



Factors contributing to adverse events after ICU discharge: A survey of liaison nurses

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ARTICLE INFO

Article history:

Received 16 January 2012

Received in revised form 7 June 2012

Accepted 3 July 2012

Keywords:

Adverse event

Patient safety

Intensive care

Discharge

ABSTRACT

Background: A significant number of patients experience an adverse event when discharged from intensive care to a ward. More than half of these events may be preventable with better standards of care.

Aim: To explore the opinions of an expert group of clinicians around factors contributing to adverse events in patients discharged from ICU.

Method: Online survey of Australian ICU Liaison Nurses ($n = 39$) using a validated questionnaire of 25 items.

Results: The response rate was 92.8%. Key contributing factors included a lack of experienced ward staff, patient co-morbidities and the clinically challenging nature of many patients.

Conclusion: Modifying processes of care may decrease the risk or impact of adverse events in this high risk patient population.

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Introduction

Many patients experience an adverse event when discharged from intensive care (ICU).¹ These events are defined² as unintended injury or an event that results in disability, which is caused by the health care provided rather than the patient's disease or illness. Research³ suggests that half or more of all adverse events following ICU discharge may be preventable with better standards of care.

Currently limited data are available on the incidence, characteristics and outcomes of patients who experience an adverse event following ICU discharge.⁴ The specific factors which contribute to adverse events in this high risk population are unclear. Identifying these factors has the potential to improve patient outcomes by streamlining care processes, thus preventing avoidable death and injury as well as reducing health care costs.

Over the last decade a new clinical service role has evolved in Australia to assist ward staff caring for patients discharged from ICU through various mechanisms. The ICU liaison service is generally staffed by an experienced critical care nurse who provides advanced clinical consultancy to ward staff and assists them with the management of patients following ICU discharge.^{5,6} As the ICU Liaison Nurse is a relatively new clinical role, little research has been conducted on this role, such as exploring the unique knowledge these nurses possess. This study utilises a key informant process. Due to their specialised role, ICU Liaison Nurses are in a unique position to provide an informed opinion of the care processes associated with patients discharged from ICU.

Aim

This study builds on earlier qualitative research⁷, which identified key factors contributing to ICU readmission. The aim of the current study was to survey ICU Liaison Nurses to explore the contribution that these and other factors identified in the literature make towards adverse events following ICU discharge.

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Methods

Ethics

Ethics approval was obtained from a university human research ethics committee (approval number V2011 132). There were no anticipated risks to the nurses participating in the study. Non-identifiable data were collected.

Survey instrument

In the absence of a tool to explore nurses' opinions of factors contributing to adverse events following ICU discharge, a questionnaire was developed. The questionnaire was informed by a literature review of studies examining adverse events following ICU discharge and earlier research on ICU readmission.⁷ Tool development guidelines^{8–10} were followed to ensure the questionnaire's rigour, reliability and validity. The questionnaire was piloted amongst 12 ICU Liaison Nurses and its reliability and validity established (alpha coefficient 0.852, content validity index 0.76). The questionnaire consisted of two parts.

The first part contained 16 questions and collected demographic data such as the hours per day the liaison services operated. The second part used five point Likert scales (*never, seldom, sometimes, often, always*) to assess the extent to which respondents believed 25 factors contributed to adverse events after ICU discharge. These factors were categorised into three domains based on Reason's Accident Causation Model¹¹: system or organisation, such as staff skill mix (14 factors); human, such as failure to follow a guideline (8 factors); and patient factors, such as a complex patient with a central venous catheter, tracheostomy and chest drain (3 factors). Reason's model¹¹ proposes that people involved in accidents do not deliberately cause them, and that these events are often due to the characteristics of the environment in which the accident occurs. These characteristics may include weaknesses within the safety systems which are actually designed to prevent harm.

Target population and recruitment

The target population for the survey was Australian ICU Liaison Nurses. This group of specialist nurses has representation through the Australian College of Critical Care Nurses (ACCCN) ICU Liaison Special Interest Group which has 656 members. The ACCCN agreed to contact group members via the email list and invite them to complete the questionnaire. The invitation outlined the background and aim of the survey and contained a hyperlink to the survey website.

To ensure the survey only captured the Special Interest Group members who are practising as ICU Liaison Nurses, recipients were instructed to complete the questionnaire only if their current role involved following up patients after ICU discharge. The survey

was conducted via Survey Monkey which is secured using Secure Socket Layer encryption. Responses were received during a six week period in April and May 2011. Response to the survey implied consent.

Data management and analysis

Data were downloaded and analysed in PASW Statistics 18.¹² Demographic data are reported as descriptive statistics. No assumptions were made about missing data. For the section of the questionnaire on factors contributing to adverse events, Likert scale items are summarised and reported in frequency tables. Strength of relationship between the 25 factors was assessed using Spearman's correlation coefficient, with number of hours per day the service was provided as the dependent variable ($P < 0.05$ was considered statistically significant). These relationships were explored because of all the demographic data, the number of hours per day the service was provided was hypothesised to have the greatest influence on adverse events.

Results

Sixty-seven members of the ICU Liaison Special Interest Group commenced the online questionnaire. Of these 39 completed the questionnaire and indicated their clinical role involved following up patients after ICU discharge. A recent survey¹³ found that 27% of 113 Australian ICUs have a Liaison Nurse service, with a mean of 1.4 full time equivalent positions (i.e. population = 42). Based on this, our study had a response rate of 92.8% (39/42) of the Australian ICU Liaison Nurse population.

The Liaison Nurses worked in hospitals with bed numbers ranging from 100 to 700 (mean 391). ICU bed numbers ranged from five to 48 (mean 17.5). Of the ICUs, 15% were level I, 22% were level II and 63% level III. Most of the Liaison Nurses (82.1%) had a Graduate Certificate or Diploma in intensive care nursing. The length of time the Liaison Nurse services had been available ranged from two months to more than 13 years. The operation times of the Liaison Nurse service ranged from one to 24 h (mean 9.5, SD 5.01) per day. Sixty percent provided the service during business hours (08:00–18:30); eight percent after hours (18:30–23:00); with the remaining 32 percent offering services in and out of business hours (08:00–22:00).

System factors contributing to adverse events

Of the 14 system factors hypothesised to contribute to adverse events, most were deemed by half or more of the Liaison Nurses to sometimes or often contribute to these events. These are summarised in Table 1.

Table 1
System factors.

| Factor | Never/seldom (%) | Sometimes (%) | Often/always (%) |
|--|------------------|---------------|------------------|
| Heavy workloads on the wards | 2.6 | 21.1 | 76.3 |
| Lack of experienced nursing staff on the wards | 5.3 | 42.1 | 52.6 |
| Lack of/inadequate supervision of ward medical staff | 7.9 | 42.1 | 50 |
| Lack of/inadequate supervision of ward nursing staff | 7.9 | 44.7 | 47.3 |
| Lack of experienced medical staff on the wards | 5.3 | 47.4 | 47.3 |
| Patient discharged from ICU after hours | 23.7 | 39.5 | 36.8 |
| Ward nursing staff skill mix not usual ratio | 28.9 | 36.8 | 34.2 |
| Lack of adequately qualified ward staff | 13.2 | 52.6 | 34.2 |
| Ward staffing levels below normal requirements | 39.5 | 28.9 | 31.5 |
| Nurse to patient ratios | 42.1 | 28.9 | 28.9 |
| ICU discharge process | 36.8 | 34.2 | 28.9 |
| Patient admitted to inappropriate ward | 44.7 | 28.9 | 26.3 |
| Patient discharged from ICU prematurely | 28.9 | 52.6 | 18.4 |
| Fragmentation of patient management due to input of multiple medical teams | 10.5 | 73.7 | 15.8 |

Table 2
Human factors.

| Factor | Never/seldom (%) | Sometimes (%) | Often/always (%) |
|---|------------------|---------------|------------------|
| Delayed medical care on the ward | 0 | 31.6 | 68.4 |
| Lack of recognition of (or response to) patient deterioration | 5.3 | 42.1 | 52.7 |
| Inadequate patient monitoring or assessment | 7.9 | 42.1 | 50 |
| Failure to deliver what is considered standard care | 13.2 | 39.5 | 47.4 |
| Delay in providing nursing care | 10.5 | 52.6 | 36.9 |
| Failure of staff to follow a rule or policy | 28.9 | 50 | 21 |
| Failure to follow advice from a senior clinician | 21.1 | 57.9 | 21 |
| Inadequate patient handover from ICU to ward staff | 29.7 | 51.4 | 18.9 |

Table 3
Patient factors.

| Factor | Never/seldom (%) | Sometimes (%) | Often/always (%) |
|---------------------------------|------------------|---------------|------------------|
| Clinically challenging patients | 0 | 31.6 | 68.4 |
| Increased illness acuity | 5.3 | 36.8 | 57.9 |
| Presence of co-morbidities | 0 | 42.1 | 57.9 |

Table 4
Factors associated with number of hours per day the Liaison service was available.

| Factor | Spearman's correlation coefficient | P value | Coefficient of determination |
|--|------------------------------------|---------|------------------------------|
| Nurse:patient ratios | −0.354 | 0.017 | 12.5% |
| Inadequate patient handover from ICU staff | 0.308 | 0.036 | 9.4% |
| Inadequate patient monitoring | 0.285 | 0.046 | 8.1% |
| Ward staffing levels below normal requirements | −0.279 | 0.049 | 7.8% |

Human factors contributing to adverse events

All eight human factors were deemed by the majority of respondents to sometimes or often contribute to adverse events. These are summarised in Table 2.

Patient factors contributing to adverse events

All three patient factors were believed to be major contributors to adverse events following ICU discharge; these are reported in Table 3.

Correlation

Strength of relationships between the number of hours per day the Liaison Nurse service was provided and the 25 systems, human and patient factors are summarised in Table 4. Only factors which demonstrated correlation are listed (i.e. those reaching statistical significance). Two factors, 'lack of experienced nursing staff on wards' and 'failure to deliver what is considered standard care' did not reach significance but had *P* values <0.6.

Discussion

This study aimed to explore ICU Liaison Nurses' opinions of factors contributing to adverse events following ICU discharge. Numerous factors were identified, by expert opinion, as sometimes or often contributing to adverse events.

Two recent studies^{1,3} identified factors contributing to adverse events in the post-ICU population; this was achieved primarily via chart review. Contributing factors in these studies included delay in taking action for abnormal vital signs and infrequent charting. Results from our study were similar, though obtained via a different method. The majority of Liaison Nurses believed that inadequate patient monitoring or assessment sometimes or often contributed to adverse events; most also believed that a lack of recognition (or response to) patient deterioration sometimes or often contributed.

Research^{14–16} similarly found that deterioration in other patient cohorts is often documented but not acted upon. Our findings, though only expert opinion, reinforce the importance of measuring, recording and reporting of abnormal vital signs in patients discharged from ICU. They also emphasise an essential role for ICU Liaison Nurses – ensuring that ward staff understand the significance of vital sign measurement and interpretation in post-ICU patients. These findings also raise the broader question of why this crucial assessment is not occurring in the first instance. This is an area for further research and may relate to staff skill mix, qualifications, experience or staff supervision, which were also identified as key contributors in our study. The choice (or lack of choice) of post-ICU discharge destination may also be a factor.

Over half the ICU Liaison Nurses believed that admitting patients to an inappropriate ward sometimes or often contributed to adverse events. If a patient requires high dependency care, it cannot be assumed they will receive it in an environment not resourced to do so; similarly it cannot be assumed that a patient will receive specialised care in a general ward. The challenge of caring for multiple patients who require highly skilled care compounded by rapid unpredictable changes in care has been recognised.^{17–19}

It is surprising that a patient would be discharged from ICU to an inappropriate environment given that many post-ICU patients still require close observation and comparatively more complex care than routinely provided at ward level.⁶ However in the current era of resource limitations such as a shortage of ICU beds,²⁰ remaining in ICU may not always be feasible given competing priorities. It is often difficult to identify indicators that define the right discharge destination for high-risk ICU patients.²¹ Decisions on when to discharge patients from ICU and the ideal discharge location are complex and influenced by many factors. Heterogeneity in ICU discharge practices has therefore been identified.²² The complexity of ICU discharge decision making and its impact on patients' outcomes has also been demonstrated.²³

ICU bed availability and associated step-down bed availability (HDU) may be the factor most likely to have the greatest impact on ICU discharge decisions, resulting in an admission to a ward environment with lower nurse to patient ratios and differing staff

skill mix and staff expertise than found in a high-dependency unit.

In our correlation analysis, a significant negative relationship was found between ward staffing levels and the number of hours per day Liaison Nurses work. A negative relationship was also found between nurse:patient ratios and the number of hours per worked. Given the relationship which has been established^{24–26} between nurse staffing, workload, patient dependency and outcomes, these are expected findings. Our results also highlight the important clinical contribution of ICU Liaison Nurses when hospital beds are in short supply.

Nearly three quarters of the Liaison Nurses believed that after hours discharge from ICU sometimes or often contributed to adverse events. The detrimental impact of after-hours ICU discharge on patients' outcomes has been previously demonstrated.^{27–29} In our study, Liaison Nurses were available 24 h/day at only three sites; these respondents believed that after hours ICU discharge is seldom a factor contributing to adverse events. A study comparing patient outcomes in hospitals with and without a 24 h Liaison Nurse service may therefore be worth conducting.

More than half of the Liaison Nurses surveyed believed that inadequate patient handover from ICU to ward staff sometimes contributed to adverse events. Given the links identified^{30,31} between handover, care quality and patient outcomes, we expected this factor to be rated more highly. Quality of clinical handover is currently a priority area for the Australian Commission on Safety and Quality in Health Care³² and research³ has found that care needs are not always communicated to ward staff when a patient is discharged from ICU.

In correlation analysis, a positive relationship was found between inadequate patient handover and the number of hours per day Liaison Nurses worked. This is an unexpected finding and might be explained by an ICU nurse's need to give a rushed handover due to an impending new ICU admission; this might also occur if he or she knew that a Liaison Nurse was available to assist ward staff with patient care. Unplanned discharge from ICU after hours is often rushed to accommodate an emergency ICU admission.^{3,33} It is unclear if this also occurs during business hours.

Attempts⁴ are currently being made to improve the quality of handover from ICU staff such as the adoption of a discharge plan. If ward staff are not informed of the care required following ICU discharge particularly if the patient is admitted to a general ward area, then it is quite likely continuity of care will not occur. This highlights another key role for ICU Liaison Nurses – ensuring ward staff are aware of essential patient care and have the skills or resources to deliver it.

Research^{34,35} has found that undergraduate medical and nursing education often lacks a critical care component, possibly explaining why important care is missed in post-ICU or acutely ill patients. Attempts³⁶ have been made to address this problem, such as the development of core competencies in acute care for undergraduates. Not surprisingly more than half the Liaison Nurses in the current survey indicated a lack of adequately qualified ward staff was sometimes a contributing factor to adverse events and a third indicated it was often a contributing factor. Other data support this. For example most Liaison Nurses believed that delays in providing nursing care on the wards, such as not sitting a patient out of bed for two days following ICU discharge, sometimes or often contributed to adverse events.

All three patient factors were rated highly in terms of their contribution to adverse events. This is consistent with previous research^{37,38} which found that risk factors for ICU readmission include older age (e.g. >65 years) and the presence of comorbidities. ICU readmission was also shown to increase the risk of in-hospital mortality in these studies. Patient characteristics

however are not factors which clinicians can modify or alter but they highlight patients who are at greater risk of an adverse event.

Strengths and limitations

This study builds on earlier qualitative research on ICU readmission.⁷ By doing so it adds to the understanding of adverse events in patients recently discharged from ICU. It is also the first study to explore and utilise the in-depth knowledge and experience that Australian ICU Liaison Nurses' have of this clinical problem.

The size of the ICU Liaison Nurse population is estimated to be 42; 39 of these Nurses contributed data to this study. It is not known what true portion of the ICU Liaison Nurse population this actually represents however and it is likely that the actual population is greater than estimated. This study's findings may therefore have differed if a larger portion of ICU Liaison Nurse population completed the questionnaire, or if the factors contributing to adverse events were able to be captured in real time. Furthermore the number of factors used in the correlation analysis is potentially a methodological limitation.

Although ICU Liaison Nurses were uniquely positioned to inform this study, the results only represent collective expert opinion. These factors require prospective clinical validation. Further research is also needed to explore how or why key factors influence quality of care and patient outcomes following ICU discharge.

Clinical implications

The findings of this study may have implications for patient safety and quality of care following ICU discharge. ICU and ward staff need to understand the risks and implement processes to manage patients discharged directly from ICU to a ward. Medical and nursing staff caring for post-ICU patients on hospital wards should also be educated on the importance of ongoing assessment of these high risk patients. There is also a strong argument for post-ICU patients' care being delivered by the most qualified staff. Where possible ward managers should assess staff skill mix when an admission from ICU is expected; however given that some of these admissions occur after hours or at short notice, this may not be possible.

Conclusion

There is consensus among ICU Liaison Nurses in this study regarding the factors contributing to adverse events following ICU discharge. Establishing expert opinion about these factors is a step towards minimising the incidence and impact of these events, and thus improving patient outcomes. Future research needs to examine exactly how these and other factors influence patient outcomes so that processes of care can be streamlined hopefully reducing the incidence and impact of future adverse events in patients discharged from ICU.

Acknowledgement

The authors thank the ICU Liaison Nurses who contributed data to this study, the ACCCN for administering the survey and Professor Jenny Peat for statistical advice.

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