Handover: Faster and safer?

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KEY WORDS

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ABSTRACT

Objective
This study aimed to introduce bedside handover to three rural South Australian hospitals.

Design
A mixed-method, pre-test post-test evaluative approach involving quantitative (quasi-experimental) and qualitative (ethnographic) elements was used.

Setting
This study was set in three acute hospital wards.

Subjects
The sample comprised forty-eight self-selected enrolled/registered nursing staff; forty-seven females and one male.

Main outcome measure(s)
A 7-point Likert scale (19 items) and ethnographic interview questions covered themes relating to nurses satisfaction of pre and post-handover processes, frequency of incidents and estimations of time taken to conduct handover processes. Pre and post-handover processes were digitally timed. Documentation review of pre and post incident frequencies and journaling were also undertaken.

Results
With regard to handover duration, the average total time taken to conduct handover had decreased between 13% and 70% depending on the site. From a practical aspect, this can be regarded as significant. With regard to incident comparison, there is a clear trend from pre to post; the total number of incidents dropping from eighteen to seven.

Conclusions
The results of this study indicate that bedside handover approach is significantly less time consuming than the closed door approach previously adopted. The findings indicate a trend in the reduction of frequency of incidents under the bedside handover process. Literature suggests that incident reduction is directly correlated with increased information accuracy, however, this was not found to be the case in this study. Further research is warranted into factors, other than information accuracy, that may increase safety in clinical settings.

INTRODUCTION

Bedside handover is considered by hospitals and reported in literature to be a superior method of handover, leading to increased safety and providing economic benefits to the organisations involved (Payne et al 2000; Parker 1996). Whilst the importance of various handover methods has been documented in the literature in relation to their value in communication, clinical, monetary and psychological terms (O'Connell and Penney 2001), little has been written about its implementation. This project sought to study empirically the process and outcomes of the introduction of nurse-to-nurse bedside handover in three rural South Australian (SA) hospitals and was underpinned by Lewin's (1947a; 1947b) 3-Stage Model of Change.

In this paper literature and study results pertaining to the aspects of safety and duration of handover will be discussed.

Literature review

Rising patient numbers and complexity of care are increasing the amount of time needed to perform the handover process (Payne et al 2000). As noted by Buchan et al (2000), in order to provide cost-effective nursing care, a delicate balance is required between staffing levels and skill mix to meet patients' needs. In an industry that is financially stressed, procedures that provide the greatest benefits at the lowest cost must be implemented.

Upon review of literature pertaining to handover, the researchers were unable to locate any empirical studies with the aim of determining the most cost-effective handover method. That being said, several authors (Trossman 2009; Lally 1999) make the unsubstantiated claim that bedside handover is a more economic system than other handover methods available. In conjunction with relevant industrial awards and empirical evidence gathered in this study, an estimated cost can be established. With the health industry facing economic hardship, the sizeable costing of handover serves as motivation to uncover more cost-effective practices that may also potentially result in better operation of handover (Strople and Ottani 2006).

Not only is the financial expenditure of handover worth consideration, but also the outlay of time completing the process, which removes nursing staff from the individuals at the centre of the care. As suggested by Caruso (2007), this separation between nurses and patient can lead to decreased patient safety.

Bedside handover is the single handoff method reported that both unites nursing staff with patients and increases patient safety (Trossman 2009; Caruso 2007). Again, no empirical evidence demonstrating a clear link between handover method used and frequency of errors/incidents was able to be found. The findings of this study will pave the way in establishing a concrete connection between handoff method used and incident frequency.

METHODOLOGY

This study was conducted within three small rural SA hospitals. While these sites share similarities, points of difference such as patient capacity, qualifications of ward staff and types of patients were present. In order to accurately measure the change process, the introduction of bedside handover was duplicated in each site. The handover approach adopted prior to the change intervention was that of face-to-face verbal closed-door handover. The change implementation resulted in the adoption of the nurse-to-nurse bedside handover method.

The sample comprised forty-eight (n=48) self-selected nursing staff (at various levels). There were no exclusion criteria for the study; however, participants were required to be working on the wards/units involved in the study prior to, during and post implementation.

The data collection within this mixed-method study was underpinned by the paradigms of interpretivism and post-positivism, with triangulation of data undertaken to reduce the level of subjectivity. Data collection was performed in three stages with qualitative and quantitative elements performed simultaneously. These stages were aligned to the three stages of Lewin's (1947a; 1947b) 3-Stage Model of Change (unfreezing, changing and refreezing).

Quantitative elements of data collection included comparison of pre and post incident frequencies and handover timings. The researchers attended handovers to gather data relating to the type of information discussed, the time it took to undertake the process and to become familiar with terminology used by nurses. During stages one and three, the researchers attended and timed a total of fourteen morning-to-afternoon handovers across the three sites. Timing the handovers allowed a point of comparison on a pre and post basis.

The qualitative aspects of data collection comprised ethnographic interviewing, journaling and observations.

FINDINGS

The findings will be presented under the headings of demographics, quantitative findings and qualitative findings. While all calculations were performed without rounding, figures within tables have been rounded to two decimal places for ease of review.

Demographics

The survey data were collected from a fairly even spread of respondents across the three sites (Table 1). A total of 38.1% (n=16) of respondents were from Site 1, 33.3% (n=14) from Site 2 and the remaining 28.6% (n=12) from Site 3.

Regarding the age of the sample, 59.5% (n=25) of respondents were aged over 40, 33.3% (n=14) were aged 26-39 and 2.4% (n=1) of respondents were in the 18-25 category. Two respondents declined to answer this question. Table 1 displays the results of the age by site breakdown.

Table 1: Site* age contingency table.

			Age				Total
			18-25	26-39	40-50	51+	
Site	Site 1	Count	0	6	8	2	16
		Expected count	.4	5.6	6.0	4.0	16.0
		Std. Residual	-.6	.2	.8	-1.0	
	Site 2	Count	0	5	6	2	13
		Expected count	.3	4.6	4.9	3.3	13.0
		Std. Residual	-.6	.2			
	Site 3	Count	1	3	1	6	11
		Expected count	.3	3.9	4.1	2.8	11.0
		Std. Residual	1.4	-.4	-1.5	2.0	
Total		Count	1	14	15	10	40
		Expected count	1.0	14.0	15.0	10.0	40.0

Actual and expected frequencies are shown. Exact statistical procedures are used. The p-score falls just outside significance (p=0.052). However, the standardised residuals in table 1 suggest there are more nurses aged 51+ at site 3 than would be expected if there was independence. The residual is of magnitude 2, which is significant at the 5% level.

The gender spread of participants was one-sided. The demographic data consisted of 92.9% (n=39) of respondents being female and 2.4% (n=1) being male. With regard to the type of staff that participated in the

study, 88.1% (n=37) of respondents were registered nurses and 7.1% (n=3) were enrolled nurses. A further 4.8% (n=2) of respondents declined to answer questions pertaining to gender and type of staff.

Quantitative Results

The results pertaining to duration of handover incorporated staff perceptions of the time taken to perform handover and the physical timing of the handover itself. Presented below are the findings of the question 'I believe the current handover process is difficult and time consuming' (table 2 and figure 1).

Table 2: I believe the current handover process is difficult and time consuming.

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	73	386.832	.000
Time	1	73	4.615	.035
Site	2	73	2.405	.097
Time* Site	2	73	2.912	.061

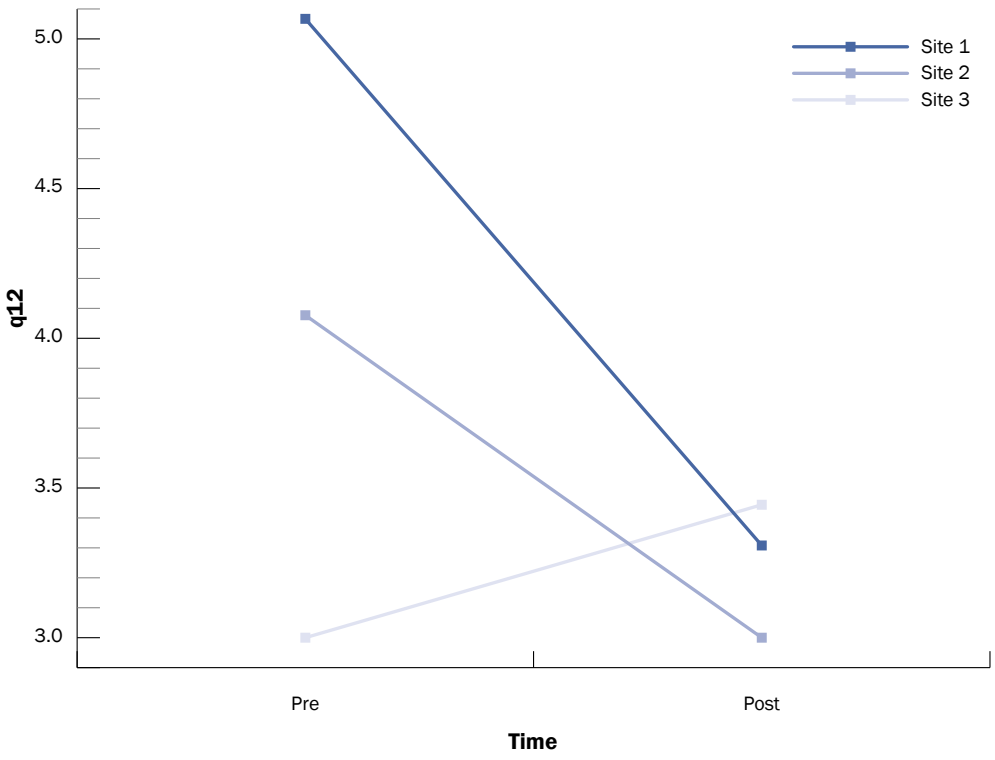
[a] Dependent Variable: q12

3. Site* Time[a]

Site	Time	Mean	Std. Error	df	95% confidence interval	
					Lower bound	Upper bound
Site 1	Pre	5.067	.404	73	4.261	5.872
	Post	3.308	.434	73	2.442	4.173
Site 2	Pre	4.077	.434	73	3.212	4.942
	Post	3.000	.452	73	2.099	3.901
Site 3	Pre	3.000	.472	73	2.059	3.941
	Post	3.444	.522	73	2.405	4.484

[a] Dependent Variable: q12

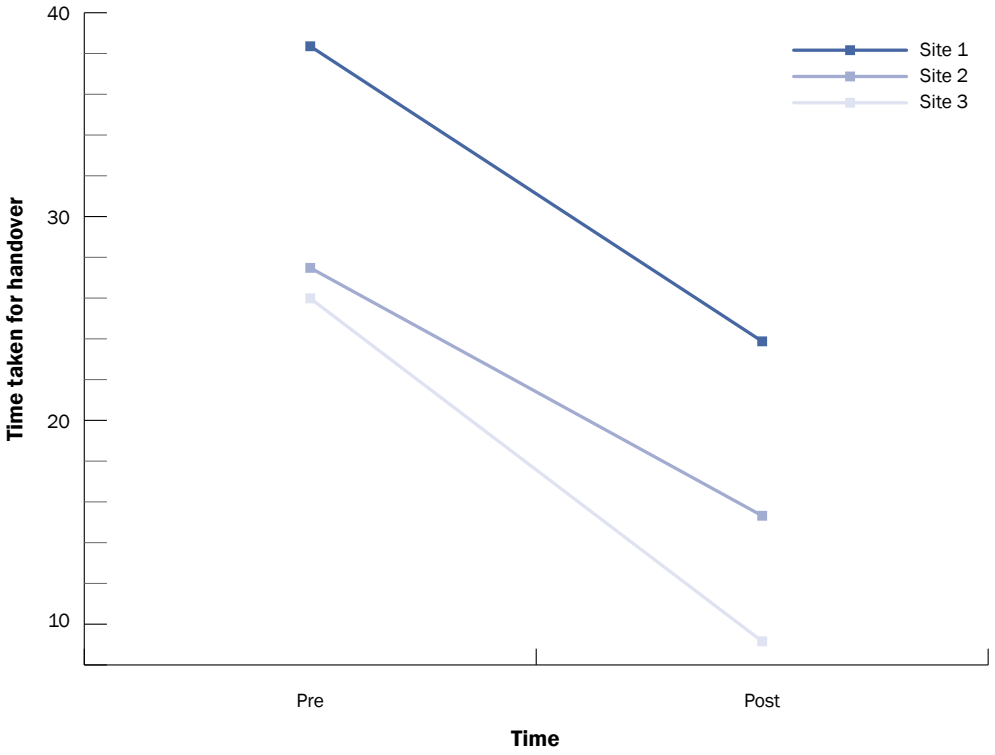
Figure 1: I believe the current handover process is difficult and time consuming.



In looking at table 2 and figure 1, Sites 1 and 2 have experienced significant decreases, while Site 3 shows no evidence of change. It is clear that staff believe the level of difficulty and time taken to undertake handover have decreased as a result of the change implementation. There is a significant time effect; however, the post-hoc Bonferroni test shows that this is due to Site 1 (p=0.038).

Nurses were also asked to estimate the time taken to perform handover on a pre and post basis. These results are presented in figure 2.

Figure 2: Nurses' estimations of the time taken to perform pre and post-handover.



From looking at figure 2, it is evident that there is a significant overall site difference in the estimation of handover time from pre to post. While Site 1 started and finished higher on the plot than the other sites, the rate of change between sites is comparable and holds no significance. These figures indicate that nurses believed the time taken to perform handover had decreased as a result of the change implementation. This concurs with the physical timings of the handover process that were undertaken. Table 3 outlines the pre-implementation averages obtained from timing the handover process.

Table 3: Figures obtained from timing the handover pre-implementation.

Site	Number of Patients	Number of staff	Total time to conduct handover (hours)	Average handover p/patient (hours)	Average time to handover p/patient, p/staff member (minutes)
Site 1 (average)	13	6	5.54	0.43	4.25
Site 2 (average)	7	4	2.25	0.32	4.80
Site 3 (average)	3	5	1.45	0.48	5.80

The researchers were able to calculate the all sites' average time taken to handover per patient pre-implementation. This total time is the time taken to handover a single patient, multiplied by the number of staff present during the handover. The average (mean) total time taken to handover per patient across all sites pre-implementation was 0.44 hours. Table 4 outlines the post-implementation averages obtained from timing the handover process.

Table 4: Figures obtained from timing the handover post-implementation.

Site	Number of Patients	Number of staff	Total time to conduct handover (hours)	Average handover p/patient (hours)	Average time to handover p/patient, p/staff member (minutes)
Site 1 (average)	12	6	4.47	0.37	3.72
Site 2 (average)	8	4	0.78	0.10	1.45
Site 3 (average)	3	4	0.39	0.13	1.93

The average (mean) total time taken to handover per patient across all sites post implementation was 0.22 hours. Table 5 shows the mixed modelling analysis of the pre and post-handover times. The descriptive statistics for this variable are broken down by site and time.

Table 5: Mixed modelling analysis of pre and post-handover times.

Site	Time	Mean	N	Std. Deviation
Site 1	Pre	5.5367	3	1.74489
	Post	4.4800	3	.62378
	Total	5.0083	6	1.30708
Site 2	Pre	2.2550	2	.16263
	Post	.7800	2	.15556
	Total	1.5175	4	.86145
Site 3	Pre	1.4500	2	1.79605
	Post	.3850	2	.47376
	Total	.9175	4	1.23619
Total	Pre	3.4314	7	2.35435
	Post	2.2529	7	2.13009
	Total	2.8421	14	2.24196

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	2.022	3.787	.190
Time	1	10.022	4.639	.057

[a] Dependent Variable: handover time

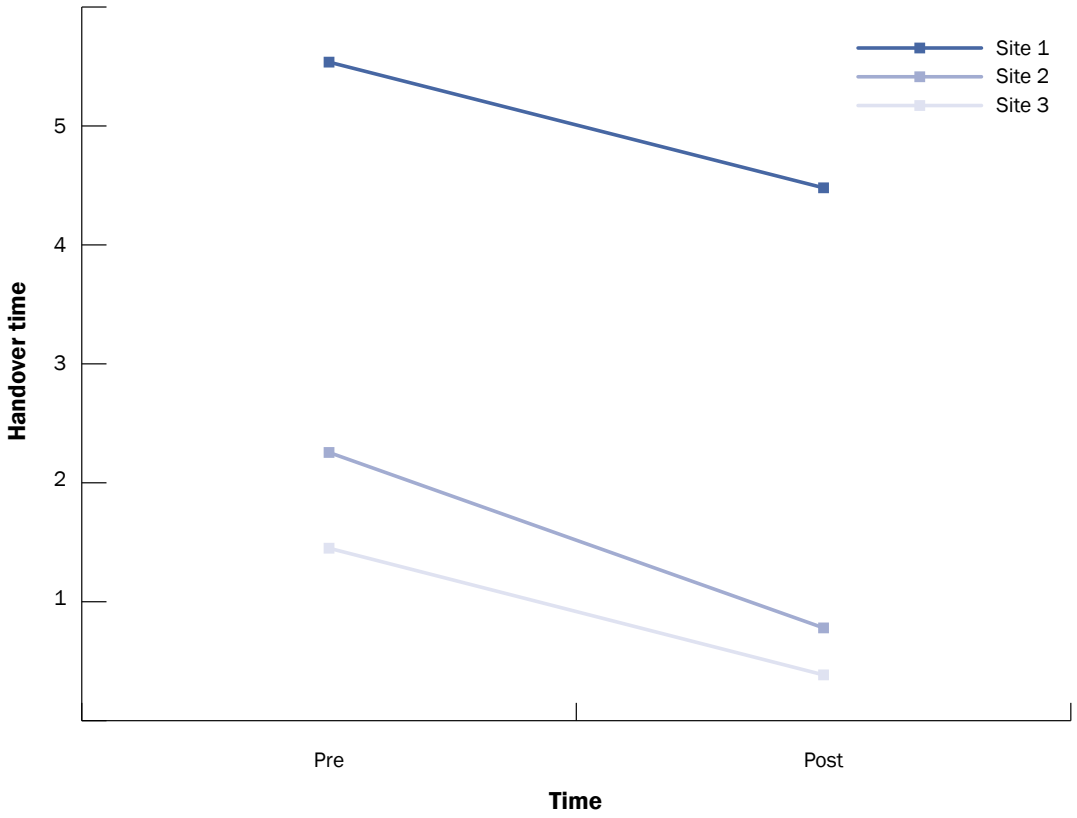
Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower bound	Upper bound
Intercept	1.906818	1.311505	2.209	1.454	.272	-3.254112	7.067748
[time=.00]	1.178571	.547190	10.022	2.154	.057	-.040274	2.397417
[time=1.00]	0[a]	0	-	-	-	-	-

[a] This parameter is set to zero because it is redundant
[b] Dependent Variable: handover time

It is clear that, arithmetically, handover time decreased. Overall, there was a 1.2 hour drop from pre to post. The sample is small although there is nearly a significant effect for time (p=0.057). The average time taken to conduct handover pre-implementation at Site 1 fell by 13%. Likewise, Sites 2 and 3 experienced reductions of 70% and 67%, respectively. From a practical aspect, this can be regarded as significant. Figure 3 plots these results.

Figure 3: Mixed modelling analysis of handover pre and post times.



A comparison of the frequency of incidents on a pre and post basis was undertaken to determine whether or not the handover practice used had an effect on this area. Table 6 outlines incident frequency on a pre and post basis.

Table 6: Incident frequencies for all sites on a pre and post basis.

	Site 1		Site 2		Site 3	
Incident Category	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Burns					1	
Medication Incidents				1	5	
Skin tears		1			1	
Slips, Trips, Falls	7	1	1		2	4
OH&S Incidents			1			
TOTAL	7	2	2	1	9	4

While the overall frequency of incidents decreased in all sites during the implementation period, the distribution between categories has altered (table 6). Descriptive statistics for the number of incidents are shown below (table 7).

There is a clear trend from pre to post; the number of incidents has dropped. The analysis requires a Generalised Mixed Model since the data is not interval but counts. The Poisson distribution is typically used for data of this type (Rabe-Hesketh and Skrondal 2005) (Table 8). Time is negative and statistically significant.

Table 7: Descriptive statistics for the number of incidents.

Site	Time	Mean	N	Std. Deviation
Site 1	Pre	7.0000	7	.00000
	Post	2.0000	2	.00000
	Total	5.8889	9	2.20479
Site 2	Pre	2.0000	2	.00000
	Post	1.0000	1	-
	Total	1.6667	3	.57735
Site 3	Pre	9.0000	9	.00000
	Post	4.0000	4	.00000
	Total	7.4615	13	2.40192
Total	Pre	7.4444	18	2.20220
	Post	3.0000	7	1.29099
	Total	6.2000	25	2.82843

Table 8: Generalised mixed model with a Poisson distribution specified.

Random-effects Poisson-regression				Number of obs	=	6	
Group-variable: site				Number of groups	=	3	
Random-effects u_i ~ Gamma				Obs per group: min	=	2	
				avg	=	2.0	
				max	=	2	
				Wald-chi2(1)	=	4.50	
Log-likelihood	=	-12.119225		Prob > chi2	=	0.0340	
incidents	|	Coef.	StdErr.	Z	P>|z|	[95%Cl]	
time	|	-.9444616	.4454354	-2.12	0.034	-1.817499	-.0714243
_cons	|	1.791759	.3310484	5.41	0.000	1.142917	2.440602

Qualitative Results

Interview results showed that nurses felt the closed door handover process had many negative aspects and few advantages. According to one nurse 'it (the handover process) needed to change.

> *Sometimes we [took] an hour to handover a few patients... a lot of discussion didn't relate to handover (#033)'.*

On the contrary, interviewing revealed that bedside handover had many positive aspects and very few drawbacks. These benefits included the handover being purely patient-centred and the duration of handover being shorter. As one nurse stated:

> *It has increased efficiency of handover, time, handing over everything...issues come up so you can sort that out then and there. It's more efficient for us and patients (#333).*

Field observations and journaling paralleled findings obtained through interviewing. An excerpt from one researcher's journal of pre-intervention handovers stated 'the researcher noted several instances where handover was lengthy and staff would remain in the meeting room well after handover had concluded. This is fitting with interview data'.

Journal entries made under the post-intervention handover also supported interview data. One extract states 'notes made in the research journal support this (shorter duration) aspect. The researcher observed that staff were direct and concise and this resulted in handover taking less time to conduct'.

DISCUSSION

Handover has been identified as a leading source of clinical information that directs nursing practice (Hopkinson 2002; Taylor 2002) as well as providing opportunities for other activities (O'Connell and Penney 2001; Wilson 2007). The literature notes that these additional activities served by the handover process result in lengthy handovers (Payne et al 2000). In this study, nurses' perceptions indicate that bedside handover reduces the amount of time taken to complete the handover process.

Through interviewing and observation researchers ascertained that staff were dissatisfied with the previous process because of the lengthy duration of handovers. This is akin to literature which notes drawbacks of the traditional verbal handover include its tendency to be lengthier than bedside handover (Trossman 2009; Watkins 1993). Nurses in this study were significantly more satisfied with the shorter duration (an average reduction of 48%) taken to perform handover under the bedside format as opposed to the closed door format. From this study, it is evident that the introduction of nurse-to-nurse bedside handover resulted in a significant decrease in the time taken to undertake handover. While Site 1 started and finished with longer durations than the other sites, the researchers attribute this difference to staff numbers, patient numbers and complexity of care required in this site; not to the handover process employed. Literature pertaining to duration of various handover methods supports these findings (Wilson 2007; Lally 1999).

Furthermore, benefits experienced with bedside handover are reportedly connected to a reduction in errors, improved safety (O'Connell and Penney 2001) and better quality of care for patients (Caruso 2007; Trossman 2009). In line with this, comparison of incident frequency on a pre and post basis revealed that the bedside handover process reduced incident frequency.

CONCLUSION

This study aimed to provide knowledge about the duration and safety of two methods of nursing handover. The results of this study indicate that bedside handover approach is significantly less time consuming than the closed door approach previously adopted. The findings indicate a trend in the reduction of frequency of incidents under the bedside handover process. While literature supports this trend, it attributes increased safety to improved accuracy and timeliness of information. This directly conflicts with other findings of the study (not discussed here) that revealed that nurses were undecided about information accuracy under the bedside handover approach.

LIMITATIONS

This study was conducted with a relatively small sample size (n=48) and under the time constraints of a Bachelor of Management (Honours) program thus hindering the ability to employ more exhaustive data collection. A further limitation is that using a mixed-methods approach is more time consuming than other approaches and has resulted in a surface understanding; rather than a comprehensive exploration.

RECOMMENDATIONS

Based on the findings of this study, the authors suggest the following area for further research. The findings indicate a trend in the reduction of the frequency of incidents under the bedside handover process. However, as this reduction is not based on increased accuracy of information as the literature suggests, further research is warranted into factors, other than accuracy and timeliness of information, that may increase safety in clinical settings.

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