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## Can this patient be safely discharged from the ICU?

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It is 3:00 a.m. on Saturday morning, and there are no empty beds in your ICU. The trauma team has requested a bed for an unstable abdominal gunshot wound victim. Only two current patients are not receiving mechanical ventilation or vasopressors: one is a 63-year-old diabetic, dialysis patient who was admitted 3 days ago for heart failure. After overnight mechanical ventilation and emergency dialysis, she is now extubated and on a high-flow oxygen mask. The other is a 75-year-old man who underwent elective coronary bypass surgery on Friday morning and is doing well 12 h after ventilator liberation. Beds are available on wards and a step-down unit. Which patient is at higher risk for readmission or adverse events if discharged to make room for the trauma patient?

Intensivists are routinely presented with discharge decisions similar to the one above. In this article we focus on two major concerns when making ICU discharge

decisions: the possibility of ICU readmission, and death on a ward or intermediate care unit.

### Which patients are readmitted?

Because discharge decisions are based on clinical judgment, physicians can improve patient safety by being aware of the risk factors for ICU readmission (Table 1). The diagnoses most often associated with subsequent readmission include heart failure, gastrointestinal bleeding, bacterial pneumonia, and chronic obstructive pulmonary disease [1]. Other patient risk factors include age, comorbidities, severity of physiological abnormalities at ICU discharge, dialysis, mechanical ventilation, and length of initial ICU stay.

In addition to patient risk factors, ICU discharge decisions are also influenced by institutional factors [1–8]. A review of patient discharges from ICUs reported that limited availability of ICU and ward resources (26 %) and patient and family anxiety (21 %) were the most frequent barriers to high-quality care [6]. The presence of intermediate care units in a hospital has also been associated with higher readmission rates, implying that units may be prematurely discharging patients with borderline stability to step-down units [8]. In contrast, the risk for ICU readmission appears to be reduced in institutions with critical care transition (outreach team, nurse liaison) programs [6, 7].

The impact of institutional factors on readmission may explain why predictive models that focus on patient risk factors have poor to modest discrimination (area under the receiver operating characteristic curve (AUROC) = 0.64–0.77) [1, 9, 10]. In addition, variations among institutions and across healthcare systems may explain, at least in part, the failure of models to accurately predict ICU readmission in external validation studies [11].

**Table 1** Summary of patient and institutional risk factors for ICU readmission

Admission/discharge/transfer factors [1]	Patient factors [1]	Institutional factors
Discharge to an intermediate care (step-down) unit	Age	Capacity strain [2]
Length of hospital stay before ICU admission	Comorbidities	Critical care transition programs [7]
Length of initial ICU admission	Dialysis	Limited ICU resources [4, 5]
Transfer from another hospital	Diagnosis <sup>a</sup>	Night-weekend transfers [3]
	Emergency surgery	
	Glasgow coma score	
	ICU admission diagnosis <sup>a</sup>	
	Mechanical ventilation (first and last day)	
	Severity of illness (physiological abnormalities at ICU discharge—not at admission)	

<sup>a</sup> Most frequent = congestive heart failure, gastrointestinal bleeding, bacterial pneumonia, chronic obstructive pulmonary disease, other respiratory diseases. These five diagnoses accounted for 24.4 % of ICU readmissions [1]

### Are ICU readmissions a sign of poor care?

ICU readmission is currently considered a key core measure of the safety and quality of ICU care in the USA, Australia, and Europe [8, 12]. The rationale is that ICU readmissions are costly and have higher mortality rates and longer ICU and hospital lengths of stay. Early readmission (48–72 h) is focused upon as a higher rate suggests poor decision-making [12]. ICU readmissions are at a higher risk of poor outcomes even after adjusting for physiology and diagnosis [1].

But is readmission rate a good indicator of poor care? Our recent study showed that case-mix-adjusted hospital mortality and lengths of ICU and hospital stay among ICUs with high readmission rates are no worse than for units with low or average readmission rates [8]. These results indicate that ICU readmission rate should be implemented as a quality measure only if patient case-mix is taken into account. The reasons for “poor care” also need to be precisely defined. Physicians forced to make ICU discharge decisions at institutions with a consistently inadequate number of ICU beds, constantly full ward beds, and a lack of structures and policies to facilitate safe transfer should not be judged as poor decision-makers.

### What other outcomes should be considered?

Death after ICU discharge is obviously an important outcome and the risk factors are similar to those for ICU readmission [9, 13]. It should be noted, however, that patient deterioration or death after ICU discharge is not necessarily an indicator of poor care, as the impact on quality care is mitigated by treatment limitations [3]: some patients are discharged from an ICU with the expectation of death.

Additional considerations also have an impact on outcomes and the quality of ICU discharge decisions.

Barriers to high quality decisions include patient and family anxiety and unmet needs, and shortcomings in communication and coordination between ICU and ward personnel. Facilitators of quality decisions include improved discharge information and education for families and ward providers, early discharge planning, verbal and written communication with ward physicians, and critical care transition programs [6, 7].

### Which patient should be discharged?

In the beginning of this article a scenario was proposed in which a discharge decision needed to be made. Best evidence suggests that the cardiac surgical patient is at lower risk for death or readmission to the ICU. Knowing the risk factors for patient deterioration after ICU discharge can assist ICU physicians in making better clinical judgments.

Validated tools for predicting outcomes after ICU discharge could improve discharge decisions. A recent systematic review of tools for predicting adverse events after ICU discharge (readmission,  $n = 4$ ; mortality,  $n = 3$ ; or both,  $n = 1$ ) revealed uncertainty about the clinical utility of these tools [14]. This is because these tools have not undergone comparative study, not been compared to clinical judgment, and not shown to improve care and outcomes when used by clinicians. While there are no valid predictive models to assist in making ICU discharge decisions, the consequences of patient deterioration are well defined.

### Conclusions

Patients with a high risk for ICU readmission and death have complex and severe illnesses and persistent

physiologic abnormalities at ICU discharge. Readmitted patients are at increased risk for mortality and lengths of stay even after adjusting for case-mix. But this increased risk does not convey to inter-ICU comparisons, where adjustment for patient case-mix is necessary. Physicians can use the above information to make more informed discharge decisions, especially in the presence of limited resources.

#### Compliance with ethical standards

All human and animal studies have been approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

**Conflicts of interest** None.

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