



Special Feature

Triage decisions for ICU admission: Report from the Task Force of the World Federation of Societies of Intensive and Critical Care Medicine



Lluís Blanch ^{a,*}, Fayeze François Abillama ^b, Pravin Amin ^c, Michael Christian ^d, Gavin M. Joynt ^e, John Myburgh ^f, Joseph L. Nates ^g, Paolo Pelosi ^h, Charles Sprung ⁱ, Arzu Topeli ^j, Jean-Louis Vincent ^k, Susan Yeager ^l, Janice Zimmerman ^m on behalf of the Council of the World Federation of Societies of Intensive and Critical Care Medicine

^a Universitat Autònoma de Barcelona, CIBERes, Parc Taulí Hospital, Sabadell, Spain

^b Lebanese American University, Beirut, Lebanon

^c Bombay Hospital Institute of Medical Sciences, Mumbai, India

^d Mount Sinai Hospital & University Health Network, Toronto, Canada

^e The Chinese University of Hong Kong, Shatin, NT, Hong Kong

^f University of New South Wales, Australia

^g The University of Texas MD Anderson Cancer Center, Houston, TX, USA

^h Department of Surgical Sciences and Integrated Diagnostics, IRCCS AOU San Martino IST, University of Genoa, Genoa, Italy

ⁱ Hadassah-Hebrew University Medical Center, Jerusalem, Israel

^j Hacettepe University, Ankara, Turkey

^k Université Libre de Bruxelles, Belgium

^l Ohio State University, Columbus, OH, USA

^m Houston Methodist Hospital, Houston, TX, USA

ARTICLE INFO

Keywords:

Triage

Intensive care

Allocation of resources

Health care delivery

ABSTRACT

Demand for intensive care unit (ICU) resources often exceeds supply, and shortages of ICU beds and staff are likely to persist. Triage requires careful weighing of the benefits and risks involved in ICU admission while striving to guarantee fair distribution of available resources. We must ensure that the patients who occupy ICU beds are those most likely to benefit from the ICU's specialized technology and professionals. Although prognosticating is not an exact science, preference should be given to patients who are more likely to survive if admitted to the ICU but unlikely to survive or likely to have more significant morbidity if not admitted. To provide general guidance for intensivists in ICU triage decisions, a task force of the World Federation of Societies of Intensive and Critical Care Medicine addressed 4 basic questions regarding this process. The team made recommendations and concluded that triage should be led by intensivists considering input from nurses, emergency medicine professionals, hospitalists, surgeons, and allied professionals. Triage algorithms and protocols can be useful but can never supplant the role of skilled intensivists basing their decisions on input from multidisciplinary teams. Infrastructures need to be organized efficiently both within individual hospitals and at the regional level. When resources are critically limited, patients may be refused ICU admission if others may benefit more on the basis of the principle of distributive justice.

© 2016 Elsevier Inc. All rights reserved.

1. Background

Triage involves complex decisions that require balancing the potential risks and benefits for a specific patient while considering the implications for other potential patients when the number of beds and other

resources are limited. Demand for intensive care unit (ICU) resources often exceeds supply, and shortages of ICU beds and staff are likely to remain significant. Ideally, all patients in whom mortality or morbidity would potentially decrease with ICU care in comparison with care on other wards would be admitted provided that they consent to life-supportive therapies.

However, ICU admission can also increase the risk of overly aggressive treatments, exposure to errors or nosocomial infections, pain and discomfort, deconditioning, cognitive impairment, and psychological problems such as posttraumatic stress disorder and depression. Patients

* Corresponding author at: Critical Care Center, Parc Taulí Hospital Universitari, CIBER Enfermedades Respiratorias, Institut d'Investigació i Innovació Parc Taulí I3PT, Universitat Autònoma de Barcelona, Sabadell, Spain. Tel.: +34 687 731 269.

E-mail address: lblanch@tauli.cat (L.B. Torra).

who are very likely to die after ICU admission and those who will recover with care outside the ICU should not be admitted [1].

Triage is critical to optimize patient safety and early treatment in underresourced environments. Undertriage (ie, not admitting patients who are likely to substantially benefit from the ICU) means patients may fail to receive the care they need, affecting outcomes adversely; overtriage (ie, admitting patients who are unlikely to benefit from the ICU) may lead to more invasive and potentially harmful interventions as well as inappropriate allocation of resources, diverting care from other patients that need it more.

Specific criteria that measure potential incremental benefit from ICU admission are not clearly defined, and determining which patients to admit can be extremely difficult. Many factors, including differences in socioeconomic status, cultural attitudes, and resource availability among countries, may influence this process [2–4]. Therefore, to provide general guidance for intensivists in making ICU triage decisions, the World Federation of Societies of Intensive and Critical Care Medicine (WFSICCM) assigned a multidisciplinary task force to address 4 basic questions regarding this process. The task force emphasized elements that have the greatest impact on intensivists' routine day-to-day triage.

2. Objective

As part of a series of Task Forces developed by the WFSICCM Council in 2014, 5 key priority areas were identified: End-of-Life Care in the ICU, Triage, Disaster Response, Defining an ICU, and Defining the Specialty. The objective of these Task Forces was to develop a generic statement about recommendations for each of these 5 priority areas that would be relevant to the global community and that may inform regional and local initiatives.

3. Methods

Member Societies were invited to participate and identify potential participants.

Two meetings were held during the International Symposium of Intensive and Emergency Medicine in Brussels on 18 March 2015 and at the World Congress of the WFSICCM in Seoul on 29 August 2015, where summaries of the responses from Member Societies were presented and discussed.

A final report was prepared by the Chair of the Task Force, circulated to Task Force members, and approved by the WFSICCM for publication.

4. Who will benefit from admission to the ICU?

Weighing the potential risks and benefits for patients being considered for ICU admission is paramount in triage. Ideally, patients with reversible disease whose risk of death decreases with the ICU's sophisticated technologies and therapies and specially trained personnel should be admitted [5,6]. However, aggressive ICU treatments can also increase risk. Extremely ill patients with little chance of survival despite ICU admission are unlikely to benefit from transfer to the ICU; on the other hand, patients requiring anticipatory monitoring who will almost certainly thrive even if they are not admitted are also unlikely to benefit from ICU admission. Nevertheless, it can be extremely difficult to predict whether patients will thrive with or without ICU care [7,8]. Considering the limited number of ICU beds, the indications for admission should be defined to enable the identification of patients who are most likely to benefit from intensive care. Written institutional policies shared with all stakeholders (administrators, health care staff, and even patients) would be ideal.

Candidates for ICU admission are patients failing therapy on other wards, those at risk of complications that would require immediate intervention, and occasionally those with end-stage disease that require control of specific symptoms and those needing specific organ support [9]. Intensivists should guide the multidisciplinary team's consideration of the intricacies of each case.

Prompt diagnosis and treatment are essential for critically ill patients, especially those who are neurologically decompensated or hemodynamically unstable and those who have signs of impaired tissue perfusion and oxygenation. Although clinical observation can detect these signs, advanced monitoring might help reach decisions more quickly [10]. Adequate nurse staffing is essential to ensure appropriate care in the ICU.

Although it is unknown whether initial vital signs are useful in identifying critically ill older patients that would benefit from transfer to the ICU from emergency departments, triage scores based mainly on initial vital signs will probably exclude many critically ill older patients that might benefit from admission [11]. In general, triage scores are problematic because they usually have limited calibration in specific settings, tend to consider only ICU outcomes rather than the benefits of ICU care compared with ward care, and focus excessively on short-term rather than mid- or long-term benefits. However, in extreme conditions such as pandemics, scores may be necessary to ensure speed and consistency in decisions (see below).

5. Who makes the decision to admit a patient to the ICU?

Many ICUs have written criteria for admission according to the services they provide, and some use scoring systems to aid triage. However, these criteria, while outlining the principles on which these decisions should be made, may remain subject to interpretation. In fact, in daily clinical practice, most intensivists must interpret these criteria when deciding whether to admit a patient. Thus, the decision to admit a given patient often depends on the intensivist's judgment, and few data about the factors involved in these decisions are available [7,8,12]. Other professionals who regularly provide services to ICU patients (eg, other physicians, respiratory therapists, nurses, and social workers) may also offer valuable input, and ongoing dialogue with these professionals can help ensure a broader perspective and optimize decision making in complex care environments. Moreover, ethics committees, professional organizations, and other groups should be involved in discussing principles and formulating policies. ICU telemedicine programs could allow access to multidisciplinary teams for decision making, alternative implementation strategies, or consultation for ethical or medicolegal issues [13]. Criteria should focus on optimizing the use of limited resources to improve benefits for patients in the form of increased survival and quality of life, and social criteria for ICU admissions and triage policies based on a patient's ability to pay must be avoided.

Although intensivists should be ultimately responsible for triage decisions for ICU admission, they should involve emergency medicine professionals, hospitalists, surgeons, nurses, and allied professionals in the decision-making process (especially in the case of patients with cardiorespiratory disease or sepsis). Patients requiring transfer to the ICU within 24 to 48 hours of admission to general wards may have better outcomes if they are admitted directly to the ICU. Once the decision to admit a patient to the ICU has been made, the stay in the emergency department should be minimized.

Triage algorithms provide a standardized procedure for preliminary patient assessment and classification. Triage algorithms for mass casualty incidents (eg, STaRT, Triage Sieve, jumpstart, mSTaRT, or SALT) call for withholding lifesaving interventions for presumably unsalvageable patients well before the decision of whether to admit a given patient to the ICU is considered. These triage systems are not used for day-to-day triage for admission to ICUs. Emergency care providers other than physicians may need simplified algorithmic decision making for primary triage in these situations. More research is needed to clarify the effects of standardized triage algorithms [14–17].

Epidemics of severe diseases can potentially overwhelm critical care resources, and specific triage systems may be helpful as initial guidance for developing customized tools in these situations [18–25].

Some patients who need to be stabilized or who have illnesses too complex for general wards might benefit from alternatives to ICU admission. Intermediate-care or high-dependency units (HDUs) offer theoretical advantages for lower-risk patients who need monitoring and less intense nursing care. Although the cost-effectiveness of these units has yet to be demonstrated, they could make triage more flexible and help ensure the optimal use of ICU beds. It is advisable to have unified teams to attend patients in the ICU and HDU; although this may be difficult to organize in some settings, the potential benefits make it worth the effort. In the absence of HDUs, emergency department patients with intermediate risk often need to be admitted to the ICU [7,8]. HDUs managed by trained intensivists supported by a multidisciplinary team can help ensure the safety of patients outside the ICU.

6. What in-hospital factors limit the ability to admit a patient to the ICU?

Delayed ICU admission from the ward or emergency department may increase the risk of death. While on the wards, patients' conditions often deteriorate slowly over hours or days, ultimately resulting in multiorgan dysfunction. Patients whose condition deteriorates significantly on the ward would generally benefit from early ICU admission. To prevent these situations on the wards, it is essential to coordinate treatment plans with emergency department staff. Rapid response teams and local and regional plans to ensure patients are admitted to appropriate facilities can help organize care optimally.

Reduced ICU bed availability is associated with faster ICU turnover, high ICU admission refusal rates [26,27], and also higher rates of cardiac arrest on the ward [28]. Bed availability pressures may encourage physicians to discharge patients from the ICU more efficiently so that ICU readmissions are unlikely to be causally related to patient outcomes [29]. Insufficient ICU capacity may be addressed by expanding units, revising triage policies, reducing throughput delays, and creating step-down and/or HDUs for patients with lower risk that cannot be adequately cared for on ordinary wards.

Although physically reconfiguring beds could help alleviate bed shortages [30], this strategy is time consuming, is costly, needs a multidisciplinary team, and is potentially catastrophic to patients [31]. Thus, without strong evidence of clear benefits, physical reconfiguration should be avoided. Likewise, transferring patients out of the ICU requires appropriate selection to ensure that their clinical condition does not deteriorate rapidly in the ward, especially during the night when ward staffing may be reduced.

Priority for admission to the ICU or HDU should be given to patients from the wards who have clinical deterioration that cannot be adequately treated on the ward over similar patients from the emergency department. Because respiratory and nursing support on the wards is limited, beds in the HDU can be allocated for ICU use, maximizing flexibility. However, pooling ICU/HDU beds has the potential drawback that the nursing-to-patient ratio in the HDU might have to be increased, thereby increasing hospital costs; yet failure to increase nursing-to-patient ratios may compromise patient safety and reduce the benefits of critical care for all patients [32]. Flexible staffing models that match patients' needs with available resources (eg, nursing and respiratory support) may help avoid cost increases. Reserving the last available ICU bed for acute patients might reduce waiting times [31] but has the drawback of always having to keep an ICU bed available in a busy ICU.

Attempts to reduce the time to ICU admission could reduce waiting times for bed assignment. Optimally shortening ICU stay frees up beds more quickly, and this is reflected in low mean ICU bed occupancy. To reduce time-to-transfer, hospitals may need to increase transfer staff, coordinate admissions better between the wards and ICU, and reduce delays in hospital discharges to avoid delays in admission to wards from the emergency department while ensuring that patients are not prematurely discharged. Administrations should align ICU resources with estimates of the number and type of patients requiring admission

[31,33–35]. It is also important to avoid exit block in which the unavailability of beds on the wards makes it impossible to discharge patients from the ICU [36].

Pooling beds (ie, making bed assignments more flexible for patients of all types) reduces waiting times, but the size of the effect depends on the specifics of the hospital. Generally, pooling is most attractive when the ICU and/or HDU cannot be expanded because of physical or economic constraints [31].

To sum up, flow into and out of the ICU should be optimized, preventing deterioration in the wards, ensuring early admission when needed, providing adequate treatment in the ICU, and optimizing criteria for discharge. This strategy requires discussion and organization at the local, regional, and national levels.

7. What other factors should influence the decision to admit a patient to the ICU?

The patient's autonomy (eg, advance directives and power of attorney for health care decisions) should be taken into account in decisions about admission and discharge but are not strictly triage (prioritization) issues. However, the ability to pay; age; or ethnic, racial, or religious background should have no impact on triage [18,37,38].

Triage decisions can give rise to conflicts between the ethical principles of distributive justice and obligations to individual patients. Distributive justice refers to fairness in the distribution of limited resources and benefits. Although triage tools may support and improve the quality of critical care admission decisions, they probably cannot and should not supplant intensivists' experience and clinical judgment in decision making. If triage tools are misused, the public can come to distrust health care professionals and question the system [39]. Thus, it is essential to develop practical, reliable triage criteria to allocate critical care resources equitably. Given adequate resources and organization, available ICU beds can be viewed as a resource for a geographic area rather than a resource for a single hospital [18].

Patients and families need to understand that refusal to admit a patient to the ICU or the decision to discharge a patient from the ICU does not necessarily mean that physicians consider that the patient cannot survive [7,8]. Patients will remain outside the ICU when the risks outweigh the possible benefits for an individual patient or, on the basis of distributive justice, when other patients stand to benefit more from ICU care. Measures should be taken to work within the administrations of individual institutions and regions to optimize triage protocols to promote the best care for patients [40].

8. Summary and conclusion

Intensive care is expensive, and the number of beds is limited. However, when there are insufficient beds for the patients that need them, refusal rates can be too high, raising ethical quandaries and/or leading to potential legal repercussions [7,8]. In such situations, in addition to optimizing resource allocation, medical and nursing staff must speak out and lead the drive to improve infrastructures.

Measures to improve ICU triage should be implemented in accordance with the policies and characteristics of the institution and region. Before making adjustments, it is important to think through what patients and the health system as a whole stand to gain and what they stand to lose. Small changes in triage procedures when applied with wisdom can result in significant effects on operational procedures and can lead to potentially profound effects on outcomes and costs.

Ethics committees, government bodies, and society as a whole need to participate in a discussion about the principles involved in defining policies to allocate resources in each country. A worldwide deliberation on these issues will benefit critical care patients and professionals and ultimately communities.

Key points

1. ICU triage aims to ensure optimal and equitable use of critical care resources. ICU triage necessarily involves weighing the benefits of ICU admission against the risks involved; many factors come into play.
2. Intensivists should make the final decision about triage for ICU admission, considering input from nurses, emergency medicine professionals, hospitalists, surgeons, and other professionals.
3. Triage algorithms and protocols can be useful, but they can never supplant the role of skilled intensivists basing their decisions on input from multidisciplinary teams.
4. Infrastructures need to be organized efficiently both within individual hospitals and at the regional level.

Author contributions

Task Force planning

Pravin Amin (India).
 Djillali Annane (France).
 Lluís Blanch, CIBERES-ISCIII (Spain).
 Guillermo Castorena (Mexico).
 Bin Du (China).
 Edgar Jimenez (USA).
 Younsuck Koh (Korea).
 John Marshall (Canada).
 John Myburgh (Australia).
 Masaji Nishimura (Japan).
 Paolo Pelosi (Italy).
 Álvaro Réa-Neto (Brazil).
 Arzu Topeli (Turkey).
 Sebastian Ugarte (Chile).
 Jean-Louis Vincent (Belgium).
 Janice Zimmerman (USA).

Drafting of the manuscript

Lluís Blanch (Spain).

Participant members of the WFSICCM Task Force meetings 18 March and 29 August 2015 and critical revision of the manuscript for important intellectual content

Fayez François Abillama (Lebanon).
 Defne Altintas (Turkey).
 Pravin Amin (India).
 Djillali Annane (France).
 Lluís Blanch, CIBERES-ISCIII (Spain).
 Guillermo Castorena (Mexico).
 Dhruva Chaudhry (India).
 Michael Christian (Canada).
 Ramazan Coskun (Turkey).
 Nahit Çakar (Turkey).
 Nazim Dogan (Turkey).
 Bin Du (China).
 Chris Farmer (USA).
 Mohamed Omar Faruq (Bangladesh).
 Rob Fowler (Canada).
 Jorge Hidalgo (Belize).
 Edgar Jimenez (USA).
 Sameer Jog (India).
 Gavin M. Joynt (Hong Kong, China).
 Younsuck Koh (Korea).
 Rudy Manalu (Indonesia).
 John Marshall (Canada).
 Gernot Marx (Germany).

Naoyuki Matsuda (Japan).
 John Myburgh (Australia).
 Joseph L. Nates (USA).
 Masaji Nishimura (Japan).
 Paolo Pelosi (Italy).
 Assem Abdel Razek (Egypt).
 Álvaro Réa-Neto (Brazil).
 Nobuaki Shime (Japan).
 Charles L. Sprung (Israel).
 Arzu Topeli (Turkey).
 Mirza Nazim Uddin (Bangladesh).
 Sebastian Ugarte (Chile).
 Jean-Louis Vincent (Belgium).
 Dameera Weeratunga (Sri Lanka).
 Tobias Welte (Germany).
 Susan Yeager (USA).
 Pinar Zeyneloglu (Turkey).
 Janice Zimmerman (USA).

Financial support

None.

Conflict of interest disclosures related to this manuscript

None.

Acknowledgments

The authors thank Ms Mercè Ruiz and Mr John Giba for their invaluable support in editing the manuscript and language revision, respectively.

References

- [1] Barbash IJ, Kahm JM. Assessing the value of intensive care. *JAMA* 2015;314(12):1240–1.
- [2] Guidelines for intensive care unit admission, discharge, and triage. Task Force of the American College of Critical Care Medicine, Society of Critical Care Medicine. *Crit Care Med* 1999;27(3):633–8.
- [3] Cohen RI, Eichorn A, Silver A. Admission decisions to a medical intensive care unit are based on functional status rather than severity of illness. A single center experience. *Minerva Anestesiol* 2012;78(11):1226–33.
- [4] Guidet B, Hejblum G, Joynt G. Triage: what can we do to improve our practice? *Intensive Care Med* 2013;39(11):2044–6.
- [5] Dorman T, Angood PB, Angus DC, et al. Guidelines for critical care medicine training and continuing medical education. *Crit Care Med* 2004;32:263–72.
- [6] Garrouste-Orgeas M, Tabah A, Vesin A, et al. The ETHICA study (part II): simulation study of determinants and variability of ICU physician decisions in patients aged 80 or over. *Intensive Care Med* 2013;39(9):1574–83.
- [7] Orsini J, Blaak C, Yeh A, et al. Triage of patients consulted for ICU admission during times of ICU-bed shortage. *J Clin Med Res* 2014;6(6):463–8.
- [8] Orsini J, Butala A, Ahmad N, et al. Factors influencing triage decisions in patients referred for ICU admission. *J Clin Med Res* 2013;5(5):343–9.
- [9] Bazerbashi H, Merriman KW, Toale KM, et al. Low tissue oxygen saturation at emergency center triage is predictive of intensive care unit admission. *J Crit Care* 2014;29(5):775–9.
- [10] Chamberlain DJ, Willis E, Clark R, et al. Identification of the severe sepsis patient at triage: a prospective analysis of the Australasian triage scale. *Emerg Med J* 2015;32(9):690–7.
- [11] Lamantia MA, Stewart PW, Platts-Mills TF, et al. Predictive value of initial triage vital signs for critically ill older adults. *West J Emerg Med* 2013 Sep;14(5):453–60.
- [12] Joynt GM, Gomersall CD, Tan P, et al. Prospective evaluation of patients refused admission to an intensive care unit: triage, futility and outcome. *Intensive Care Med* 2001;27(9):1459–65 [1].
- [13] Lilly CM, Zubrow MT, Kempner KM, Reynolds HN, Subramanian S, Eriksson EA, et al. Critical care telemedicine: evolution and state of the art. *Crit Care Med* 2014;42(11):2429–36.
- [14] Wolf P, Bigalke M, Graf BM, et al. Evaluation of a novel algorithm for primary mass casualty triage by paramedics in a physician manned EMS system: a dummy based trial. *Scand J Trauma Resusc Emerg Med* 2014;22:50.
- [15] Christian MD, Sprung CL, King MA, et al, on behalf of Task Force for Mass Critical Care. Triage care of the critically ill and injured during pandemics and disasters. Chest consensus statement. *Chest* 2014;146(4 Suppl.):e615–745.

- [16] Griffiths JL, Kirby NR, Waterson JA. Three years experience with forward-site mass casualty triage-, evacuation-, operating room-, ICU-, and radiography-enabled disaster vehicles: development of usage strategies from drills and deployments. *Am J Disaster Med* 2014;9(4):273–85.
- [17] Aryal D, Acharya SP, Shrestha GS, Goffi A, Hawryluck L. Nepal after the disaster. Insider points of view for the future of critical care medicine. *Am J Respir Crit Care Med* 2015;192(7):781–4.
- [18] Morton B, Tang L, Gale R, et al. Performance of influenza-specific triage tools in an H1N1-positive cohort: P/F ratio better predicts the need for mechanical ventilation and critical care admission. *Br J Anaesth* 2015;114(6):927–33.
- [19] Guest T, Tantam G, Donlin N, Tantam K, Mcmillan H, Tillyard A. An observational cohort study of triage for critical care provision during pandemic influenza: 'clipboard physicians' or 'evidenced based medicine'? *Anaesthesia* 2009;64(11):1199–206. <http://dx.doi.org/10.1111/j.1365-2044.2009.06084.x>.
- [20] Ashton-Cleary D, Tillyard A, Freeman N. Intensive care admission triage during a pandemic: a survey of the acceptability of triage tools. *J Intensive Care Soc* 2011;12(3):180–6.
- [21] Shahpori R, Stelfox HT, Doig CJ, Boiteau PJE, Zygun DA. Sequential organ failure assessment in H1N1 pandemic planning. *Crit Care Med* 2011;39(4):827–32. <http://dx.doi.org/10.1097/CCM.0b013e318206d548>.
- [22] Christian MD, Devereaux AV, Dichter JR, Geiling JA, Rubinson L. Definitive care for the critically ill during a disaster: current capabilities and limitations: from a Task Force for Mass Critical Care summit meeting, January 26–27, 2007, Chicago, IL. *Chest* 2008;133(5 Suppl.):8S–17S. <http://dx.doi.org/10.1378/chest.07-2707> [PubMed PMID: 18460503].
- [23] Devereaux AV, Dichter JR, Christian MD, Dubler NN, Sandrock CE, Hick JL, et al. Definitive care for the critically ill during a disaster: a framework for allocation of scarce resources in mass critical care—from a Task Force for Mass Critical Care summit meeting, January 26–27, 2007, Chicago, IL. *Chest* 2008;133(5):51S–66S. <http://dx.doi.org/10.1378/chest.07-2693> [PubMed PMID: WOS:000255807800005].
- [24] Christian MD, Joynt GM, Hick JL, Colvin J, Danis M, Sprung CL. Chapter 7. Critical care triage. Recommendations and standard operating procedures for intensive care unit and hospital preparations for an influenza epidemic or mass disaster. *Intensive Care Med* 2010(36 Suppl. 1):S55–64. <http://dx.doi.org/10.1007/s00134-010-1765-0> [Epub 2010/03/23. PubMed PMID: 20213422].
- [25] Christian MD, Hawryluck L, Wax RS, et al. Development of a triage protocol for critical care during an influenza pandemic. *CMAJ* 2006;175(11):1377–81.
- [26] Baskett PJ. Ethics in disaster medicine. *Prehosp Disaster Med* 1994;9(1):4–5.
- [27] Heras A, Abizanda R, Belenguer A, Vidal B, Ferrandiz A, Mico ML, et al. Intermediate care units. Health care consequences in a reference hospital. *Med Intensiva* 2007;31(7):353–60.
- [28] Town JA, Churpek MM, Yuen TC, Huber MT, Kress JP, Edelson DP. Relationship between ICU bed availability, ICU readmission and cardiac arrest on the general wards. *Crit Care Med* 2014;42(9):2037–41.
- [29] Wagner J, Gabler NB, Ratcliffe SJ, et al. Outcomes among patients discharged from busy intensive care units. *Ann Intern Med* 2013;159(7):447–55.
- [30] Mélot C. To score or not to score during triage in the emergency department? *Intensive Care Med* 2015;41:1135–7.
- [31] Mathews KS, Long EF. A conceptual framework for improving critical care patient flow and bed utilization. *Ann Am Thorac Soc* 2015;12(6):886–94.
- [32] West E, Barron D, Rafferty A, Rowan K, Sanderson C. Nurse staffing, medical staffing and mortality in intensive care: an observational study. *Int J Nurs Stud* 2014;51(5):781–94.
- [33] Lapichino G, Radrizzani D, Rossi C, Pezzi A, Anghileri A, Boffelli S, et al. Proposal of a flexible structural-organizing model for the intensive care units. *Minerva Anestesiol* 2007;73:501–6.
- [34] Sprung CL, Artigas A, Kesecioglu J, et al. The Eldicus prospective, observational study of triage decision making in European intensive care units. Part II: intensive care benefit for the elderly. *Crit Care Med* 2012;40(1):132–8.
- [35] Sprung CL, Baras M, Iapichino G, et al. The Eldicus prospective, observational study of triage decision making in European intensive care units: part I—European intensive care admission triage scores. *Crit Care Med* 2012;40(1):125–31.
- [36] Levin P, Worner TM, Sviri S, et al. Intensive care outflow limitation—frequency, etiology and impact. *J Crit Care* 2003;18:206–11.
- [37] Sprung CL, Danis M, Iapichino G, et al. Triage of intensive care patients: identifying agreement and controversy. *Intensive Care Med* 2013;39(11):1916–24.
- [38] Szalazos JE. Triage the fittest: practical wisdom versus logical calculus? *Crit Care Med* 2012;40:697–8.
- [39] O'Laughlin DT, Hick JL. Ethical issues in resource triage. *Respir Care* 2008;53:190–7 [discussion 197–200].
- [40] Heyland D, Cook D, Bagshaw SM, Garland A, Stelfox HT, Mehta S, et al. The very elderly admitted to ICU: a quality finish? *Crit Care Med* 2015;43(7):1352–60.