

Admission and discharge of critically ill patients

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Purpose of review

The intensive care unit (ICU) provides continuous surveillance and specialized care to acutely ill patients. The decisions on patient admission and discharge should be based on common clinical criteria in order to guarantee equity.

Recent findings

The survival benefit of early admission to intensive care has been demonstrated recently. Sometimes, the number of potential patients may exceed the available beds making triage of the patients necessary. The prioritization model based on the benefit that the patient can have from the admission is the most used. In the case of the outbreak peak of pandemic A H1N1 flu, a triage plan using Sequential Organ Failure Assessment score combined with inclusion and exclusion criteria to complement clinical judgment has been recommended. Nevertheless, studies have shown that this triage could lead to withdrawal of life support in patients who survive. Triage implies refusal of some patients, and refusal rates vary greatly even across the same country. Policies for discharge from intensive care show wide variability influenced by the availability of step-down facilities.

Summary

The decisions to admit and discharge patients depend on patient, structure and physician-related variables. Early ICU admission of the critically ill patient is beneficial. Future analysis should also investigate economic parameters.

Keywords

critical care, intensive care, organization, patient admission, patient discharge

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Introduction

The intensive care unit (ICU) is a hospital unit providing continuous surveillance and highly specialized care to acutely ill patients, either medical or surgical, whose conditions are life-threatening and require comprehensive care. The intensivists taking care of these patients are not specialists of organ or apparatus, but they are specialists of acuity, that is severity of the illness and risk of the patient [1].

The organization models of the ICU are commonly described as ‘open’ or ‘closed’ [2]. In the former model, which is widespread in the USA, the primary physician chooses whether to admit the patient, prescribes treatments, maintains the responsibility for any patient management decisions, and requires the consultation of other specialists, including the intensivist, if necessary. In the latter model (‘closed’) the intensivist takes on the senior role whereas the patient’s primary physician acts as a consultant for the period the patient passes in the ICU. This ‘closed’ model is used in most of the European countries as well as in Australia and New Zealand [3].

However, also if the ICU admission and discharge decisions are taken by different physicians in the ‘open’ or ‘closed’ units, common criteria should exist in order to guarantee equity in the interest of the patient and the society.

Rules for admission to ICU

The first article giving rules for adult patient admission to ICU was published in 1988 [4] and revised in 1999 [5], and another creating a framework for developing multi-disciplinary admission and discharge policies for pediatric ICUs was published in the same year [6]. Really, some National Societies have reported any guidelines in their website (www.sfar.org) or journal [7], but the topic does not seem to be a major point of discussion. All these guidelines for adults [4,5,7] stress that the categories of patients who do not take benefit from the ICU are those ‘too well to benefit’ and those ‘too sick to benefit’. Unfortunately, physician appraisal of underlying disease severity is potentially vulnerable to a number of potentially relevant biases [8]. Moreover, the decision to admit a patient to the ICU may be influenced not only by

patient and family wishes but also by physician characteristics and work setting [9[•]]. A notable exception to this rule is the need for ICU admission in many (if not all) patients in brain death or in which brain death is expected to occur soon, that should be admitted and managed in the intensive care environment to maximize the quality of the organs and better interaction with the relatives.

Considering the kind of cure that an ICU can offer to the patients, the patients suitable for ICU admission are those who are or may become critically ill, that is those who need or may need any organ supports not given in the other hospital wards. The criterion generally used to decide whether to admit to ICU or not is the prioritization model, which defines an order from the patients who will benefit most from the ICU (Priority 1), to those that will not benefit at all (Priority 4) from ICU admission [5].

- (1) Priority 1 concerns the patients who are critically ill, unstable, in need of intensive treatment and monitoring that cannot be provided outside of the ICU. No limits are generally placed on the extent of the therapy that these patients can receive. This category should include also patients in brain death or in which brain death is expected soon because better quality of transplant organs means more successful procedure [10].
- (2) Priority 2 patients are those requiring intensive monitoring and may potentially need immediate intervention. This category includes, for instance, patients who are at risk for intubation and invasive mechanical ventilation. No therapeutic limits are generally placed for these patients.
- (3) Priority 3 patients have underlying disease and/or acute illness with a reduced likelihood of recovery. Due to their long-term outcome, they may receive intensive treatment to relieve acute illness but limits on therapeutic efforts may be set.
- (4) Priority 4 patients are those who are generally not appropriate for ICU admission. These patients can be classified as 'too well to benefit' (at low risk of active intervention) or 'too sick to benefit' (with terminal and irreversible illness facing imminent death, but also patients in a persistent vegetative state or with metastatic cancer). The patients conscious and able to take decisions who refuse aggressive treatments are in the Priority 4 group, because the comfort care they need can be offered by the hospital general wards or other specific structures were present.

Another criterion to decide whether to admit to ICU or not is the diagnosis model [5]. It uses specific conditions or diseases to determine appropriateness of ICU admission. For each system or illness category, there are specific diseases (examples for cardiac system are acute myocardial infarction with complications or cardiogenic shock).

A third criterion to decide ICU admission is the objective parameters model [5]. Accordingly, there is a long list of criteria, which are by necessity arbitrary. However, objective parameters are usually incorporated as part of the admitting criteria and include vital signs, laboratory values, data from radiography/ultrasonography/tomography, electrocardiogram, acute onset physical findings.

Whichever is the model chosen, the admission of a patient to the ICU is strongly influenced by the availability of an ICU bed, which depends mainly on the number of hospital beds devoted to intensive care and on the demographic characteristics of the population covered by the hospital. Indeed, it seems quite obvious that the more ICU beds you have the higher the probability to have a free bed or alternatively a patient suitable for discharge when a new patient needs an ICU bed. Moreover, chance can also play a role, because the number of requests per time is not stable but may change in a relatively predictable way [11[•]]. For instance, fewer patients are admitted during the summer than in other seasons of the year in some hospitals located where the climate is substantially stable [12], and also a high number of ICU beds could become not adequate at the time of a seasonal flu. This happened in Canada in the past with SARS [13], and more recently with the outbreak peak of pandemic A H1N1 flu [14^{••}].

The strong effect of ICU bed availability on the decision of admission explains why the most used model is the prioritization model, which defines the order of admission according to the benefit that the patients can have from the ICU admission. However, there is a study demonstrating improved outcome for the patients admitted to ICU in comparison with those nonadmitted [15]. Using consensus ICU admission criteria which included both diagnosis and objective parameters, the authors conducted a screening process simultaneously in five hospitals during 16 days, to identify eligible patients, that is those admitted to the emergency department with clinical deterioration, as well as those presenting new clinical deterioration while in the ward. Only a small proportion of eligible patients (13%) reached the ICU within 24 h, and the early survival benefit of admission into the ICU was confirmed by the Cox survival model (hazard ratio 0.247). The final message of this study was that early ICU admission is imperative for survival advantage, in agreement with the conclusions of Chen *et al.* [16^{••}] who found an inverse relationship between the proportion of early emergency team calls and the rate of cardiac arrests and unexpected deaths.

Triage

Triage, a term coming from the French language and originated during the Napoleonic Wars, is a process of

prioritizing patients based on the severity of their condition. The principle is that the patient clinical severity should allow us to make a rough prediction of outcome, to ration patient treatment efficiently when resources are insufficient for all to be treated immediately. Therefore, triage results in determining the order and priority of emergency treatment, transport and destination, based on the special needs of the patient or the balancing of patient distribution in a mass-casualty setting.

Triage allows allocation and rationing of scarce critical care in epidemics and mass-casualties. In the face of a catastrophic event, the presence of a plan to address triage issues will result in justice and perception of correct allocation of resources [5]. To be prepared for the pandemic influenza A N1H1, the Task Force for Mass Critical Care has proposed a guidance to allocate critical care resources in overwhelmed systems. One of the suggestions given by the Task Force concerned the use of an equitable triage process utilizing the Sequential Organ Failure Assessment (SOFA) scoring system [17]. In agreement with this suggestion, the UK Department of Health's 'Pandemic Flu: Surge Capacity and Prioritisation' document [18] recommended the use of a plan including the triage criteria developed by Christian *et al.* [19] and based on the work of the care expert panel to triage admissions into critical care units [20]. This plan used the SOFA score combined with a list of inclusion and exclusion criteria for admission to the critical care unit as a triage tool to complement clinical judgment. Nevertheless, Guest *et al.* [21•] found that applying the SOFA triage criteria to a current case-mix would result in 116 of the 255 patients (46%) admitted during the study period being denied intensive care treatment they would have otherwise received, of which 45 (39%) survived to hospital discharge. The conclusion was that the proposed triage tool failed adequately to prioritize patients who would benefit from intensive care. Similar conclusions were reached by Khan *et al.* [22•] who showed that five out of the eight patients ICU admitted with H1N1 would have been considered for withdrawal of treatment using SOFA scoring guidelines at 48 h. The conclusion was that SOFA score-based triage could lead to withdrawal of life support in critically ill patients who could survive with an acceptably low length of stay in the intensive care unit. The most recent recommendations given by the European Society of Intensive Care Medicine Task Force to face toward surges of ICU patients emphasize that triage criteria should be objective, ethical, transparent, applied equitably and publically disclosed [23••]. Inclusion and exclusion criteria are reported, and re-assessment of patients is suggested. The Task Force also reports SOFA as prioritization tool, emphasizing that it has limitations and it has not been validated as a triage instrument [23••]. Moreover, a triage instrument to be used in a pandemic situation should allow the physician to discriminate

patients based on predicted length of stay and not just on ICU or hospital mortality. Otherwise, it will not be able to access the impact of the admission of a given patient in the use of the available resources.

In the present time of scarce resources, the number of potential ICU patients may frequently exceed the available beds also in absence of any epidemic or mass-casualty. As a consequence, triage of the patients is necessary in many instances, and the prioritization model seems to be the natural candidate for ordering admission according to the benefit that the patients can have from the ICU admission. Nevertheless, admission on a first-come, first-served basis has been proposed [24]. A recent study on the effects of increasing patient loads on the ICUs examined 200 499 patients admitted to 108 ICUs using a database prospectively collected during 2002–2005 [25••]. Daily census on the day of admission was determined for each patient and defined in relation to the mean census. Patients admitted on high census days had the same odds of inpatient mortality or transfer to another hospital as patients admitted on average or on low census days. Therefore, the ICUs of the study were able to increase their activities to meet the needs of a wide range of patients while maintaining consistent patient mortality outcomes.

Triage policies for an institution should be written in advance, and publicly notified as recommended by the consensus statements for triage of critically ill patients provided more than a decade ago [26]. Providers should advocate for patients; members of the provider team should collaborate; care must be restricted in an equitable system; decisions to give care should be based on expected benefit; mechanisms for alternative care should be planned. Ethnic origin, race, sex, social status, sexual preference, and financial status should never be considered in triage decisions. Despite these ethical obligations, racial disparities have been reported in the length of stay in emergency department before ICU admission in a group of USA hospitals [27•].

Triage implies refusal of some patients. Studies performed in France, in single [28] and multiple hospitals [29] found an incidence of refusal due to 'too well to benefit' of 16 and 13%, respectively, and an incidence of refusal due to 'too sick to benefit' of 9% in both studies. However, patients or relatives were involved only in 28% of decisions to forego life-sustaining treatments [28], and the ICU refusal rates varied greatly across ICUs [29], depending also on organizational factors.

Discharge from the ICU

The status of patients admitted to an ICU should be revised continuously to identify patients who may no longer need ICU care [5]. Nevertheless, Goldfrad and

Rowan [30] demonstrated that patients discharged at night from ICU fare significantly worse than those discharged during the day and similar findings have been reported in Australia and New Zealand [31]. A program to transform adult critical care throughout England, started in 2000 and involving 96 ICUs, was associated with a substantial reduction in transfers between units, unplanned night discharges, and case-mix adjusted hospital mortality compared with the three preceding years [32**]. Also a net monetary benefit was recorded [32**].

Ideally, the discharge from ICU to a lower level of care is appropriate when the patient's physiologic status has stabilized and the need for ICU monitoring and care is no longer necessary, or when the patient's physiologic status has deteriorated and active interventions are no longer planned. Therefore, the clinical appropriateness of discharge from ICU may be based on the following formula: (reversal of acute pathological condition OR lack of expectations of reversal) AND expected benefits of transfer. A survey performed on 55 Swiss adult ICUs showed that similar decisions were taken in the hospitals of different levels in four of five clinical situations, despite the marked heterogeneity in ICU discharge practices recorded [33]. Discharge decisions appeared to be influenced by institutional factors, because the decision to transfer a patient may depend also on the availability of discharge facilities such as intermediate care and step-down units, which can give a level of care higher than ward to the patients ICU discharged with any residual organ dysfunction [34]. Indeed, the assessment of residual organ failure and need for nursing care are the major determinants of ICU readmission [35,36], and discharge facilities may reduce the post-ICU mortality, but no study demonstrated that.

Really, both early and late discharge from ICU can be associated with problems. As far as early discharge is concerned, patients discharged with a TISS of 20 or greater have been shown to have a 21.4% mortality compared to 3.7% for those with a TISS of less than 10 [37]. This finding was confirmed by another study where patients with TISS scores greater than 30 who were discharged to hospital wards had a higher risk (1.31; 95% CI: 1.02–1.83) of in-hospital death compared with patients discharged to high dependency units [38]. Nevertheless, a multivariate analysis performed on the EURICUS II database using SOFA to measure organ dysfunction/failure and NEMS for nursing workload on the last ICU day found that only residual organ dysfunction/failure was associated with post-ICU mortality rate (odds ratio 1.30; 95% CI 1.10–1.53) [35]. More recently, a study performed on 3587 patients discharged from 31 ICUs where the attending physician classified each patient according to the Sabadell score from 0 (patients with expected good long-term prognosis) to 3 (patients not expected to survive the

hospital stay) concluded that the vast majority of ward deaths after ICU discharge occur in patients with very poor prognoses and that very few patients with good prognoses die in the ward after ICU discharge [39**]. This score may facilitate also decisions about readmission to ICU, which has been shown to be associated with residual organ dysfunctions at the time of the first ICU discharge [36]. In conclusion, poor physiological patient reserve before illness, severity of acute illness, intensity of the process of care, degree of organ function support required at ICU discharge and nursing dependence at ICU discharge may be markers of early discharge, responsible for readmission and/or hospital mortality [34].

Late discharge from ICU is the source of an economic burden due to the high daily cost of the ICU stay. Moreover, late discharge can be deleterious from the point of view of the society because it may reduce the bed days available for any other patient needing the ICU care, including those admitted from the operative suite. In the case of the need for a bed, the patients improved but still in the ICU may risk to be discharged at night from the ICU. As a consequence, administrations and physicians of medical wards and surgeons may suffer from the lack of ICU beds due to late discharges from ICU.

Whatever is the place of transfer, a transfer report edited at ICU discharge constitutes the primary source of information for the ward that will take charge after the ICU. Errors in ICU transfer reports have been found in 28% of 123 physician's transfer reports checked by ICU nurses and they may be potentially harmful [40].

Conclusion

The decisions to admit to and discharge patients from ICU depend on multiple variables, pertaining to patients, structure, and physicians. However, early ICU admission of the critically ill patient is beneficial. Indeed, early admission requires early detection of the patient's clinical deterioration by the ward staff who have also to communicate reliable information about patient history and wishes to the ICU physician. We do not know whether admitting patients early may increase costs, and future analysis should investigate not only patient outcomes but also economic parameters.

References and recommended reading

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