Direct and delayed admission to an intensive care or high dependency unit following discharge from the emergency department: associated patient characteristics and hospital outcomes

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ABSTRACT

Objective: To compare patients admitted from the emergency department (ED) directly to a ward (EDWard), the intensive care unit (EDICU) or stepdown (high dependency) unit (EDSDU) with patients admitted via the ED, but whose admission to an ICU (EDWardICU) or SDU (EDWardSDU) was preceded by a ward stay.

Design, setting and participants: Administrative and clinical data linkage; 650-bed, tertiary referral hospital, whose ED has about 60 000 patient presentations per annum; adult patients admitted via the ED to a ward, ICU or SDU and whose ED length of stay (LOS) was < 24 h.

Main outcome measure: Hospital outcome and stay.

Results: From January 2004 to December 2007, there were 43 484 patients, of whom 40 609 (93.4%) were EDWard, 1020 (2.3%) were EDICU, 873 (2.0%) were EDSDU, 503 (1.2%) were EDWardSDU, and 479 (1.1%) were EDWardICU. Hospital mortality for EDWardICU patients exceeded that of EDICU patients (34.9% v 23.3%; $P < 0.01$), as did EDWardSDU exceed EDSDU (12.3% v 7.8%; $P < 0.01$). Median ward stay for EDWardICU patients was 47 h 37 min (IQR, 14 h 48 min – 131 h 53 min) and for EDWardSDU patients, 46 h 18 min (IQR, 18 h 28 min – 140 h 12 min) ($P = 0.75$). Compared with patients admitted to the ICU from the operating theatre, EDWardICU patients had a longer median ward stay (58 h 35 min v 34 h 36 min; $P = 0.03$) and hospital mortality (42.8% v 20.2%; $P < 0.01$).

Conclusion: Patients discharged from the ED to a general ward and subsequently to an ICU or SDU had a mortality that exceeded that of ED patients admitted directly to the ICU or SDU. Further investigations are warranted to explain this excess mortality and ascertain the extent of potential preventability.

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For patients admitted to the intensive care unit, their location and duration there before admission can impact upon their outcome.[1-3] For example, patients admitted to the ICU and whose source of admission is another hospital have a higher than expected mortality,[4-6] while patients admitted from the ward have a mortality that exceeds most other sources of ICU admission.[7-10]

The emergency department (ED) is not an infrequent source of admission to the ICU.[11] The purpose of the ED is to triage, respond to and manage patients who present with acute illness, and to subsequently discharge those patients appropriately. Such discharge decisions are significant, as triage and discharge errors are associated with adverse patient outcomes.[12,13] For example, it is not uncommon for patients admitted to hospital from the ED to the ward, to progress within 24 hours to having a rapid response team call, an unanticipated ICU admission, a cardiac arrest or potentially preventable death.[14-16]

Two studies have shown that patients admitted to hospital from the ED, who subsequently required an unanticipated ICU admission, have a high hospital mortality of about 35%.[15,16] Certain risk factors may be predictive of a subsequent unplanned ICU admission.[15,16] The larger of these studies examined medical admissions from the ED to a general ward, and compared patients who did, with those who did not require a subsequent unplanned ICU admission. They identified factors such as age, higher acuity triage category, certain comorbidities and ED discharge diagnosis as risk factors, and

Abbreviations

APACHE II	Acute Physiology and Chronic Health Evaluation
ATS	Australasian Triage Scale
EDWard	Direct admission from the ED to a general ward, but no ICU or SDU admission during the patient's hospital stay
EDICU	Direct admission from the ED to the ICU
EDSDU	Direct admission from the ED to the SDU
EDWardICU	Direct admission from the ED to a general ward and subsequently to the ICU
EDWardSDU	Direct admission from the ED to a general ward and subsequently to the SDU
LOS	Length of stay
ROD	Risk of death
SDU	Stepdown (high dependency) unit

Table 1. Patient characteristics

Characteristics	All patients	EDWard	EDWardICU	EDICU	EDWardSDU	EDSDU
No. of patients	43 484	40 609 (93.4%)	479 (1.1%)	1020 (2.3%)	503 (1.2%)	873 (2.0%)
Age (mean years, IQR)*	60.7 (44–79)	61.0 (44–79)	63.7 (51–79)	53.3 (36–72)	64.1 (52–78)	52.3 (36–71)
Sex, male	54.8%	54.4%	58.9%	64.2%	58.3%	59.3%
Admission source*						
Self	61.9%	61.6%	64.1%	69.8%	54.9%	67.7%
General practitioner	13.9%	14.3%	11.1%	3.6%	21.7%	4.6%
Nursing home	7.0%	7.2%	7.7%	2.9%	5.2%	3.4%
Other†	17.2%	16.9%	17.1%	23.6%	18.3%	24.3%
Arrival mode*						
Ambulance	61.3%	59.9%	67.8%	90.7%	63.6%	83.2%
Private	34.3%	35.5%	28.0%	8.0%	33.8%	13.2%
Other‡	4.4%	4.6%	4.2%	1.3%	2.6%	3.7%
Admit unit*						
Medicine	44.1%	44.2%	32.6%	59.9%	21.3%	42.8%
Medicine specialty	15.4%	15.6%	20.3%	12.4%	12.5%	11.6%
Palliative care/oncology	3.1%	3.2%	3.1%	0.4%	2.0%	0.9%
Psychiatry	4.2%	4.5%	0.4%	0	0.4%	0
Orthopaedics	8.7%	9.0%	8.8%	1.0%	12.1%	1.6%
Surgery	12.4%	11.9%	19.0%	13.3%	22.7%	27.7%
Surgery specialty	12.1%	11.7%	15.9%	13.0%	29.0%	15.4%
ED arrival, median time of day (IQR)*	13:54 (10:09–18:09)	13:55 (10:11–18:09)	13:25 (10:05–17:29)	13:25 (08:08–18:40)	13:48 (10:41–17:57)	14:09 (09:55–18:43)
ED discharge, median time of day (IQR)*	15:34 (05:40–19:55)	15:37 (05:40–19:55)	15:22 (05:25–20:10)	13:23 (05:51–19:12)	15:49 (06:05–20:20)	15:05 (04:52–19:55)

EDWard = direct admission from the ED to a general ward, but no ICU or SDU admission during the patient's hospital stay. EDWardICU = direct admission from the ED to a general ward and subsequently to the ICU. EDICU = direct admission from the ED to the ICU. EDWardSDU = direct admission from the ED to a general ward and subsequently to the SDU. EDSDU = direct admission from the ED to the SDU. IQR = interquartile range. * $P < 0.01$. † Community health, community mental health, police, outpatient. ‡ Police, volunteers, escort.

developed a prediction tool for use at time of ED discharge.[16] In contrast a separate, much smaller study compared patients admitted from the ED directly to ICU with those whose admission was delayed (by less than 24 hours) by a stay in the ward. The delayed group were older and had a less urgent triage category.[15]

However, there is virtually no information that compares patients admitted via the ED across the spectrum of patients who are admitted directly to a ward, ICU or stepdown (high dependency) unit (SDU), with those whose admission to an ICU or SDU is preceded by a stay in the ward. The aim of this study was to compare and contrast the characteristics, timing, reason for an ICU admission, and hospital outcomes of such patients.

Methods

The setting for our study was the Royal Adelaide Hospital, a 650-bed, university-affiliated, tertiary referral centre. The ED has about 60 000 patient presentations per annum.

Hospital inpatients were included in the study if they had been admitted from the ED; were aged > 15 years; had been discharged from the ED and admitted directly to the ICU or SDU, or to a general ward and subsequently to the ICU or SDU; or had an ED length of stay (LOS) < 24 hours.

We excluded patients who had died in the ED; were discharged from the ED directly to the operating theatre, coronary care unit or the burns unit; were admitted to the ED short-stay ward (including those subsequently admitted to a ward, ICU or SDU); were admitted to the ED from another hospital; or were readmitted to the ICU or SDU.

Design

We conducted a retrospective cohort study using data linkage of data sourced from the hospital's electronic patient dataset, ED information system, and ICU patient-specific database (AORTIC version 9.2.1). Patients were linked based on all of the following unique identifiers: hospital medical record number, age, sex, date of hospital admission and, for ICU patients, date and source of ICU admission.

The final dataset included the following variables: patient and illness demographics; mode of arrival to the ED; dates and times of ED arrival and discharge; Australasian Triage Scale (ATS) category;[17] ED discharge location; and ICU and hospital arrival and discharge dates, times and outcomes. For all patients admitted to the ICU (but not for patients admitted to the SDU), an Acute Physiology and Chronic Health Evaluation (APACHE II) score, diagnosis, risk of death (ROD), source of admission to ICU, and ICU discharge dates were available. The outcome measures were hospital outcome (dead or alive), and ICU and hospital LOS.

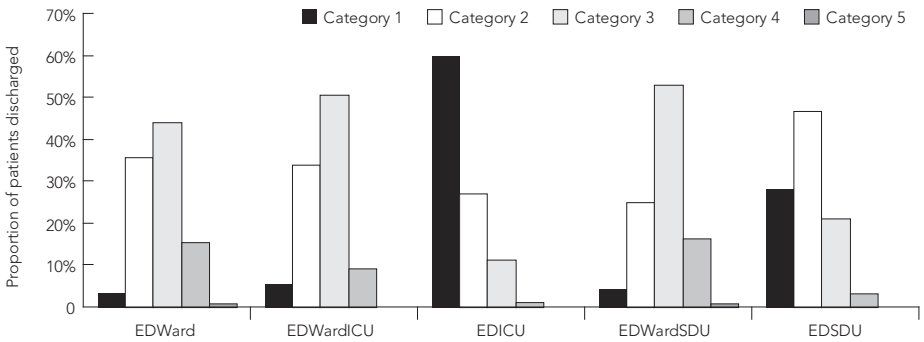
Data analysis and statistics

Patients were divided into the following categories for analysis, based on the path taken before ICU admission:

- EDWard — direct admission from the ED to a general ward, but no ICU or SDU admission during their hospital stay;
- EDICU — direct admission from the ED to the ICU;
- EDSDU — direct admission from the ED to the SDU;
- EDWardICU — direct admission from the ED to a general ward and subsequently to the ICU; and
- EDWardSDU — direct admission from the ED to a general ward and subsequently to the SDU.

Statistical analysis included descriptive data analysis, reporting medians and interquartile range (IQR) values, χ^2 testing for categorical values, and comparison of medians using the Kolmogorov–Smirnov test for data that had a non-normal distribution. Classification trees were used to split the pathways that ED patients took on the basis of data available at exit from the ED: age, sex, ATS category, ED admission and discharge times, ED LOS, referral source, admit unit and transport mode. The trees were constructed by repeatedly partitioning data into two groups such that, at any split, the difference between the two groups was maximised according to the Gini coefficient.[18] Variables with the least difference were rejected for those with a greater discriminatory power. The resulting trees were assessed using cross-validation to give the "best" tree.

Figure 1. Australasian Triage Scale category* for each emergency department discharge group ($P < 0.001$)



*EDWard = direct admission from the ED to a general ward, but no ICU or SDU admission during the patient's hospital stay. EDWardICU = direct admission from the ED to a general ward and subsequently to the ICU. EDICU = direct admission from the ED to the ICU. EDWardSDU = direct admission from the ED to a general ward and subsequently to the SDU. EDSDU = direct admission from the ED to the SDU. * Australasian Triage Scale categories:[17] Category 1: Immediately life-threatening conditions requiring immediate simultaneous assessment and treatment; Category 2: Imminently life-threatening conditions requiring assessment and treatment within 10 minutes; Category 3: Potentially life-threatening conditions requiring assessment and treatment within 30 minutes; Category 4: Potentially serious conditions requiring assessment and treatment within 60 minutes; Category 5: Less urgent conditions requiring assessment and treatment within 120 minutes.*

Table 2. Patient outcomes

Characteristics	EDWardICU	EDICU	EDWardSDU	EDSDU
ED LOS, median h:min (IQR)*	7:02 (4:52–9:32)	2:36 (1:45–4:19)	7:08 (5:06–9:48)	5:07 (3:30–7:24)
Mortality, number and proportion of patients	167 (34.9%)	238 (23.3%)	62 (12.3%)	68 (7.8%)
Hospital LOS, median days (IQR)*	14.0 (7.5–26.6)	7.4 (3.2–14.4)	15.7 (9.1–24.5)	6.8 (3.3–13.3)
ICU/SDU LOS, median days (IQR)*	1.8 (0.8–3.6)	1.6 (0.8–3.6)	0.9 (0.6–1.8)	0.9 (0.5–1.7)
APACHE II score, mean (95% CI)†	19.9 (19.1–20.7)	18.9 (18.4–19.5)		
Ward LOS before ICU/SDU admission, h:min (95% CI)‡	47:37 (14:48–131:53)		46:18 (18:28–140:12)	
APACHE II risk of death, mean (95% CI)*	0.395 (0.339–0.451)	0.288 (0.270–0.304)		
Standardised mortality ratio (95% CI)	0.88 (0.77–1.03)	0.81 (0.77–0.86)		

APACHE II = Acute Physiology and Chronic Health Evaluation. ED LOS = emergency department length of stay. EDWard = direct admission from the ED to a general ward, but no ICU or stepdown unit (SDU) admission during the patient's hospital stay. EDWardICU = direct admission from the ED to a general ward and subsequently to the ICU. EDICU = direct admission from the ED to the ICU. EDWardSDU = direct admission from the ED to a general ward and subsequently to the SDU. EDSDU = direct admission from the ED to the SDU. IQR = interquartile range. * $P \leqslant 0.001$. † $P = 0.03$. ‡ $P = 0.75$.

Ethics approval

The Royal Adelaide Hospital Human Research Ethics Committee approved our study.

Results

From January 2004 to December 2007, there were 43 778 patients who met study criteria for the initial dataset. From these, 294 (0.7%) records were omitted (20 patients due to mismatch of ICU source of admission and ED discharge destination, 157 records where the calculated ED LOS was a negative value, and 117 ICU patients with an unknown source of ICU admission), leaving 43 484 (99.3%) patients for analysis.

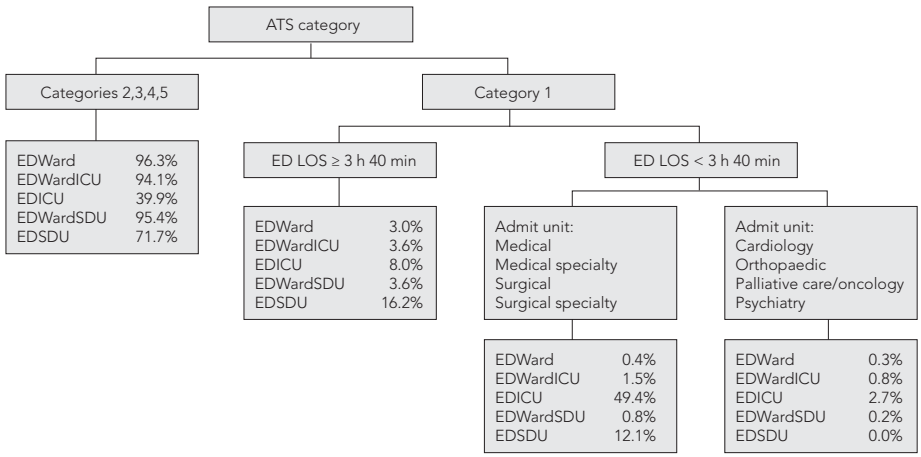
Characteristics of patients admitted from the emergency department

Most patients were admitted from the ED directly to a ward (41 627, 95.6%). Of these, 479 (1.1%) were subsequently admitted to the ICU (EDWardICU), 503 (1.2%) to the SDU (EDWardSDU), and 40 609 (97.6%) did not have an ICU or SDU admission during their hospital stay (EDWard).

EDWardICU and EDWardSDU patients were older than patients from the other groups. The ED arrival mode, admission source and ATS category of the EDWardICU and EDWardSDU patients were similar and were numerically between those of the EDICU, EDSDU and EDWard patient groups (Table 1 and Figure 1).

EDWardICU and EDWardSDU patients had a similar ED LOS (7 h 2 min and 7 h 8 min, respectively; $P = 0.33$), which were significantly longer than those of the EDSDU (5 h 7 min; $P < 0.01$) and EDICU patients (2 h 36 min; $P < 0.01$). The median ED LOS for EDSDU was longer than that of EDICU patients (5 h 7 min v 2 h 36 min; $P < 0.01$).

Figure 2. Classification tree analysis showing the principal discriminators and the proportion of patients from each Australasian Triage Scale (ATS) category



LOS = emergency department length of stay. EDWard = direct admission from the ED to a general ward, but no ICU or SDU admission during the patient's hospital stay. EDWardICU = direct admission from the ED to a general ward and subsequently to the ICU. EDICU = direct admission from the ED to the ICU. EDWardSDU = direct admission from the ED to a general ward and subsequently to the SDU. EDSDU = direct admission from the ED to the SDU.

Table 3. Emergency department length of stay (ED LOS) by most common diagnostic categories for the ED intensive care unit patients ($n = 1020$)

Diagnostic category	Median ED LOS (h:min)	Median ED LOS, survivors (h:min)	Median ED LOS, deaths (h:min)	*P*	Deaths (%)	Total (%)
Overdose	2:04	2:03	2:50	0.50	7 (4.1%)	170 (16.7%)
Head trauma	2:20	2:21	1:57	0.25	18 (15.5%)	116 (11.4%)
Cardiac arrest	1:26	1:18	1:37	0.18	59 (60.6%)	98 (9.6%)
Respiratory infection	4:50	4:58	4:40	0.36	21 (25.3%)	83 (8.1%)
Sepsis	4:24	4:33	3:51	0.64	18 (27.7%)	65 (6.4%)
Multitrauma	2:47	2:47	2:29	0.70	10 (16.4%)	61 (6.0%)
Congestive cardiac failure	2:48	2:45	4:50	0.28	5 (8.8%)	57 (5.6%)
COPD	3:48	3:42	5:46	0.22	11 (20.0%)	55 (5.4%)
Seizure	2:32	2:31	2:52	0.48	3 (5.8%)	52 (5.1%)
ICH/SDH/SAH	2:25	2:43	2:17	0.19	25 (65.8%)	38 (3.7%)
Neurological other	2:53	3:13	2:41	0.53	12 (40.0%)	30 (2.9%)
Other	2:55	2:57	2:29	0.41	53 (27.2%)	195 (19.1%)

COPD = chronic obstructive pulmonary disease. ICH = intracerebral haemorrhage. SAH = subarachnoid haemorrhage. SDH = subdural haemorrhage.

ED LOS had a positive correlation with age for EDWard (R = 0.099; $P < 0.01$), EDICU (R = 0.143; $P < 0.01$), EDSDU (R = 0.106; $P < 0.01$) and EDWardICU (R = 0.156; $P < 0.01$) patients, but not for EDWardSDU patients (R = 0.072; $P = 0.11$).

Compared with the EDICU patients, the EDWardICU patients had a higher APACHE II score and predicted ROD but not casemix-adjusted mortality (ie, SMR) (Table 2). For EDICU patients, ED LOS had a negative correlation with the APACHE II score (R = – 0.076; $P = 0.02$) and a non-significant correlation with the predicted ROD (R = – 0.027; $P = 0.42$) and ICU stay (R = 0.050; $P = 0.10$). For EDWardICU patients, the ED LOS did not correlate significantly with the pre-ICU admission hospital stay (R = 0.029; $P = 0.68$).

Figure 2 shows the classification tree for predictors of the patient categories. The results showed that only three variables best classified the patients: ATS category, ED LOS and admit unit. The EDWard, EDWardICU and EDWardSDU groups had very similar predictors and could not be differentiated. The EDICU and EDSDU groups differed from the EDWard, EDWardICU and EDWardSDU groups as they had fewer ATS category 2–5 patients. The ATS category was also the greatest distinction between the EDICU and EDSDU groups.

Emergency department discharge location and associated patient outcomes

Hospital LOS for EDWardICU patients was similar to that of EDWardSDU patients (14 days v 15.7 days; $P = 0.08$) but exceeded that of the EDICU (14 days v 7.4 days; $P < 0.01$). Similarly, the hospital LOS for EDWardSDU patients exceeded that of EDSDU patients (15.7 days v 6.8 days; $P < 0.01$). The hospital LOS for EDICU was not significantly different to that of the EDSDU patients ($P = 0.18$). EDWardICU patients had a longer, but not quite statistically different ICU LOS compared with EDICU patients (1.8 days v 1.6 days; $P = 0.06$); as did EDWardSDU patients compared with EDSDU patients (0.9 days v 0.9 days; $P = 0.05$) for SDU LOS.

Hospital mortality for EDWardICU patients exceeded that of EDICU patients (34.9% v 23.3%; $P < 0.01$), as it did for EDWardSDU patients (12.3%) compared with EDSDU (7.8%; $P < 0.01$) (Table 2) and EDWard patients (2.9%; $P < 0.01$). EDWardICU patients who died had a significantly longer pre-ICU ward stay than those who survived (median, 77 h 13 min v 38 h 38 min; $P = 0.025$). In comparison, for EDWardSDU patients, the pre-SDU ward stay was similar for those who died and those who survived (median, 51 h 5 min and 46 h 20 min, respectively; $P = 0.223$).

Table 3 lists the ICU admission diagnostic category for the EDICU patients, the ED LOS for each diagnosis and the associated hospital outcome. There was no category for which ED LOS was associated with hospital mortality; however, ED LOS varied among the diagnostic categories.

Compared with EDICU and EDSDU patients, EDWardICU and EDWardSDU patients were more likely to be based within medical and surgical specialties, and orthopaedic and oncology admit teams. Table 4 lists the ICU admission diagnosis for EDWardICU patients. Median stay in the ward was 47 h 37 min (interquartile range [IQR], 14 h 48 min – 131 h 53 min) for EDWardICU patients and 46 h 18 min (IQR, 18 h 28 min – 140 h 12 min) for EDWardSDU patients ($P = 0.75$). There were 167 EDWardICU patients (34.9%) and 156 EDWardSDU patients (31.0%) whose stay in the ward was < 24hrs following discharge from the ED. Of the EDWardICU patients, those admitted directly from the ward had a longer pre-ICU ward stay (median, 58 h 35 min; IQR, 18 h 48 min – 137 h 44 min) compared with those admitted from the operating theatre (median, 34 h 36 min; IQR, 9 h 46 min – 100 h 58 min) ($P = 0.03$) and higher hospital mortality (42.8% v 20.2%; $P < 0.01$).

Table 4. Diagnostic categories* and median pre-intensive care unit ward stay for patients directly admitted from the emergency department to a general ward and subsequently to the ICU

Diagnostic category	No. of patients (%)	Median pre-ICU ward stay (h:min)
Respiratory other	55 (11.6%)	23:39
Respiratory infection	52 (10.8%)	63:14
Gastrointestinal other	39 (8.1%)	47:37
Sepsis	36 (7.5%)	79:20
Postoperative gastrointestinal perforation/obstruction	34 (7.2%)	30:20
Cardiac arrest	31 (6.4%)	57:52
Congestive cardiac failure	28 (5.8%)	42:23
Chronic obstructive pulmonary disease	18 (3.7%)	49:47
Neurological other	16 (3.3%)	55:53
Haematological	13 (2.7%)	120:14
Postoperative multitrauma	12 (2.5%)	60:56
Other	145 (30.2%)	70:02
All postoperative†	161 (33.7%)	34:36
All ward	318 (66.3%)	58:35

* Acute Physiology and Chronic Health Evaluation. † $P = 0.03$ (for pre-ICU ward stay, all postoperative v all ward).

Discussion

Patients discharged from the ED to the ward, and who subsequently required admission to the ICU (EDWardICU) or SDU (EDWardSDU), were few in comparison to

all EDWard admissions. However, they were a highly significant group, as their hospital mortality and stay far exceeded those of EDWard, EDICU and EDSDU patients. In contrast to all EDWard patients, EDICU and EDSDU patients were characterised by having the most acute triage category, a short ED LOS, and admission to a general or specialty medical/surgical service.

ED LOS was shortest for EDICU patients whose diagnosis was an overdose, post-cardiac arrest, non-operative head injury or intracranial haemorrhage, whereas those with sepsis and respiratory conditions stayed longer. There was no one diagnostic category for which ED LOS differed significantly for those who died compared with survivors.

Almost a third of patients admitted from ED to the ward, and then subsequently to the ICU or SDU, were transfered within 24 hours; and half died within 48 hours of discharge from the ED. EDWardICU patients, in contrast to EDICU patients, had significantly higher severity of illness measures at time of admission to the ICU.

It is well documented that patients discharged from the ED to the ward may go on to have a significant adverse event soon after discharge from the ED.[9,14-16,19] However, we also noted that although they were a relatively small proportion of all ED to ward discharges, such patients had a high associated mortality.

Direct admissions to ICU from the ED showed a particular pattern. Patients who were younger and had a higher severity of illness had a shorter ED LOS, which is in keeping with previous findings.[20] Furthermore, we found that ED LOS varied by diagnosis, but did not appear to affect outcome. Further exploration is required to ascertain explanations for this variability in ED LOS and its repercussions, if any, on outcome for patients across different diagnostic groups.

There are a number of possible explanations for our findings. EDWardICU and EDWardSDU patients were more likely to be admitted to medical and surgical specialities, orthopaedics and oncology services. It is possible specialty units were more likely to self-manage higher acuity or deteriorating patients with certain conditions and thus delay admission to the ICU.[2] We found that a longer ward stay before ICU, but not SDU admission, was associated with a higher mortality. Similarly, a cardiac arrest was not an uncommon reason for ICU admission for EDWardICU patients, as were respiratory or gastrointestinal conditions and sepsis, all of which may have benefited from early interventions. Many such patients were admitted to the ICU and SDU from the operating theatre, often within 24 hours following ED discharge, and potentially may have benefited from early detection and interventions[10,21,22] or preoperative optimisation, all of which are best delivered within a critical care area.[23,24]

Accurate triage on arrival to the ED is important for delivering orderly and timely acute care and reducing patient harm.[13,25-27] Our findings would suggest that ED discharge decisions are equally important. EDICU and EDSDU patients were best differentiated from all EDWard patients by their triage category. EDWardICU and EDWardSDU patients, in contrast to EDWard patients, were slightly older and more likely to be admitted to a specialty service, but had characteristics such as triage category and mode of arrival that fell somewhere between those of EDICU/EDSDU patients and those of EDWard patients. This suggests that such patients are in a "grey" zone, difficult to differentiate from all other EDWard patients, and so provide the greatest challenge to ED discharge decision making.

Our study relied on a large, highly linked dataset, which allowed for comparisons across a range of patient groups, from the same major tertiary referral hospital, and thus system of care. It would be important to re-examine them across different health settings. Analysis was limited to the available administrative data, and thus may have overlooked other potentially important factors. Our analysis is also based upon the assumption that all patients admitted to the ICU were admitted with an equivalent "intention to treat". These, plus differences in the baseline characteristics of the patient groups, may also, in part, explain our findings.

Our findings suggest that there may be the potential for reducing adverse events following ED discharge, and this requires further exploration. Preventive strategies that ameliorate the risk of subsequent adverse events, rather than those that respond to an adverse event, are preferred — eg, senior clinician involvement in ED discharge decisions,[16,28] nomograms to determine risk,[19] discharge from the ED to "acute medical units"[29] or the use of an "ED outreach team". Outreach teams evolved in response to reports, indicating suboptimal care of patients discharged from intensive care, and have been shown to positively influence post-ICU hospital survival and ICU readmission.[30-32] Future studies should focus on evaluating such strategies.

EDWardICU and EDWardSDU occurrences, based upon their association with a comparably higher mortality and LOS, and potential preventability, should be used as a hospital performance measure, as are unplanned admissions from other sources.[33,34]

Conclusion

Patients discharged from the ED to the ICU who are younger, have a high severity of illness and, with certain diagnoses, have a shorter ED LOS. The ED LOS we observed was not associated with an adverse outcome. ED LOS and triage category best differentiated for the EDICU/EDSDU patient. Of the ED patients discharged to a general ward, a few go on to require admission to an ICU or SDU and those few have a mortality that exceeds that of patients admitted directly to the ICU or SDU. ED discharge decisions are potentially crucial

to patient outcomes and should be supported by strategies to better identify at-risk patients whose adverse outcomes may be potentially preventable. Such occurrences should be included as performance measures. Further investigations are warranted to explain this excess mortality and ascertain the extent of potential preventability.

Competing interests

None declared.

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