Australian Critical Care xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Australian Critical Care

journal homepage: www.elsevier.com/locate/aucc

Discussion paper

Clinical audits to improve critical care: Part 2: Analyse, benchmark and feedback

Gillian Ray-Barruel RN, BSN, GC ICU, BA (Hons), PhD [a,b,c,*],
Amanda J. Ullman RN, GC Paediatric ICU, MAppSci, PhD [a,b,d,e],
Claire M. Rickard RN, PhD [a,f,g,h],
Marie Cooke RN, PhD [a]

[a] National Centre of Research Excellence in Nursing, Alliance for Vascular Access Teaching and Research (AVATAR) Group, Menzies Health Institute Queensland, Griffith University, Nathan, QLD, Australia
[b] Centre for Clinical Nursing, Royal Brisbane and Women's Hospital, Australia
[c] Nursing Practice Development Unit, Princess Alexandra Hospital, Australia
[d] School of Nursing and Midwifery, Alliance for Vascular Access Teaching and Research (AVATAR) Group, Menzies Health Institute Queensland, Griffith University, Australia
[e] Paediatric Critical Care Research Group, Lady Cilento Children's Hospital, Brisbane, Australia
[f] Royal Brisbane and Women's Hospital, Australia
[g] Princess Alexandra Hospital, Woolloongabba, Australia
[h] The Prince Charles Hospital, Australia

ARTICLE INFORMATION

Article history:
Received 1 February 2017
Received in revised form 17 March 2017
Accepted 28 April 2017

Keywords:
Quality improvement
Clinical audit
Critical care
Evidence-based practice
Feedback

ABSTRACT

Clinical audits are an essential part of the cycle designed to ensure that patients receive the best quality of care. By measuring the care delivered against established best practice standards, it becomes possible to identify shortcomings and to plan targeted strategies and processes for continuous improvement. The success of a clinical audit depends upon defined goals, motivation of stakeholders, appropriate tools and resources, and clear communication.

In part 1 of this series, an overview of the structures and processes needed to prepare and collect data for clinical audits in the critical care setting was provided [A.J. Ullman, G. Ray-Barruel, C.M. Rickard, M. Cooke, Clinical audits to improve critical care: Part 1 Prepare and collect data, Aust Crit Care, 2017, in press]. In part 2, we discuss how to analyse the collected audit data, benchmark findings with internal and external data sets, and feedback audit results to critical care clinicians to promote evidence-based practice and improve patient outcomes.

1. Introduction

The importance of clinical audits in measuring performance and tracking progress is well recognised by critical care leaders. Clinical audits are a quality improvement process, systematically undertaken to improve clinical practice and subsequent patient outcomes. By providing objective and quantifiable data, clinical audits enable clinicians to compare current performance with explicit, defined criteria, and identify areas for improvement.[1] Clinical audits can be used to monitor and track both clinical practice and service delivery changes, and they provide a useful and objective tool to motivate healthcare staff to engage in the process of continuous quality improvement.

Undertaking a clinical audit in the critical care unit need not be a daunting task. With careful preparation and an informed approach, clinical audits can provide a useful and valuable tool for critical care clinicians. Preparing and committing to a clear audit strategy creates transparency in the process, ensures validity and reliability of the data, and builds confidence in the findings. The success of an audit will depend upon clearly defined goals, motivation of key opinion leaders and stakeholders, appropriate tools and resources (time, staff, equipment), and clear communication.

This is Part Two of a two-paper series regarding clinical audits in critical care. In the previous article, the structures and processes needed to prepare and collect data for clinical audits in the critical care setting were addressed. This article features an overview of the skills and resources needed to analyse, benchmark and feedback

* Corresponding author at: National Centre of Research Excellence in Nursing, Alliance for Vascular Access Teaching and Research (AVATAR) Group, Menzies Health Institute Queensland, Griffith University, Nathan, QLD, Australia.
E-mail address: g.ray-barruel@griffith.edu.au (G. Ray-Barruel).

http://dx.doi.org/10.1016/j.aucc.2017.04.002
1036-7314/

audit data. Together, these articles provide a step-by-step guide, and the remaining five steps are outlined here. These are:

7 Identify appropriate techniques for analysing audit data
8 Identify internal and external audit data for benchmarking
9 Feedback to clinical area and management
10 Plan targeted strategies and processes for continuous improvement
11 Repeat the audit cycle: re-identify areas for improvement

2. Step seven: identify appropriate techniques for analysing audit data

Once the data collection is complete, the data must be collated and analysed. The primary goal of data analysis is to understand the key audit findings, so these can be presented to the clinical staff and other stakeholders, and action plans can be developed, if needed. Before any data analysis can begin, it is important to check the data are "clean", that is, no typographic errors have been made during data entry. This does not mean that all the audit data entry needs to be double-checked (although this is ideal), but attention is at least needed to confirm/correct any missing data, and check any extreme results (high and low), as well as any impossible results (e.g., age = 187 years old). Ideally, the person checking the data should have a thorough understanding of the data collection tool and an excellent eye for detail, as well as knowledge of the clinical practice or service being audited.

An in-depth knowledge of statistics is not necessary when analysing audit data. For the purposes of clinical audit, it is perfectly acceptable in many cases to present the data using simple percentages and absolute numbers, incorporating appropriate numerators and denominators whenever possible.[2] Percentages represent a calculation of the number of times an event occurred based on the total number of people, whereas rates represent the probability of a certain event. For instance, to determine the percentage of pressure injuries in the critical care unit, a simple snapshot audit could identify the number of pressure injuries detected (numerator) in the total sample of patients (denominator) and multiply by 100. To calculate the rate of pressure injuries for your unit, it would be more accurate to keep track of the total number of pressure injuries per 1000 patient days. While the simple percentage provides a neat starting point to identify if the unit has a problem with pressure injuries, the rate provides a better picture of the extent of the problem over time.

The primary purpose of the clinical audit is to improve practice, and an essential component of this is building staff engagement in the continuous quality improvement process, therefore, simple calculations and descriptive statistics[3] that can be easily presented and understood by busy clinicians are preferred. Software programs such as Microsoft Excel® are satisfactory for this level of analysis. If more detailed enquiry is desired, statistical software packages can be used, but this is certainly not essential. If capacity exists, inferential statistics, such as Chi-square, *T*-tests, and Mann–Whitney, can be used to determine meaningful differences between samples. More information regarding the appropriate use of descriptive and inferential statistics can be found in the series of statistics articles published by Australian Critical Care.[3–9]

3. Step eight: identify internal and external audit data for benchmarking

The presentation of results using internal and external benchmarking is effective in provoking discussion surrounding the results and strategies for improvement.[10,11] Benchmark criteria indicate a desired level of care in the critical care area.[12] Therefore, clinical practice guidelines should be used to inform the audit criteria, as discussed in Step Three. These criteria may be in the form of rates or percentages (e.g., percentage of patients receiving enteral nutrition within 48 h of ICU admission), but need to provide a realistic and attainable goal for the local unit.

Benchmarking can be either internal or external, and decisions about benchmarking criteria should be made with the key stakeholders to ensure the benchmarks chosen are clinically relevant and appropriate. Internal benchmarking can be accomplished via repeated audits over time in the same institution, using the same audit tools. For the majority of data types, results may be presented using graphical illustrations such as Statistical Process Control (SPC) Charts. Fig. 1 illustrates how tools such as SPC Charts can be used to present data over time for repeated measures, with built-in thresholds (upper and lower control lines) to highlight significant variations in practice. These significant variations emphasise results outside of the normal fluctuations in the statistical 'norm' of care and reflect three standard deviations above (upper control line) or below (lower control line) the mean (central line).[13] These statistical norms are most valuable when external benchmarks do not exist. Resources are readily available to support the development of these charts which use programmes including Microsoft Excel® (Refer to Part 1 of this series. Table 1: Organisations providing resources on-line to support the undertaking of clinical audits of critical care practice". Ullman AJ, Ray-Barruel G, Rickard CM, et al. Clinical audits to improve critical care: Part 1 Prepare and collect data. Australian Critical Care. 10.1016/j.aucc.2017.04.003).

External benchmarking provides another form of goal setting for improvement, but should be chosen in consultation with stakeholders to ensure their relevance to the institution. External benchmarks can be identified within a range of resources including international institutions (e.g., World Health Organization), national institutions (e.g., Australian Commission on Safety and Quality in Healthcare), discipline-specific clinical registries (e.g., Australian and New Zealand Intensive Care Society registry), or published audits using similar methods of assessment. Some examples of common indicators to benchmark ICU performance include: the rate of central-line associated bloodstream infection (CLABSI) (expressed as number of CLABSI occurrences per 1000 line days); the Standard Mortality Ratio (actual deaths divided by the predicted number of deaths at each ICU); the rate of ICU readmissions, declined admissions, or after-hours discharge.[14] An example of external international benchmarking is the International Nutrition Survey, in which 150 ICUs participate annually.[15]

4. Step nine: feedback to clinical area and management

Providing feedback about the audit results is one of the most important but frequently undervalued aspects of the audit cycle.[16,17] The goal of feedback is to raise awareness and challenge beliefs about current practice and clinical outcomes, with the assumption that people will be motivated to change when presented with suboptimal results and a clear action plan.[16] Developing appropriate feedback strategies should be the result of in-depth, collaborative discussion between the original project stakeholders. Audit feedback is most effective when delivered by a well-respected supervisor or colleague, rather than an external party.[16,18] This person should ideally be passionate about improving practice and have a good rapport with the critical care staff. Importantly, feedback needs to be timely, individualised and non-punitive in order to be effective in improving performance.[19,20] A lag time of months between collecting the data and providing feedback to staff can lead to disinterest in the findings.[21]

Current audit results can be displayed beside previous audit results or the results of another area in the same hospital. Alter-

Please cite this article in press as: Ray-Barruel G, et al. Clinical audits to improve critical care: Part 2: Analyse, benchmark and feedback. *Aust Crit Care* (2017), http://dx.doi.org/10.1016/j.aucc.2017.04.002