CLINICAL EFFECTIVENESS OF A CRITICAL CARE NURSING OUTREACH SERVICE IN FACILITATING DISCHARGE FROM THE INTENSIVE CARE UNIT

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Background Improved discharge planning and extension of care to the general care unit for patients transferring from intensive care may prevent readmission to the intensive care unit and prolonged hospital stays. Morbidity, mortality, and costs increase in readmitted intensive care patients.

Objectives To evaluate the clinical effectiveness of a critical care nursing outreach service in facilitating discharge from the intensive care unit and providing follow-up in general care areas.

Methods A before-and-after study design (with historical controls and a 6-month prospective intervention) was used to ascertain differences in clinical outcomes, length of stay, and cost/benefit. Patients admitted to intensive care units in 3 adult teaching hospitals were recruited. The service centered on follow-up visits by specialist intensive care nurses who reviewed and assessed patients who were to be or had been discharged to general care areas from the intensive care unit. Those nurses also provided education and clinical support to staff in general care areas.

Results In total, 1435 patients were discharged during the 6-month prospective period. Length of stay from the time of admission to the intensive care unit to hospital discharge (*P*= .85), readmissions during the same hospital admission (5.6% vs 5.4%, *P*= .83), and hospital survival (*P*= .80) did not differ from before to after the intervention.

Conclusions Although other studies have shown beneficial outcomes in Australia and the United Kingdom, we found no improvement in length of stay after admission to the intensive care unit, readmission rate, or hospital mortality after a critical care nursing outreach service was implemented. (*American Journal of Critical Care.* 2010;19:e63-e72)

The major role of intensive care units (ICUs) is to save lives that would otherwise be lost to conditions such as severe infection, trauma, burns, drug overdose, or acute respiratory failure. Australia has 167 hospitals with ICUs that, in 2003, admitted 143 000 patients.[1] Overall survival is good, with 85% of patients being discharged from the hospital. However, critical care is expensive. In the United States in 2000, critical care costs represented 13.3% of hospital costs, 4.2% of national health expenditures, and 0.56% of the gross domestic product. The number of ICU admissions and the cost per day of ICU care in Australia are unknown but are most likely substantially lower than in the United States (eg, 0.1% of gross domestic product, which corresponds to about 900 million per annum). However, demand for intensive care services is increasing, and intensive care is growing at a rate that is higher than the average for all health services.[2] Demand for increasingly sophisticated technology in clinical care, increasing numbers of older patients with concomitant comorbid diseases, and increased consumer expectations all contribute to this increased demand for intensive care services.[3]

Given the financial burden of critical illness, there is considerable impetus to consider strategies to reduce the demand for intensive care services, ideally by preventing critical illness in the first place. Once a patient has been selected for discharge from ICU, however, the goal is to expedite their discharge

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from the ICU and then from the hospital by preventing deterioration that requires readmission to the ICU or a prolonged hospital stay. Patients who are readmitted to the ICU have increased morbidity, mortality, and costs.[4]

Timely detection of critically ill patients or patients in deteriorating condition is of paramount importance in improving their outcomes. Indeed, attempts to facilitate the early management of patients who exhibit signs of deteriorating condition underpinned the implementation of "medical emergency teams" (METs) in hospitals (initially) throughout Australia[5] and now throughout the world. The MET concept, however, relies on the staff in general care areas being able to recognize that the patient's condition is deteriorating and then to call for the MET to attend. In a cluster randomized controlled trial to compare outcomes with a MET versus without a MET, researchers found no improvement in the incidence of cardiac arrest, unplanned ICU admissions, or unexpected death with an MET, which suggests that this approach may not be as effective as initially reported.[6] An alternative strategy for post-ICU patients is use of an ICU outreach team (in the United Kingdom)[7] or an ICU liaison nurse (in Australia).[8] The principle underpinning ICU "outreach" services is to avert readmission to the ICU (and in-hospital death) once patients are discharged from the ICU. Readmission is avoided by monitoring the post-ICU discharge progress and promptly recognizing when patients are unwell or in deteriorating condition so

> Australia has 167 hospitals with intensive care units (ICUs).

as to permit initiation of appropriate interventions. In a landmark study[7] that galvanized interest in this outreach concept, researchers reported a reduction in readmissions to the ICU by 6.4% (95% confidence interval [95% CI] 0.26-0.87) after the introduction of a critical care (nurse) outreach team in the United Kingdom. Hospital survival in ICU patients was increased by 6.8% (relative risk 1.08, 95% CI, 1.00-1.18), although the difference was not statistically significant.[7] The characteristics of the "before" and "after" cohort of ICU patients in that study did not differ significantly, thus reducing the likelihood that the improvements in outcomes were due to confounding. In a more recent multicenter survey of 108 units in the United Kingdom, the critical care outreach service was associated with significant decreases in the proportion of patients admitted to the ICU who had received cardiopulmonary resuscitation before admission (95% CI, 0.73-0.96), in after-hours ICU admissions (95% CI, 0.84-0.97), and in mean physiology score[9] (95% CI, 0.31-2.12) but neither ICU mortality (95% CI, 0.87-1.08) nor in-hospital mortality changed significantly.[10]

A critical care nursing outreach service thus extends critical care services beyond the confines of the ICU, to function within a service and educational partnership between the ICU and the general care areas. The outreach teams support the staff in general care areas by following up patients recently discharged from the ICU, as well as participating in discharge planning for ICU patients. Discharge planning is important for enabling timely discharge to the general care area. In a study conducted at one of this project's study sites in 2000 and 2001, the researchers detected a significant delay in transfer from the ICU in 27% of patients, even in patients who had been ready for transfer to the general care area for several days.[11] These delays not only result in unnecessarily higher costs, but the delays block potential admissions to the ICU and can result in hastily performed discharges after hours if an ICU bed is needed in an emergency. Although bed availability was an issue that delayed discharge, having adequate support for specialized services in the general care areas was also identified as a factor in delaying transfer.

In reports[12-15] of previous evaluations of the use of liaison nurses in Australian hospitals, researchers have described positive outcomes. Chaboyer et al[12] reported a 3-fold reduction in delays of at least 2 hours in discharge from the ICU and a decrease of about 2.5 times in delays of 4 hours or more when a liaison nurse service was implemented. Furthermore, use of liaison nurses was positively evaluated by nursing staff in the general care areas[13] and by patients and their families.[14] Green and Edmonds[15] found the proportion of medical readmissions to the ICU decreased from 2.3% to 0.5% after the liaison nurse service was introduced. However, in a more recent 3-year study, researchers found no significant change in median length of stay (LOS) in the ICU, median hospital LOS, or ICU or hospital mortality before and after use of an ICU liaison nurse was implemented.[16]

Few studies have been done to evaluate the effect of use of Australian liaison nurses on outcomes in a large cohort of critically ill patients. This study was intended to evaluate the clinical effectiveness of the critical care nursing outreach service in 3 tertiary hospital sites in Perth, Western Australia.

Materials and Methods
Objectives

The goal of this study was to evaluate the effect of a critical care nursing outreach service on the outcomes of patients discharged from the ICU, specifically, LOS in hospital from the time of admission to ICU, hospital mortality, and readmissions to ICU.

Design

A before-and-after study design was used, along with historical controls and a prospective intervention. Six months of retrospective data were collected before 6 months of prospective data collection after implementation of the outreach service. Patients who were discharged from the ICU between June 2 and November 30, 2007, comprised the preintervention cohort, and patients discharged between June 2 and November 30, 2008, were recruited for the postintervention cohort.

Participants and Setting

Patients discharged from the ICU in 1 of the 3 adult tertiary-referral hospitals in Perth (Royal Perth Hospital, Sir Charles Gairdner Hospital, and Fremantle Hospital) were recruited. The level III ICUs[17] operate as closed ICUs, which is customary in Australia and New Zealand. Patients who died in the ICU or were discharged directly from the ICU to home or to another hospital or institution were excluded.

Ethical Considerations

The need to obtain formal consent from the patient was waived after a review by the institutional ethics committee in accordance with the Australian

> The ICU outreach role is to avert readmission to the ICU (and in-hospital death) after ICU discharge.

National Health and Medical Research Council guidelines.[18] All patients in the prospective data collection were subject to the intervention. The change in practice at the study hospitals is considered best practice in several ICUs in Australia and the United Kingdom. Approval to conduct the study was obtained from the department heads. The confidentiality of participants has been maintained; data are reported in ways that ensure that individuals are not identifiable. The information collected is kept in a secure environment, and electronic data are stored on a password-protected computer. Any publication arising from the study does not identify individual participants.

Critical Care Nursing Outreach Service

The service involved assessments before discharge from the ICU and follow-up visits by critical care nurse specialists, who reviewed and assessed patients before and after discharge from the ICU to the general care areas. The nurse specialists provided coverage 7 days a week during business hours (8 AM to 5 PM). In addition, they provided education and clinical support to the staff in the general care areas. A protocol for the processes to be undertaken at the bedside—and the actions to be taken in response—was developed in consultation with a multidisciplinary team informed by guidelines already developed in the United Kingdom.[19] Minimal modification was required at each hospital, to accommodate the differing structures and processes for patient care at the individual hospitals.

Implementation of the Service

Development of the job description and selection criteria enabled the recruitment of 2 outreach nurses at each site. The outreach nurses were provided with a 2-week orientation period to enable them to familiarize themselves with their role. Hospital staff were informed about the study through newsletters, personal communication, and education sessions. The promotion of the outreach service continued throughout the implementation phase.

Outcomes

The primary outcome was LOS in the hospital from the time of admission to the ICU to hospital discharge for patients' first admission to the ICU during the study. Secondary outcomes were (1) the number of ICU readmissions during the same hospital admission, (2) survival to hospital discharge, (3) day of week discharged from the ICU, (4) time of day discharged from the ICU, (5) activities of the outreach nurse, and (6) delay to discharge from the ICU.

Data Sources

Data for the primary outcome were abstracted from the Western Australian Health Department's administrative computer system (The Open Patient Administration System), in which all patient admissions, transfers, and discharges are recorded.

Statistical Analysis

Time zero for the calculation of the primary outcome was taken as the date and time that the patient was admitted to the ICU for the first time. Each of the study outcomes was first analyzed by using univariate statistics to compare the outcomes before and after the intervention. (Percentages may not total 100% because of rounding.) Severity of illness was assessed by using the worst score on the Acute Physiology and Chronic Health Evaluation (APACHE) II during the first 24 hours.[20] Length of stay was calculated from the time of admission to the ICU to the time of discharge from the hospital. Readmissions during the same hospital stay were defined as early, those within 48 hours[10] and therefore most likely to be attributable to ICU-related care, or late, those occurring more than 48 hours after discharge from the ICU and more likely to be associated with an issue in the general care area. Time of day discharged from ICU was categorized as daytime (7 AM to 5:59 PM), evening (6 PM to 9:59 PM), and nighttime (10 PM to 6:59 AM). Patients' discharge from the ICU was defined as delayed when patients who were deemed suitable for discharge from the ICU were not discharged for more than 8 hours.[11] For cases in which multiple reasons were given for the delay, medical condition took precedence, followed by lack of availability of a bed in the general care area.

Categorical variables were reported as frequencies and compared by using a χ^2 test. Continuous data were reported as medians and interquartile ranges (IQRs) and compared by using the Student t test for normally distributed data and nonparametric tests for data that were not normally distributed. Multiple linear regression was used to examine the independent effect of the intervention on the primary outcome, adjusted for age and sex. The outcome measure, in-hospital LOS from the time of ICU admission, was log-transformed because these data were not normally distributed. Data were analysed by using SPSS, version 17.0 (SPSS Inc, Chicago, Illinois). Where data were missing, the number of available observations is reported and no assumptions are made about the

> Outreach teams support the ward staff by following up patients recently discharged from the ICU.

Table 1
Characteristics of cohorts before and after intervention

Characteristic	Before (n = 1566)	After (n = 1435)
Age, mean, y	55	54
Males, %	65	65
Score on Acute Physiology and Chronic Health Evaluation II for 2762 patients, mean	16.8	16.7
Length of stay in intensive care unit, median, d	1.9	1.8
Length of stay from time of admission to intensive care unit to hospital discharge, median, d	9.8	10.1
Hospital mortality, %	5.5	5.4
Readmissions, %	5.6	5.4

missing data. Two-sided comparisons with 95% CIs were used, and *P* values less than .05 were considered statistically significant.

Sample Size

According to the 2002 data for all patients discharged alive from the ICU at Royal Perth Hospital (n = 1345), the mean LOS in the hospital after discharge from the ICU was 13.2 days (SD, 28.0 days). Therefore, for a 20% reduction in post-ICU LOS in hospital (ie, to reduce the mean LOS from 13.2 to 10.5 days), for a power of 0.90, and an alpha of 0.05, a minimum of 1320 patients was required. According to 2007 data obtained from each of the 3 study hospitals, approximately 60 patients are discharged (alive) from the ICU each week, with the weekends having the lowest proportion of discharges. Thus, based on an estimate of 60 patients per week for 26 weeks, a total of 1560 post-ICU patients were expected during the 6-month intervention period. If one estimates that 10% of patients will not be suitable to enter the study (eg, died in the ICU or were discharged to another facility or directly home from the ICU), the number of patients discharged from the 3 ICUs would be sufficient to meet the required sample size of 1320 patients.

> Neither ICU nor hospital length of stay differed from before to after use of critical care outreach.

Results

Of the total of 3001 patients discharged from the 3 ICUs during the study period, 1566 patients were in the 2007 "before intervention" cohort and 1435 patients were in the 2008 "after intervention" cohort. The characteristics of both cohorts are compared in Table 1. The cohorts from before and after the intervention were not significantly different.

The mean age was 55 (SD, 19) years in the before group compared with 54 (SD, 19) years in the after group ($t = -1.96$, $P = .05$). The proportion of men was 65%, the same for both cohorts. From available data for 2762 patients, the mean APACHE II score was 16.8 (SD, 7.4) in the before group and 16.7 (SD, 7.2) in the after group ($t = -0.37$, $P = .66$).

Primary Outcome

The LOS for the ICU patients in the before cohort (median, 1.9 days; IQR, 1.0-4.0 days) was not significantly different ($z = 0.57$, $P = .57$) from that in the after cohort (median, 1.8 days; IQR, 0.9-4.8 days). The median LOS in the hospital from admission to the ICU until hospital discharge was 9.8 (IQR, 6.0-19.5) days in the before cohort and 10.1 (IQR, 5.9-20.6) days in the after cohort ($z = 0.18$, $P = .86$). After adjustment for patients' age and sex, the LOS after admission to the ICU did not differ significantly between the cohorts (95% CI, -0.096 to 0.041, $P = .42$).

Secondary Outcomes

Secondary outcomes were (1) number of ICU readmissions during the same hospital admission, (2) survival to hospital discharge, (3) day of week discharged from the ICU, (4) time of day discharged from the ICU, (5) activities of the outreach nurse, and (6) delay to discharge from the ICU.

Before the outreach service was implemented, 5.4% of patients were readmitted to the ICU during the same hospital admission, with 40% of the first readmissions within 48 hours of discharge from the ICU. After implementation of the outreach service, 5.6% of patients were readmitted to the ICU during the same hospital admission, with 33% of the first readmissions within 48 hours of discharge from the ICU. Readmission rates did not differ significantly between cohorts ($\chi_1^2 = 0.04$, $P = .83$). Although the proportion of later admissions was lower after the introduction of the critical care outreach service, this difference was not statistically significant ($\chi_1^2 = -0.94$, $P = .33$). Hospital mortality was similar between cohorts: 5.5% before the outreach service was implemented compared with 5.4% after the service was implemented ($\chi_2^2 = -0.03$, $P = .86$).

The day of discharge did vary between the 2 cohorts ($\chi_6^2 = 18.8$, $P = .005$), as shown in Figure 1. Most patients were ready for discharge on weekdays and least often on Sundays in both cohorts, but discharges on Sundays decreased almost by half after the outreach service was implemented compared with before.

The time of discharge did not differ significantly from before to after the introduction of the critical
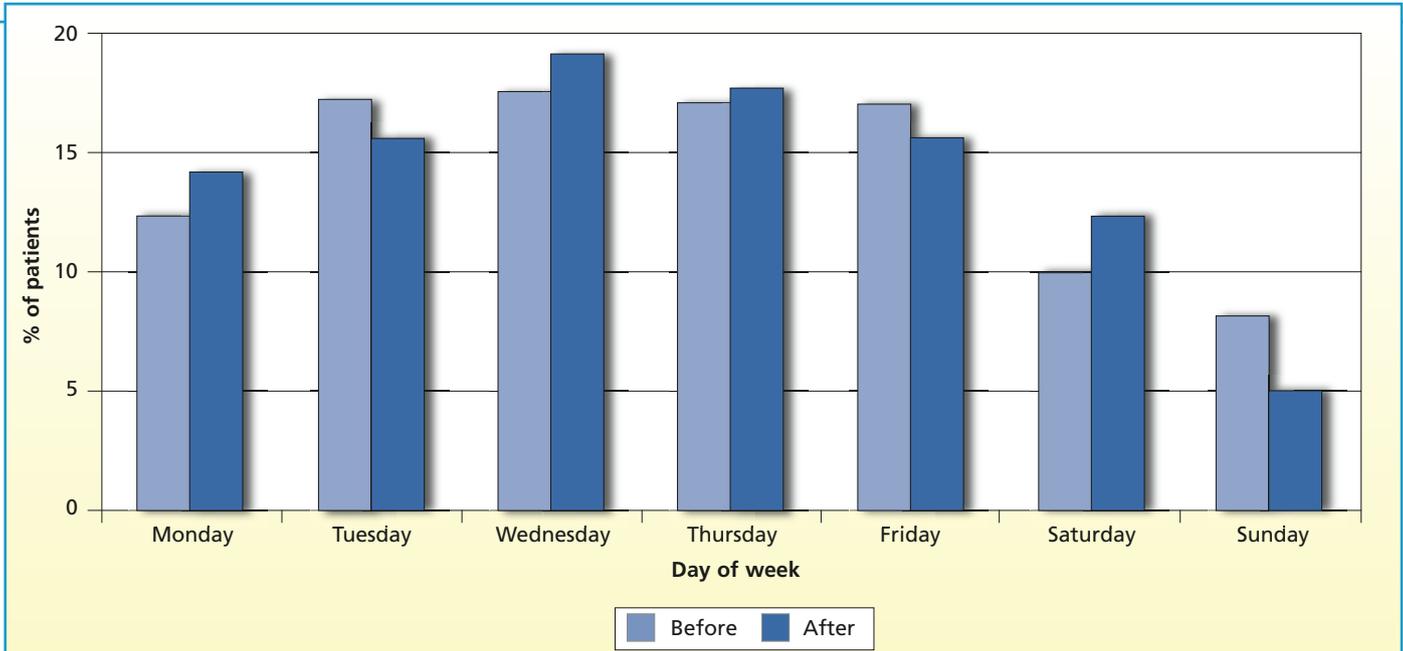
Figure 1 Comparison of day of discharge before and after implementation of a critical care nursing outreach service.

care outreach service ($\chi_2^2 = 3.0$, $P = .22$). The most common time for discharge was in the daytime (77% before and 78% after implementation of the outreach service). Further comparison showed that evening discharges were more frequent after than before the intervention; nighttime discharges were more frequent after (10%) than before (8%) the intervention (Figure 2).

Outreach Service

After the outreach service was implemented, 1435 patients were discharged from the ICU. The following results relate only to this postintervention cohort. Of these 1435 patients, the critical care outreach nurses visited 1198 patients before their discharge from the ICU (83% of patients admitted to the ICU during the study period). Some patients had more than 1 visit from the outreach nurses before their discharge, giving a total of 1459 visits.

Predischarge Visits

Fourteen percent of the patients who received a predischarge visit required 2 or more visits (range, 1-7 visits). The time taken for visits conducted before the patient's discharge from the ICU ranged from 2 to 260 (median, 15; IQR, 15-30) minutes. Issues most often encountered were respiratory (70% of visits), related to catheters (52% of visits), gastrointestinal (52% of visits), renal (48% of visits), and cardiovascular (45% of visits). Up to 14 types of referrals, 1115 in total, were made for 456 patients at these predischarge visits. The 5 most common
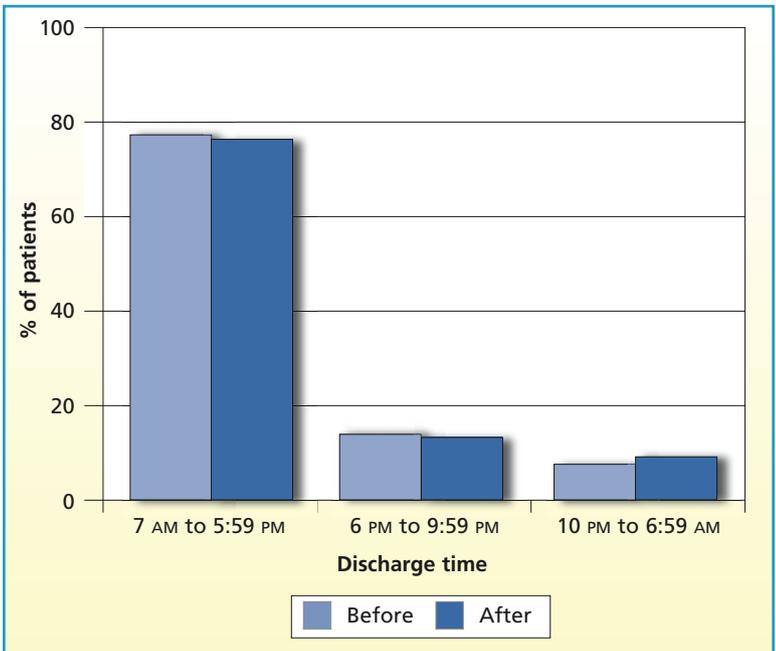

Figure 2 Comparison of time of discharge between before and after implementation of a critical care nursing outreach service.

referrals were to the ICU team (52%), a physiotherapist (23%), a dietitian (19%), a specialty team, (19%) and a speech pathologist (16%).

Care Needs on Discharge From the ICU

From a total of 1435 patients discharged from the ICU after implementation of the outreach service, just more than half (56%) had no requirements for

Table 2
Number of referrals made at the review after discharge from the intensive care unit (3721 visits)

Referral to	No.
Specialty team	347
Physical therapist	134
Dietitian	101
Speech pathologist	74
Other medical	61
Intensive care unit team	51
Social worker	43
Acute pain service	36
Occupational therapist	26
Wound	26
Ostomy nurse	24
Psychiatry/psychologist	11
Diabetic educator	9
Other	83
Total referrals	**1026**

special accommodation on discharge from the ICU. For the others, accommodation needs included 1:1 nursing care (29 discharges, 2%), isolation/single rooms (70 discharges, 5%), 1:1 nursing care and isolation (5 discharges, 0.3%), high-dependency unit (335 discharges, 23%), coronary care unit (28 discharges, 2%), and other requirements related to nursing staffing (135 discharges, 9.4%). Thirteen discharged patients (1%) required other care requirements (eg, patient care assistant to guard patient, burns room, larger 2-bed room for bariatric patient). Three percent of patients had some order restricting resuscitation (do not resuscitate in 23 patients [2%], no cardiopulmonary resuscitation/MET activation /escalation of treatment in 16 patients [1%]) before discharge from the ICU. Most discharged patients had vascular catheters (93%): 66% of discharged patients had central catheters, and 83% required some form of respiratory therapy, including tracheostomy in 9%. Urinary catheters (84%) also were common, 43% of patients had concerns associated with intravenous fluids, and 81% had issues related to fluid balance that required monitoring in the general care area. Thirty-three percent of patients had cardiovascular intervention: cardiac monitoring, drains, pacing, and/or vasoactive infusions. Confusion or delirium was present in 11% of patients.

Postdischarge Review

Most patients (89%) from the cohort after the outreach service was implemented were reviewed while in the general care area after their discharge from the ICU. Of the 3721 reviews conducted among 1285 patients discharged from the ICU, 93% were considered routine. The number of reviews performed by the critical outreach team ranged from 1 to 49 visits (median, 1; IQR, 1-3). The mean time spent for each review was 18 (SD, 16.9) minutes but ranged from 4 to 450 minutes. At the Royal Perth Hospital, most patients were discharged to postsurgical care areas, but most reviews were conducted in medical care areas. The reviews by the critical care outreach nurses were conducted primarily for reasons related to the patient (95%) but education (n = 251), clinical issues (n = 218), advice (n = 121), equipment (n = 119), staff in the general care area (n = 94), adverse events (n = 90), and relatives (n = 32) were also the primary or secondary reason(s) for conducting the review.

Interventions (categorized as manipulation of existing therapy, recommending a practice change, education, or referral) were related to respiratory (18%), gastrointestinal (13%), catheter (7%), renal (6%), psychiatric/psychological (6%), electrolyte (5.5%), cardiac (5%), neurological (3%), pain management (4%), wound care (3.5%), activities of daily living (3%), hematological, metabolic (3%), microbiological (2%), and musculoskeletal (2%) issues.

Patients (n = 173) were referred to specialist services on 1026 occasions. For patients who had a referral, the median number of referrals was 2 (IQR, 1-3) but as many as 38 referrals per patient were made. Most referrals were to the patient's specialty team (Table 2).

Delays in Discharge

Of 1261 discharged patients for whom data on when they were deemed suitable for discharge were available, 36% of patients had their discharge from the ICU delayed by more than 8 hours. Among these patients, no bed being available or a delay in a bed becoming available were the most common reasons for the delay, accounting for 45% of discharge delays. Medical concerns accounted for 21% of delays in discharge; no reason was given for 27% of delays. Other reasons were staff shortages (4%), skill mix issues (2%), and lack of suitable accommodation (1%). The distribution pattern of the day the patient was deemed suitable for discharge from the ICU differed significantly ($\chi^2_6 = 39.3$, $P < .001$) between patients whose discharge was delayed and patients whose discharge was not delayed. Delayed discharges occurred most often on Mondays and Sundays. Patients whose discharge was delayed were more likely to be discharged after hours than were patients whose discharge was not delayed ($\chi^2_2 = 89.7$, $P < .001$).

Discussion

In this large, multicenter study, duration of stay in the hospital from the time of admission to the ICU, in-hospital mortality, and readmission to the ICU during the same hospital admission did not change significantly after the introduction of a critical care nursing outreach service. Although more than 3000 patients were recruited for our study (1566 before and 1435 after the introduction of the critical care nursing outreach service), it is possible that a larger sample is needed to show a significant difference in LOS. It is not surprising that mortality and readmission rate did not change significantly after the outreach service was implemented. Both mortality and readmission rates for the study hospitals' ICU are already low by Australian[21] standards, and a larger sample is more likely to be necessary for a significant difference to be detected for this low-frequency outcome.

Reports describing outcomes from a critical care outreach service have conflicting results.[15,16,22-24] The randomized controlled trial conducted by Ball and colleagues[7] in the United Kingdom found improved outcomes after an outreach service was introduced. The LOS and readmissions before the intervention, however, were higher than those reported in Australian centers, and this difference may explain why the study by Ball et al showed a positive result. Also, the services operate in different health care environments, and there are differences in service delivery. In the United Kingdom, outreach care was developed to improve the care of acutely ill patients in general care areas of hospitals and not specifically to focus on patients who have been discharged from the ICU.[25-27] Outreach care in the United Kingdom consists of a range of services from a fully comprehensive 24-hour-a-day/7-day-a-week emergency response service and a follow-up service for after critical care (a combination of the MET service and the follow-up service) to a limited education and support service focused on improving the recognition of deteriorating condition and the improved delivery of care to acutely ill patients in general care areas.

In the Australian context, several reports have described the beneficial effects of the use of an ICU nurse liaison, although beneficial outcomes such as reducing hospital LOS and readmissions to ICU have not been clearly demonstrated.[15,22,24] Our results are similar to those reported by Eliott and colleagues,[16] who found no difference in hospital LOS, readmissions, or mortality after implementation of an ICU liaison nurse service at a metropolitan university teaching hospital in Victoria, Australia. Differences in health care contexts, the services provided (eg,

having a MET system), the focus of the intervention (on all acute care patients in the general care area vs patients discharged from the ICU), and the outcomes reported are all likely reasons for these discrepancies. In a recent integrative review, Endacott and colleagues[28] noted that a range of research methods have been used to evaluate critical care nursing outreach services, but it was not possible to conclude unequivocally that such outreach services improve outcomes. This conclusion was supported by the results of an earlier systematic review performed by Esmonde and colleagues.[29]

The benefit of the critical care outreach service in facilitating the discharge process was difficult to gauge. We believe that the discharge process was facilitated by the critical care nursing outreach service, as demonstrated by the large number of referrals before patients were discharged from the ICU. Qualitative data from focus groups conducted before and after the intervention (unpublished data) also showed positive comments about the service. For example, patients were less afraid of the transition process, and staff found the support and education beneficial. Chaboyer and colleagues[22] did not find that use of a nurse liaison was associated with a reduction in pretransfer anxiety among patients discharged from the ICU to the general care area. It is likely that the method of assessing the benefits of use of a critical care nursing outreach team should be reevaluated to better measure the actual effect of such a team on the discharge process.

Almost a third of patients had their discharge from the ICU delayed by more than 8 hours, equivalent to 1 or more traditional nursing shifts. Although no information was available on delays in discharge from the ICU before implementation of the outreach service to compare with delays after implementation, a higher proportion of patients may have had their discharge delayed after implementation because of issues identified by the critical care outreach team. This premise is supported by the large number of delays for medical reasons. In contrast, Chaboyer and colleagues[12] reported a reduction in discharge delays from the ICU after introduction of a nurse liaison service, although their definition of discharge delay differed from ours and they had a comparison group.

Our study confirmed the complexity of the care that patients require when discharged from the ICU. Many patients were discharged with central catheters,

> A range of research methods have been used to evaluate the outreach role, making conclusions difficult.

oxygen therapy, and urinary catheters, and a large number of interventions were delivered by the outreach nurses. Although the reviews were conducted primarily for reasons related to patients, the outreach nurses provided education and advice, assisted with equipment issues, and supported staff and relatives. Referrals were made primarily to medical teams (specialty, ICU), but support from physical therapists and dieticians also were important.

Because this was a multicenter study, differences in management practices from hospital to hospital may have affected the outcomes of the outreach service in the different hospitals. The 2 larger tertiary-care hospitals have clinical nurse specialist support available both during office hours (7 AM to 5 PM) in the general care areas and after hours (after 5 PM) throughout the hospital, but the third hospital did not. More benefits may have been observed at the third hospital, but the sample size may have been too small for a significant difference to be detected. The short follow-up time of 6 months may have been insufficient to determine the true effect of the intervention. Certainly a criticism of the MERIT study[6] was that a complex intervention such as the introduction of a MET or, as in this article, a critical care follow-up service, may require considerably longer than 6 months to have a significant effect. Eliott and colleagues[16] conducted a before-and-after study for 36 months and did not find a difference in outcomes. Funding constraints prevented a longer duration of follow-up for our study.

> The benefit of ICU outreach in facilitating the discharge process was difficult to gauge.

Conclusion

Although several studies have shown beneficial outcomes for a critical care nurse lead outreach service in Australia and the United Kingdom, we found no improvement in LOS after admission to ICU, readmission rate, or hospital mortality after introduction of such a service. However, it may well be that the true benefits of the service (eg, improvement of the transition from the ICU to the general care area for both the staff in the general care area and patients, and the provision of educational support for junior staff in the general care area) are not reflected by the more quantitative outcomes measured in this study.

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