Available online at www.sciencedirect.com

ScienceDirect

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

Original Article

Redesigning case selection methods to improve clinical review of inpatient medical records

Aneeta Minhas^{a,*}, Tun Tun Kyaw^b, Biauwei Chi Ong^{c,d,e}^a Executive, Clinical Governance, Singapore General Hospital, 169608, Singapore, Singapore^b Senior Executive, Clinical Governance, Singapore General Hospital, 169608, Singapore, Singapore^c Head & Senior Consultant, Department of Anaesthesiology, Singapore General Hospital, 169608, Singapore, Singapore^d Director, Clinical Governance, Singapore General Hospital, 169608, Singapore, Singapore^e Director, Patient Safety, Singapore General Hospital, 169608, Singapore, Singapore

ARTICLE INFO

Article history:

Received 2 June 2014

Accepted 12 October 2014

Available online 30 October 2014

Keywords:

Adverse events

Clinical

Quality

Readmission

Screening

ABSTRACT

Background: The objective was to redesign selection criteria for readmission cases to improve pick up rates of adverse events* for clinical reviews of inpatient medical records using a new methodology.

***Adverse events:** An unintended injury or complication resulting in increased length of hospital stay, temporary/permanent disability/death, caused by healthcare management.

Level 1 AE's: Unpreventable events only for information of clinical departments.

Level 2 AE's: Preventable/potentially preventable events reported to Heads of clinical departments.^{1,2a}

Trigger tools: The use of “triggers”, or clues, to identify adverse events (AEs) is an effective method for measuring the overall level of harm in a health care organization.^{2b}

PDSA: An iterative four-step management method used for continuous improvement of processes.³

Methods: Selected screening criteria were applied in a series of quality improvement cycles with further modification to eliminate unnecessary cases. A checklist to simplify screening was implemented and a staff satisfaction survey conducted to check process efficacy.

Results: Modification of selection criteria continuously improved review quality and accounted for better time management by the team.

Conclusion: The project resulted in a significant increase in the total AE pick up rate of 94.23% as compared to the baseline of 80%. The level 1 and 2 AE rates also increased to 92.31% and 1.92% from the baseline rates of 75% and 0.2%.

There was also noted to be a significant decrease of 80.98% in review time taken. These findings support the fact that an effective screening process for readmission review is beneficial and worth implementing.

Copyright © 2014, INDIACLEN. Publishing Services by Reed Elsevier India Pvt Ltd. All rights reserved.

* Corresponding author. Tel.: +65 97694161; fax: +65 62221058.

E-mail addresses: aneeta.minhas@sgh.com.sg, aneetaminhas@gmail.com (A. Minhas).
<http://dx.doi.org/10.1016/j.cegh.2014.10.001>

2213-3984/Copyright © 2014, INDIACLEN. Publishing Services by Reed Elsevier India Pvt Ltd. All rights reserved.

1. Introduction

The Clinical Review Program team (CRP) in the Singapore General Hospital is a patient centric quality improvement program that highlights and focuses the clinician's attention on issues related to patient safety for peer evaluation, recommendation and action. Level 2 issues that are picked up by reviewers are addressed by the departments concerned along with the medical board, and thus help in bringing about systemic changes in the hospital procedures and policies thereby improving the quality of clinical care offered to the patients.

The CRP team reviews patient medical records using a multi-stage review methodology to pick up adverse events. The primary review is done by a team of specially trained clinicians and nurses to identify the lacunae in the standard of care in the hospital. An analysis of adverse patient outcome is done in order to prevent future occurrences and bring about an improvement in patient care quality. The number of readmissions to acute care hospitals is huge, with numerous factors contributing to them and it is important for clinicians to gain an understanding of the possible preventable causes for readmission.⁴

This project was undertaken following the Ami (Accelerated model for improvement) program.⁵

The CRP team comprises of eight reviewers with a clinical background whose roles are to conduct case notes reviews of the selected flagged cases. The number of readmission cases in a month was about 900, making it difficult to sustain reviewing such large volumes of cases by the team, and this provided the impetus for this quality improvement project. The objective of this study was to reduce the total number of readmission cases for review and to increase the yield of total adverse events (levels 1 & 2), thereby increasing reviewer efficiency and satisfaction by eliminating unnecessary reviews. This time saved was utilized more effectively by reviewing cases flagged by other criteria, viz. Returns to the Operating theatre/ICU and Mortality cases, which was beneficial for the hospital as more AEs could be identified and resolved.

No similar studies have been documented in literature regarding Clinical Review Programs in any hospital and this could provide learning points for other teams to adapt or follow.

2. Methods

This study was conducted from January 2010 to June 2011 on inpatients readmitted to SGH within 30 days of discharge, across all wards and specialties. The number of readmission cases in a month was about 900. Previously all cases were reviewed to pick up levels 1 and 2 AEs, with pick up rates of 40% and 0.2% for level 1 and 2 cases respectively.

First, the January–December 2010 readmission review data was taken as the baseline data and rate of level 1 and 2 AEs picked up was calculated. Next, a series of exclusion filters was applied; these formed the 'Plan Do Study Act' (PDSA) cycles 1a, 1b and 1c. The cases without AE or with low yield of preventable or potentially preventable AE's were identified and were excluded from the study using general exclusion criteria, which included unscheduled unrelated readmissions, unscheduled related readmission after 15 days from discharge, scheduled related readmissions, social admissions, discharged against advice (AOR discharges).^{6–8}

By excluding the above categories, cases with higher yield of preventable or potentially preventable AE's remained in the selection pool for this study.

PDSA cycle I commenced using the exclusion criteria as shown in Fig. 1.

The next PDSA cycle, PDSA 2, applied the exclusion criteria as well as the screening of the Hospital Inpatient Discharge Summary (HIDS), which is a list of reasons for readmission summarized by the clinicians. The discharge diagnosis categories, shown in Fig. 1, were studied in detail. It was noted that these categories had a higher yield of AE's and it was more prudent to study these closely in order to get a better selection of cases with high yield AEs. Full case note review was done for all these cases and it was noted that those cases contained

Fig. 1 – Review methodology.

Fig. 2 – Overall AE pickup rate.

only unpreventable AE or no AE; therefore these are excluded from the study using additional filters. Finally, PDSA 3 evaluated the results of the project.

In PDSA 1b, further exclusion criteria were added: disease related readmissions and those due to discharge issues with unpreventable AE, and the data thus obtained was analyzed.⁹

PDSA 1c was done with further addition of exclusion criteria of the category of 'Others'. In this category some cases were excluded from the exemption if they included any of the following key words: bleeding; dislocated; rash; intestinal obstruction; leak; overwarfarinization; discharge; recurrent; dehiscence; and unsuccessful (Fig. 1).

PDSA 2 was carried out and all the above exclusion criteria were applied along with screening of the HIDS. This further reduced the unnecessary cases by eliminating cases with low yields of AEs.

PDSA 3 was then introduced and a checklist was mapped to aid the reviewers in understanding the modified criteria for selection of cases for review. This resulted in improved efficiency and greater understanding of the selection process as compared to the reviews being done without a checklist in the preliminary cycles, thus making it easier for the staff to manage their workload.

A staff satisfaction survey was conducted and it indicated improved levels of staff satisfaction regarding the revised readmission review process and reduced number of unnecessary reviews.

SPSS software* was used to analyze the data with reference to age, gender, ethnicity, LOS (length of stay in the hospital) during the previous inpatient admission and the distribution of cases according to the discharge departments. Comparison of the project data with the baseline data (January–September 2010) was done regarding demographics and department specificity.

*IBM SPSS Statistics is an integrated product that addresses the entire analytical process, from planning to data collection to analysis, reporting.

3. Results

Table 1 depicts the overall, level 1 and 2 AE pick up rate improvement noted during the various PDSA cycles.

The project resulted in improving the Readmission review process by significantly decreasing the unnecessary reviews and increasing the AE pick up rates (Fig. 3).

4. Discussion

PDSA 1a was undertaken and it resulted in 30% improvement in AE pick up rate with 70% decrease in the number of unnecessary reviews. Baseline pick up rate for level 1 and 2 AEs was 40% and 0.2% respectively.

PDSA 1b was commenced with further modification of the selection criteria. After this cycle it was noted that the total number of unnecessary reviews was further reduced by 7% and 80% of the total workload was reduced by eliminating unnecessary reviews. It also resulted in an increase in the Level 2 AE pick up rate, but there was a slight fall in the total AE/level 1 AE pick up rates.

PDSA 1c was then started with further modification of the triggers to select cases and this resulted in unnecessary reviews being further reduced by 10% leading to an overall 90% reduction in workload and increased AE pick up rate.

PDSA 2 was then undertaken and an additional filter of HIDS screening was added and this resulted in a further decrease of 62% in the total unnecessary reviews and 94% reduction of workload. Overall AE pickup rate increased, with both level 1 and 2 AE rates improving (Fig. 2), (Fig 3).

Table 1 depicts the overall, level 1 and 2 AE pick up rate improvement noted during the various PDSA cycles.

This further resulted in a significant drop of 80.98% saving of the total man hours required to complete the reviewing of the Readmission cases by appropriate case selection (Fig 4).

These findings support the fact that an effective screening process for readmission review is beneficial and worth

Table 1 – Overall and level 1 and 2 AE pick up rates.

	Overall rates (%)	Level 1 (%)	Level 2 (%)
PDSA1 (a)	69.23	67.69	1.54
PDSA1 (b)	67.7	66.9	1.8
PDSA1 (c)	68.32	66.34	1.98
PDSA 2	94.74	92.11	2.63
Post implementation	94.23	92.31	1.92

Fig. 3 – Total number of cases reviewed.

implementing. However, the evidence in support of its widespread implementation is still relatively limited in scope. It is important to continue to scientifically study the extent to which such a system affects the review outcomes.

PDSA 3 was then introduced and an implementation checklist was mapped to aid the reviewers in understanding the modified criteria for selection of cases for review (Fig 5), (Fig 6).

To substantiate this, staff satisfaction surveys were carried out regarding understanding of the process and satisfaction on a scale of 1–5, and it was noted that staff voted for increased satisfaction regarding their work process (Fig 7).

Fig. 4 – Total man-hours spent in case-notes review.

Fig. 5 – Pre checklist implementation staff survey.

This project aimed to eliminate unnecessary reviews and this objective was achieved with a 94% reduction in the total workload, increased AE pick up rates and improved staff satisfaction with the modified review process. There was also a noticeable saving of 80.98% in the man-hours spent in reviewing cases.

There was noted to be an increase in the AE pick up rate without losing preventable AE issues. Data analysis showed the overall yield of AE's increased to 94.23%, the pick up rate of Level 1 AE's was 92.31% and Level 2 AE pick up rate increased to 1.92% after the redesigned review process was implemented.

Statistical analysis of the demographic data by SPSS software showed that there was not much change in the average age of the patient population studied. Ethnicity also remained constant with majority of patients belonged to the Chinese group, followed by Malays, Indians, and Others.

The mean age of patients was 60.04 as compared to the mean age of 62.96 in the baseline data. The gender ratio in the project data was 53.3% females and 46.7% males as compared to the baseline data with 46.9% females and 52.0% male patients. Ethnicity remained the same in both data sets with maximal patient of Chinese origin (72.4% and 73.7%), Malay origin (15.0% and 13.0%), Indian origin (7.0% and 10.3%) and Others (4.7% and 1.7%).

Fig. 6 – Post checklist implementation survey (process understanding).

Scoring key: 1 – Very poor/strongly dissatisfied; 2 – Poor/dissatisfied; 3 – Average/neutral; 4 – Good/satisfied; 5 – Excellent/strongly satisfied

Fig. 7 – Post checklist implementation survey (overall staff satisfaction).

The baseline and project data regarding the length of stay as inpatient (LOS) showed a mean of 11.28 days for the baseline and 6 days for project data. This suggests that there was a drop of LOS to half and can be explained by the fact that the chronic disease/disease progression cases were eliminated leading to a fall in the LOS. These cases mostly belonged to the ONC, DIM, REN departments and thus there was a drop seen in their numbers after filtration was done.

The **departmental distribution** of these patients was studied and the following pattern emerged, as shown in Table 2 of the Results.

It was noted that in the baseline data, the specialty with maximum readmissions to the hospital were Oncology, Internal Medicine, Renal medicine, Surgery. This can be explained on the basis that the bulk of hospital readmissions are patients with malignancies which necessitate frequent admissions as inpatients due to the spread of disease and its ensuing complications or pain management. Other chronic diseases like renal failure also necessitate frequent admission for the patients due to complications and management of vascular access issues. The data findings corroborate these facts and seem to be a logical reasoning for certain departments showing higher rates of readmissions.

After applying the exclusion criteria in the various PDSA cycles, it was noted that the departments with maximum

readmission rates were Internal Medicine, General Surgery, Colorectal Surgery, Orthopedics. These findings are expected as the departments having a bulk of patients with chronic and debilitating conditions were filtered out of the readmission review process, with the data showing increased percentages of surgical cases. This is in line with our expectations as more of surgical complications were picked up in the filtered data as compared to cases of disease progression/chronic conditions which were excluded by the filtration process.

These findings support the fact that an effective screening process for readmission review is beneficial and worth implementing.

However, the evidence in support of its widespread implementation is still relatively limited in scope. It is important to continue to scientifically study the extent to which such a system affects the review outcomes.

Staff satisfaction surveys that were carried out also substantiated an improvement in the staff understanding and satisfaction with the new review process that was implemented. This was beneficial for the staff and institution as there was a substantial saving in the man-hours spent on reviewing unnecessary cases and this time could be effectively used by the team for other purposes.¹⁰ This contributed towards improving the quality of patient care in the organization by signaling preventable AEs via the patient safety and quality management pathways.

Table 2 – Distribution of readmission cases pre and post implementation of revised selection process.

No	Department	Pre	Post	Difference
		% Of cases	% Of cases	
	Oncology	14.1	7	7.1
	Internal Medicine	13.9	18.2	4.3
	Renal medicine	12.1	8.9	3.2
	General Surgery	11.3	11.7	0.4
	Respiratory	9.1	4.2	4.9
	Gastroenterology	6.1	2.3	3.8
	Colorectal Surgery	5.1	10.3	5.2
	Hematology	4.2	7	2.8
	Orthopedics	3.9	8.4	4.5
	Neurology	3.3	2.8	0.5

Results of the staff satisfaction with the review checklist and overall satisfaction score.

Funding

Internal.

Patient consent

Retrospective review of hospital inpatient data was done and special permission from patient was not required for reviewing of case notes by CRP staff. Risk was minimal.

Study approval

This study was conducted by the Clinical Review Program team and supervised by the Director, Clinical Governance,

which is part of the Medical Board offices of Singapore General Hospital. The data studied belonged to the hospital medical records department.

Conflicts of interest

All authors have none to declare.

Acknowledgements

This project was possible by the co-operation of the whole CRP team of reviewers who participated in reviewing all the cases used as baseline and other data that was collected for the various PDSA cycles.

We are thankful to the whole team for their support and effort in completing this task within the stipulated timeframe, thereby helping to make this a successful venture.

We are also thankful to our sponsor Prof Ong Biauwei Chi for her support and encouragement to undertake this project and also her suggestions for improvement through the various stages of the project.

REFERENCES

1. Thomas W Nolan, Clifford L Norman, Lloyd P Provost: The Improvement Guide: A Practical Approach to Enhancing Organizational Performance: 16–23.
2. (a). Juran J: Quality Control Handbook (5rd ed.). Ch 13: 4.
(b). Institute for healthcare improvement Global Trigger Tool.
3. Deming W.E: The New Economics for Industry, Government, Education. Ch 6.
4. Percy Bridgman: The Logic of Modern Physics.
5. Nolan T, Bisognano M. Finding the balance between quality and cost. *Healthc Financ Manage*. 2006;60:66–72.
6. Wilson R, et al. The quality in Australina healthcare study. *Med J Aust*. 1995;6:458–471 [CRP and AE related].
7. Brennan, et al. Incidence of adverse events and negligence in hospitalized patients: Results of the Harvard Medical Practice Study. *N Engl J Med*. 1991;324:370–376.
8. NSW Health Department. *A Framework of Managing the Quality of Health Services in NSW*. 1999:55–56.
9. Culler SD, Parchman ML, Przybylski M. Factors related to potentially preventable hospitalizations among elderly. *Med Care*. 1998;36:804–817.
10. Anderson GF, Steinberg EP. Hospital readmissions in the medicare population. *N Engl J Med*. 1984;311:1349–1353.