. Evaluations on programmes such as accreditation suggest paradoxical results regarding impact on patient-related outcomes (13, 14). This presents a gap in understanding the purpose of S&Q governance in preventing patient harms and reducing variation in care. For example, at least a third of hospital-acquired complications

(HACs), a group of 16 agreed high-priority conditions, are considered as preventable (15), yet continue to occur at 2.0 per 100 separations in Australian public hospitals, with an average length of stay four times higher than hospitalisations without a HAC (16). Those complications are estimated to cost the Australian public health sector $4.1 billion or 8.9% of total hospital expenditure in 2017-18 financial year (17).

Studies have shown that improving patient-related outcomes is achievable through targeted interventions. For example, the Keystone Intensive Care Unit Project reduced the annual mean rate of central line-associated bloodstream infection (CLABSI) from 2.5 infections per 1,000 catheter-days in 2004 to 0.76 in 2013 (18). However, aggregated effect of quality activities on patient-related outcomes at the hospital level is unclear, especially in the Australian context. Considering the aforementioned gaps in knowledge, the aim of this study is to (1) assess adherence to the quality cycle for quality activities in a large Australian tertiary hospital; (2) reported outcomes of completed activities at the hospital level, including impact on the occurrence of HACs which represent a set of patient-related outcomes (15), and (3) estimate the time and costs for data collection. This information may enable hospitals to explore a value-based approach to investing in quality activities in a resource-constrained context.

Methods

Data source

This quantitative study utilised three data sources. The primary one was the study hospital's electronic quality management system named Governance, Evidence, Knowledge and Outcome (GEKO) that is used by all professions for maintaining governance related document chains for quality activities. HAC performance case mix data was sourced from the hospital's Tableau dashboards. Estimates of time taken to collect data via bedside observation and retrospective notes review were derived from a study into the management of peripheral intravenous catheter (PIVC) that consisted of 1,029 bedside observations and 103 retrospective notes reviews for HACs conducted by clinical staff. This data was captured using Microsoft Teams.

Sample selection

Defined as being completed when the outcome of recommendations was submitted, a total of 1,768 completed quality activities was identified on GEKO between 2015 and 2019. Data were downloaded into an excel workbook for analysis. To enable a comprehensive review of the activities, a representative sample of 490 were randomly selected for this study, based on the methodology described by the Australian Bureau of Statistics (19). This sample size was to provide an accurate reflection of all quality activities completed, their characteristics and outcomes, with a 95% confidence interval and a 5% margin of error.

Measurements and data analysis

Quality activities were grouped into ten patient safety areas per the Australian National Safety and Quality Health Service Standards (NSQHSS) version 1 (20). Those patient safety areas were Blood and Blood Products, Clinical Communication, Consumer Engagement, Falls, HAIs, Medication Safety, Patient Identification and Procedure Matching, Pressure Injury, Recognising and Responding to Clinical Deterioration and 'Other'. 'Other' included all activities that were not specific to the above patient safety areas. Activity planning was categorised as either S&Q or equivalent planned and coordinated or clinician-initiated per designation of principal investigator on GEKO.

Adherence to quality cycle was assessed against the four stages of best practice in clinical audit (11) through document review because audits represented majority of the quality activities in the hospital (1). The four stages are Preparation and Planning, Measuring and Performance, Implementing Change, and Achieving and Sustaining Improvement (11). Improvement from each activity was assessed on process and outcome measures per proposal and report on GEKO. Impact on HACs was attempted via bivariate regression analysis of the annual HAC rate per 10,000 episodes of care and annual completed activities between 2015 and 2019.

Data analysis was descriptive, describing adherence to the four stages of the quality cycle, relationship between completed activities and overall hospital HAC rate, comparison between professions and planning, and patient safety areas. Estimations were made on time and cost in

Australian dollars required for data collection for all 1,768 completed activities, using the median sample size per GEKO reports and median hourly salary rates of Nursing, Medical and Health Service Union (HSU) per industrial agreements in 2018 to avoid skewness by extreme values. Time in hour required for data collection for each case included in a sample was taken from the 95% confidence intervals of the PIVC project and retrospective HAC reviews. Data for the PIVC project and retrospective reviews was downloaded into excel worksheets, then analysed on IBM SPSS Statistics 24. Data cleaning was performed to remove extreme values that could not be explained.

Results

Adherence to quality cycle

Preparation and Planning

Most quality activities were clinician-initiated (87.8%) with those planned and coordinated by S&Q or equivalent accounting for the remainder (12.2%). Over four fifths of activities (88.0%) stated they undertook stakeholder engagement, but less than 10% (9.8%) engaged with patients.

Measuring and Performance

All quality activities had reasons and objectives described in GEKO but less than half (42.4%) sought to alter an outcome measure such as re-admission rate. Rationale for sample size was available in 97.8% of the occasions; 94.5% outlined inclusion and exclusion criteria for sample selection, and 90.6% included a data collection tool in activity proposal. Only 53.3% included benchmarks for chosen measures. There was an enormous diversity in activity sample size, which ranged from 1 to 63,842 cases, although the mean was 333, median 47, and mode 30. Retrospective data collection was used for 64.7% of activities while 35.3% were prospective. Most activities utilised descriptive statistics (84.5%) with only a few (6.5%) reporting statistical values such as *p* value. Less than 10% (9.4%) undertook qualitative methods to investigate their findings.

Implementing Change

Two thirds of quality activities (66.3%) provided recommendations based on their findings. Of these, recommendations involved education & training (31.0%), communication changes (30.2%), process

changes (21.4%), policy development (10.4%) and numerous other categories (7%). Evidence of action plan was available in 14.1% of the reports.

Achieving and Sustaining Improvement

Nineteen percent of activity reports made comparison to previous findings or pre-defined targets on process measures; 9.0% made comparison on outcome measures. Overall, improvement in processes was reported for 17.1% of quality activities, while only 7.1% for improvement in outcomes. Table 1 provides examples.

Relationship between completed quality activities and HAC rates

No association was found between the annual total number of completed quality activities and the hospital's annual HAC rate (see Figure 1).

Comparison between professions and by planning

As shown in Table 2, Pharmacy, Medical and Allied Health (AH) were the professions most likely to include outcome measures in data collection, while Nursing & Midwifery (N&M) was more on processes. Pharmacy as a profession had the highest rate of improvement from completed activities. Document review suggested sound methodology, robust data collection and analysis together with processes of testing change ideas by this profession. Activities by medical staff were often related to the management of specific disease or conditions, generally comprehensive data analysis and reporting. Among the 60 quality activities (56.7% were related to management of Blood and Blood Products) that were planned and coordinated by S&Q or equivalent, 8.3% brought improvement in outcome measures, and 46.6% brought improvement in process measures, while the 430 clinician-initiated quality activities resulted in 7.0% improvement in outcome measures and 11.0% for process measures.

Comparison between patient safety areas

Table 3 illustrates that activities related to the management of Blood and Blood Products had the highest rate of process improvement at 61.4%. Transfusion Safety Nurses planned and coordinated 77.0% of the activities, using a quarterly audit plan and standardised data collection tools. Findings

from previous audits were frequently used for comparison. There was a focus on process compliance such as completion of transfusion consent. Transfusion Safety Nurses were mostly accountable for follow-up actions to close the loop.

Time required for data collection and associated costs

Estimated time and cost for data collection (Table 4) averaged at 3,490 hours per year, equivalent to 1.8 full-time employees, for a cost of $171,000 at nursing rate, $280,000 at medical rate, and $200,000 at the HSU rate.

Discussion

Statement of principal findings

Quality activities in the study hospital were mainly clinician-initiated. Although two fifths of activities sought to alter an outcome measure in planning, less than a tenth made comparison of performance to pre-defined benchmark or target. Activities that reported improvement in process measures were less than a fifth. No clear association was found between activities completed and improvement in patient-related outcomes at the hospital level as measured by HACs. Adherence to best practice in quality cycle was strong for Measuring and Performance except only half referred to known standards or benchmark. Stakeholder engagement was common but less so for patient engagement. Majority of the activity reports did not have evidence of action plan to address recommendations. More work needs to be done for Implementing Change and Achieving and Sustaining Improvement. Four principal findings are of importance to note: (1) closing the loop from quality activities to achieve sustainable improvement in hospitals remains challenging. (2) a planned and coordinated approach may bring more improvements based on results from activities that are planned and coordinated by S&Q or equivalent. (3) Differences exist among professions, with opportunities to leverage strengths that each profession could bring for making changes and improvement. (4) Time and costs for data collection could be moderate depending on sample size decision and delegation.

Strengths and limitations

Our study advances previous knowledge of hospital quality activities in the literature by describing adherence to the quality cycle and outcomes at the hospital level in the Australian context, with estimations on time and cost for data collection, but not without limitations.

First, in assessing outcomes of quality activities and analysing relationship between completed activities and occurrence of HACs, contextual factors such as hospital S&Q climate, QI leadership and team culture were not controlled for this study which could have impacted on how quality activities were organised and conducted (21). We plan to explore this further in future studies.

Second, clinical documentation is known to affect the quality of HAC data (22) therefore a proportion of HACs may be debatable. However, this should have minimum impact on the findings of this study as quality activities on improving documentation are common (1) and are not excluded from the analysis of this study.

Third, estimations on time and cost for data collection were made by using the median of all sample sizes reported and median hourly profession rates in 2018. Actual time and cost are likely to differ depending on the level of complexity and scope of each activity. Considering the enormous diversity in sample sizes applied in the study hospital, time and cost are likely to be underestimated by using medians. Such estimations would therefore be better considered as minimum expenditures. In addition, data on costs for other aspects of the quality cycle were not available therefore a prospective study may be needed.

Interpretation within the context of the wider literature

This study is context-specific to a large Australian tertiary hospital. It adds new knowledge to the literature about hospital quality activities for (a) gaps in the quality cycle, (b) impact on patient-related outcomes at the hospital level, and (c) cost for data collection. Findings offer S&Q professionals and hospital administrators with information to explore a value-based and outcome-oriented approach for quality activity planning and coordination in a resource-constrained context.

Implications for policy, practice and research

Findings from this study inform discussions relating to how hospitals could plan, resource and coordinate quality activities to be value-based and outcome-oriented.

First, make improvement the goal. Quality activities do not necessarily bring improvement in process or outcome measures unless it is intentionally designed and carried out to do so (8). QA are necessary but generally considered as means to ensure 'good' care is provided and minimum requirements/standards are met (23). Those activities by themselves cannot solve ingrained deficiencies but can emphasize priorities for change, inform focused actions, and evaluate progress (11). QI therefore should be considered as the ultimate goal of quality activities, a nature progression after data collection and analysis to address gaps identified (7, 8). Making QI a core tenet of how healthcare organisations are run is essential to ensuring safe, high quality, and responsive services for patients. This may require an intentional shift in mindset such that when activities are planned, and data is collected, the intended behaviour changes by recipients and patient-related outcomes are considered (8), with mechanisms to facilitate the development and implementation of action plans.

Second, take a planned and coordinated approach. Successful quality programmes are characterised by (a) being clinician-led but centrally coordinated and supported, (b) well-defined evidence-based outcome oriented measures, (c) carefully-designed data collection and feedback process, and (d) a program of improvement to drive change (3, 8, 11, 12). Improvement work is fragmented if based on repeated, unconnected, and inappropriately delegated projects conducted in isolation (8), which result in wheel reinvention, waste of time and energy, and most importantly risk of losing motivation by clinicians when they don't feel supported and don't see changes happen (2, 11). The role of planning and coordination may include (a) aligning individual, departmental and organisational objectives through a data-driven evidence-based approach, (b) supporting high-value activities, (c) celebrating progress and successes, and (d) scaling up effective interventions. Implementing change to achieve and sustain improvement is often more challenging than data collection and analysis that

needs to be considered holistically and approached as a long-term, sustained effort (24). It creates a powerful sense of shared purpose when leaders and frontline staff work together.

Third, appreciate diversity in the workforce and leverage the strengths each healthcare profession brings. Each profession in healthcare has their strengths and clinical focuses. All professions and teams are part of the complex network and continuum of care processes in hospitals. The quality of care delivered by such network depends to a large extent on how well this network functions, and how well the people who provide and manage care work together (24). There are opportunities for QI stewardship to leverage the strengths each profession brings to target different issues or aspects of improvement programmes. Developing solutions to many S&Q problems may require high-level skills and expertise from multiple disciplines, and highly sophisticated development processes (25).

Fourth, improve efficiency in data collection to focus energies and resources on improvement. There are two important factors to consider for data collection: (1) to avoid being bogged down by excessive data collection (8, 11); (2) to conduct data collection as close to real time as possible for risk identification and mitigation therefore patient safety (26, 27). The diminishing returns of perfecting data come at the expense of focusing energy on improvement (7). Large sample is not necessary for quality activities because of the iterative nature of testing changes for improvement (28, 29). Real time feedback to caregivers is a key to behaviour change which allows personnel to become fully engaged in the actual patient safety environment (30). Near real time data collection shall become increasingly possible in the era of electronic medical record (EMR) and artificial intelligence (AI). Cost for data collection can be contained at a moderate level to maximise returns and ensure sustainability.

Conclusion

While quality activities are commonly conducted in hospitals, the quality cycle is infrequently followed through. A paradigm shift may be needed to engineer such activities to be more outcome oriented. Opportunities exist for hospitals to consider how quality activities can be planned, resourced, and coordinated to maximise returns from investment.

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Author contribution

All authors listed have made equal contribution to this study.

Ethical approval

This study received ethics approval from the South Metropolitan Health Services Human Research Ethics Committee in Western Australia.

Data availability

Original data generated in the course of the study can be available by contacting the first author.

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Table 1. Examples of reported improvements in completed quality activities

	Activity title & sample size	Measure used	Baseline	Follow up
Process	Enhancing hand hygiene practice in Post Anesthesia Care Unit (N=244 hand hygiene moments)	Hand hygiene compliance across all 5 Moments	59%	88%
	Current practice of preventing and managing pressure injury injuries in Neonatal Service (N=52 cases)	Documentation of Glamorgan score and neonatal skin condition scores within 8 hours of admission	73%	87%
Outcome	Reduction of caesarean section (emergency and elective) surgical site infection (N=20 cases)	Surgical site infection rate per 100 procedures	1.15	0.35
	A dispensary revolution 2015-2019 (N=54 months multiplied by number of prescription items per month)	Mean patient wait time for discharge prescriptions in minutes	75	40

Figure 1. Total annual completed quality activities vs hospital acquired complications rate per 10,000 episodes of care

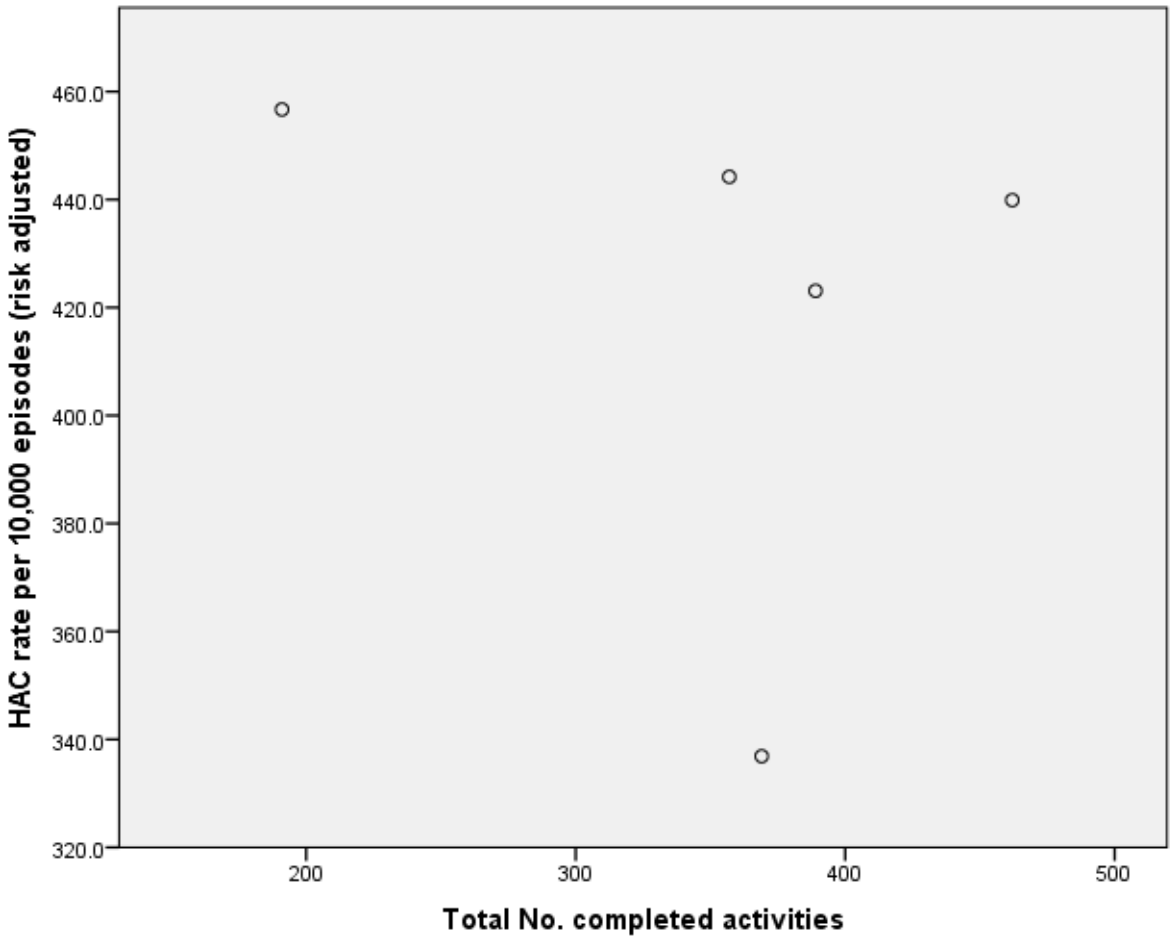

Table 2: Quality activity outcomes within profession groups 2015-2019

Profession	No. of completed activities	% of total	Process improvement	Outcome improvement	Outcome measures in activity design
Allied Health	55	11.2%	14.5%	14.5%	60.0%
Medical	121	24.7%	8.2%	5.0%	76.9%
Nursing & Midwifery	204	41.6%	25.0%	6.4%	27.0%
Other	83	16.9%	9.6%	1.2%	4.8%
Pharmacy	27	5.5%	25.9%	25.9%	85.2%
Total	490	100.0%	17.1%	7.1%	42.4%

Table 3: Quality activity outcomes within patient safety areas 2015-2019

Patient safety area	No. of completed activities	% of total	Process improvement	Outcome improvement
Blood and blood products	44	9.0%	61.4%	9.1%
Clinical communication	17	3.5%	29.4%	0.0%
Consumer engagement	26	5.3%	7.7%	7.7%
Falls	20	4.1%	35.0%	5.0%
Healthcare associated infections	39	8.0%	12.8%	15.4%
Medication safety	58	11.8%	18.9%	15.5%
Other	210	42.9%	6.7%	6.2%
Patient identification and procedure matching	17	3.5%	11.8%	0.0%
Pressure injury	10	2.0%	20.0%	0.0%
Recognizing and responding to clinical deterioration	49	10.0%	18.4%	0.0%
Total	490	100%	17.1%	7.1%

Table 4: Estimated hours and cost for data collection 2015-2019 at median sample size and hourly rates

Means of data collection	Hour per sample	Total completed activities	*Total hours	Cost at nursing rate	Cost at medical rate	Cost at *Health Service Union rate
Observation	0.1 (0.09-0.11)	624	2,932.8 (2,639.5-3,226.1)	A$143.7K (A$129.3K-A$158.0K)	A$233.2K (A$209.9K-A$256.5K)	A$172.7K (A$155.5K-A$190.0K)
Retrospective notes review	0.27(0.20-0.34)	1,144	14,517.4 (10,753.6-	A$711.2K (A$526.8K-	A$1.2M (A$855.1K-	A$855.1K (A$633.4K-

			18,281.1)	A$895.6K)	A$1.5M)	A$1.1M)
Total		1,768	17,450.2 (13,393.1-21,507.2)	A$854.9K (A$656.1K-A$1.1M)	A$1.4M (A$1.1M-A$1.7M)	A$1.0M (A$788.9K-A$1.3M)

*Pharmacy, Allied Health and Safety & Quality professions are included in the Health Service Union rate