Delayed ICU Admission and its Impact on Mortality

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Delayed admission of a patient in ICU is associated with a potential increase in mortality. This delay can be due to several factors, such as recognition of severity criteria, triage strategy and paucity of available ICU beds. The identification of these factors is important to identify targets for improvement of ICU patient early management.

A paucity of ICU beds is a major concern for many countries. A shorter time from critical illness onset to ICU admission is associated with better patient outcomes and lower rates of complications related to the ICU stay and critical illness, in both the patient and the relatives. Thus to shorten the time to admission, the number of ICU beds must be appropriate for the population served. However, advances in modern medicine, especially for the most vulnerable patients (cancer, leukemia), associated with the ageing of the population, leads inexorably to an increase in the number of patients admitted to intensive care. In this context, triage plays a pivotal role in optimising ICU admission, taking into account recognition of severity criteria, proposal of the patient to the consultant intensivist, and final acceptance, refusal or reassessment of the patient for ICU admission. It is important to integrate the triage strategy and the potential risk of delayed admission to optimise ICU admission, especially when resources in ICU beds are limited.

Recognising the Severity of Symptoms in the Emergency Department

Delay in recognising the gravity of signs motivating transfer to intensive care has been the theme of an extensive literature for nearly 15 years, which always leads to the same conclusion: delayed implementation of specific care for patients requiring resuscitation due to a failure to recognise severe symptoms is a source of mortality. Rivers et al. (Rivers, Nguyen et al. 2001) were the first to show that aggressive and early management of patients with septic shock could reduce mortality at day 28. However, such specific treatment could be carried out in the emergency department, and does not necessarily imply an immediate transfer to ICU. O'Callaghan et al. observed that patients transferred to ICU with delay needed more invasive mechanical ventilation support (O'Callaghan et al. 2012).In the context of community-acquired pneumonia where specific care (mechanical ventilation, noninvasive ventilation, physiotherapy) is probably the most urgent, Restrepo et al. (Restrepo, Mortensen et al. 2010) found that patients transferred secondarily after primary transfer to a conventional ward had a mortality significantly higher than those transferred sooner (23% vs. 47% ; p = 0.02), while they had the same clinical, biological and radiological emergency admission specifications. In a retrospective study of more than 50,000 patients, Chalfin et al. (Chalfin, Trzeciak et al. 2007) observed that critically ill patients who had more than a six hour delay in ICU transfer had an increased ICU mortality (17.4% vs. 12.9% (p<0.001).

To enable support without delay to these specific categories of patient, and avoiding misdirection and transfer from the conventional sector several areas for improvement do exist. Firstly, recognition of severity of signs by nurses can be improved by nurse education. Experienced nurses with several years of activity are faster to recognise patients requiring organ support (Cioffi 2000). As for doctors, nurses require training to recognise adequately severity of patients (McGloin et al. 1999). Secondly, development and validation of several severity scores (Early Warning Score (Morgan et al. 1997); VitalPAC EWS (Prytherch et al. 2010); Cardiac Arrest Risk Triage (CART) validated certificates (Churpek 2013)) led to the modelling and prediction of the risk of worsening and early detection of patients requiring specialised care and reducing delays to immediate care in the ICU. Finally, the implementation of rapid response teams aimed at the management of life-threatening emergencies outside the ICU to allow shorter periods of ICU admission has been proposed (Luca Cabrini 2012). However, their efficacy is controversial (Devita et al. 2006; Luca Cabrini 2012). We can relate to this rapid response team idea by creating specific trainee graduates in the emergency field, particularly in Europe, for care and quick orientation of these patients. Sophisticated prehospitalisation emergency medicine may help to reduce the delay from the onset of critical disease to ICU admission (Nirula et al. 2010).

Criteria for ICU Admission and Refusal

Recommendations for ICU admission criteria have been published by societies of critical care (SCCM, ESICM), and can help the clinician in choosing whether to admit a patient to intensive care or not. The aim of such recommendations is both to admit patients requiring specific intensive care management, and to avoid the admission of patients too sick or too well to benefit from intensive care. However, Azoulay et al. demonstrated that these recommendations were only rarely applied (Azoulay et al. 2001). Several studies pointed out the fact that intensivists tend to admit patients in ICU even though they recognise that they should not (Vincent 1990; McNarry and Goldhill 2004; Giannini and Consonni 2006). A recent score, the "European Intensive Care Admission Triage Score", was developed by Sprung et al. to prevent the admission of those patients who do not benefit from their stay in the ICU and consume limited resources (Sprung et al. 2012). However, in this latter study, the admission strategy of patients to intensive care guided by a score did not result primarily in a restriction of indications but rather in an increase in the number of admissions despite a limited resource and with no benefit for these patients yet being demonstrated.

ICU Bed Availability

Refusal for ICU admission can be related mainly to three situations: 1) the patient is considered too sick to benefit; 2) the patient is considered too well to benefit, and 3) there is no bed available. This latter situation is a daily problem for intensivists (Singer et al. 1983). The proportion of patient refusal due to absence of beds available varies between 5% (Garrouste-Orgeas et al. 2005) and 20% (Robert et al. 2012). When a patient is proposed for ICU admission and there is no bed available, there are three different possibilities: emergency bumping of a patient to release a bed; transferring the patient to another ICU; or admitting the patient to a less specialised unit with the aim of reassessing the situation and proposing secondary ICU admission if it is still indicated. Whatever the chosen solution it leads to an additional delay in ICU admission or a risk of delivering an inappropriate level of care. Transfer to another ICU where a bed is available immediately is possible in countries where the different services are not geographically too far apart and or transportation is provided by a specialist trained in the care of these patients, but not in large countries or where paramedics are responsible for transport (Wiegersma, et al. 2011). Nevertheless, even in the case of a transfer quickly assured by appropriate staff, Durairaj et al. found that these patients had worsening of their mortality (Durairaj et al. 2003). Robert et al. Observed that patients refused for lack of available beds have a higher mortality compared with patients admitted to intensive care immediately (Robert et al. 2012). Meanwhile the lack of available beds influences the decision to admit or not resuscitate, since when there is no bed available doctors accept a smaller number of patients, patients who are younger and more severe (Iapichino, Corbella et al. 2010).

To fight against this delay to ICU admission, there are several ways to improve:

1. Perform resuscitation outside the ICU. Unfortunately, the literature suggests that even if the prognosis is closely related to the diagnosis and appropriate treatment, there are other factors that should be taken into account as part of unit-specific resuscitation (e.g. nurse / bed ratio, quality monitoring, presence of a practitioner 24/24h (Simchen et al. 2007)).

2. Reduce the ICU length stay in favour of strategies associated with reduction of mechanical ventilation such as sedation protocols (Kress et al. 2000).

3. Favour the development of intermediate care allowing a privileged circuit for rapid discharge of patients no longer under intensive care but needing more complicated care than on a regular ward.

4. It is important to anticipate periods of shortage, which may be related to a structural deficit or exceptional circumstances (e.g. terrorist attack, natural disaster) to reach the various categories of stakeholders in ICUs (Biddinger et al. 2013).

Meanwhile, it should be noted that the number of ICU beds related to population ratio is quite heterogeneous (Rhodes et al. 2012). Some statistical projections appear very far from the actual demand (Lyons et al. 2000; Carroll and Herbert 2004).

Conclusion

Delayed ICU admission aggravates the prognosis of patients awaiting transfer. Transfer to ICU is thus part of emergency treatment as well as antibiotic therapy in septic shock or coronary revascularisation in myocardial infarction.

In the context of limited resources, it is important to develop tools to provide adequate care to those most able to take advantage of it in order to ensure constant availability of beds and resuscitation teams thanks to the training of various stakeholders, efficient triage policies and to promote intermediate care units.

It would be of interest to determine with homogeneous criteria the appropriate number of ICU beds for a population served. The ICU bed / population ratio is a key issue in the health policy of a country.