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POINT OF VIEW

Emergency ICU model: An advanced approach to the critically ill patient

El modelo de la UCI de emergencias como solución avanzada al paciente crítico

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Introduction

Intensive care units (ICUs) were created to improve critical patient management by providing specialized nursing and medical care, continuous monitoring, and organ support, resulting in increased survival and promoting health in severe but potentially reversible cases. While the ICU is a destination, intensive care medicine is a mindset. The critically ill patient process begins much earlier, even before hospital admission, and does not end with patient discharge from the ICU. It can be said that a great deal of critical patient care is actually provided outside of the ICU.[1]

Expressions of the pioneers of intensive care medicine, such as those of P.J. Safar, warn of the risk of the specialty becoming "luxury palliative care" if early action is not taken in the continuum of the critically ill patient.[2] Subsequent concepts such as the "right care, right now" of the Society of Critical Care Medicine (SCCM), the more recent ICU without walls concept, or transfer of the ICU to diagnostic or therapeutic spaces, highlight the need to reduce the critical patient care *gap* (the time that a patient needing it must be managed with the fundamentals of intensive care).[3]

The current care overload in Emergency Departments (EDs) often means that critical patients are not identified early, and their appropriate management is not started. The initial phase of critical care is the moment with the greatest demand for care, prognostic impact, and the phase that does not admit delay.[4] This is an unresolved challenge for most organizations. The ED has been called the ''canary in the coal mine''[5] of healthcare organizations, in that it tells us about the situation of critical patient care in the emergency room setting, becoming the most reliable alarm regarding the situation of critical patient management. Early and appropriate care of critically ill patients lowers mortality, reduces the intensity and duration of multiorgan dysfunction, and increases the availability of beds for other critically ill patients.[6]

Models of critical patient care in the emergency setting

There is no single appropriate answer to the care of critically ill patients in the emergency setting. The solutions range from support by ED professionals, with or without specialized training, to more or less standardized consul-

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Table 1 Models of critical care delivery in the ED/solutions to critical patient care in the ED.

Models	Characteristics	Advantages	Inconveniences
ICU without walls	Concept	Strategic decision Facilitates management in care saturated areas	Need for practical correlation Coordination and communication with interdisciplinary teams Non-indicated admissions
Direct admission to the ICU	Usual system	Low investment	Lack of bed availability Delayed assessment Negative impact on prognosis Need for agile communication channels
Early intervention teams	Functional solution	Valid beyond the emergency care setting Stability and comprehensive care with nursing in the setting	Need for high availability, communication and organization Systems for early detection of potentially critical patients
Resuscitation spaces managed by the ED ("Hybrid model")	Usual Flexible and longitudinal critical care according to available resources	Easier integration Adaptation to changing demands	Need for training Difficult availability 24/365 "Tragedy of the commons"[a]
Resuscitation ICU	Advanced solution	Participates to a large extent in the rest of the solutions Decrease in prolonged admissions	Need for investment, sensitivity Architectural space close to ED
Electronic ICU	Intelligence integration artificial intelligence (AI) and *machine learning*	Generation of suggestions for medical care	Technological dependence and implementation of complex security systems

ED: Emergency Department; ICU: Intensive Care Unit; EICU: Emergency Intensive Care Unit.
[a] The *tragedy of the commons* is a concept from economics and ecology that describes how shared-use resources tend to be overexploited and ultimately degraded when each individual acts in his or her own self-interest, without adequate regulation or collective management.[2]

tation with critical care professionals, telemonitoring, early intervention teams, or the establishment of an emergency ICU structure in the ED (EICU), with different resources and dimensions.[7] The characteristics of the different models are summarized in Table 1.

The main disease conditions that could be treated in this type of Unit are summarized in Table 2, although they would require institutional adaptation.

It is essential for these solutions to have mechanisms for the early identification of patients of this kind, together with specific protocols and training. It is also essential to have resuscitation areas designed in line with the functions they perform (ICU equipment, electronic medical records, *point-of-care* imaging and laboratory resources, specific safety and quality systems, etc.). An example of spaces for the initial care of the critically ill patient in the ED is provided in Fig. 1.

EICU concept

The EICU constitutes an advanced solution. It is a structural space with the human and technical resources of a conventional ICU, adapted to emergency processes, offering an area for initial stabilization and resuscitation, and diagnostic and therapeutic decision-making. It reduces the gap in the care of critical patients, and is a place where different specialties coexist for the benefit of the patient[8]. This type of care harmonizes and expands investigation in the earliest phase of critical patient care, which is when the impact on the final prognosis can be greatest. It promotes training in the field of emergency care, facilitates conditional treatments in time, and provides organic support, allowing the assessment of physiological reserve and decision-making by maintaining the treatment or guiding it towards palliative management. In short, this type of Unit can exert a buffer effect to adjust the supply and demand of critical care beds. With the necessary adaptation, it allows for the management of multiple patients and improves critical patient flow, survival, and evolution.[4] The EICU furthermore increases bed availability both in the ED and in critical care areas, improving patient safety from different perspectives.[9]

Limitations

There are difficulties for the development of EICUs: the literature has significant publication bias; the experiences available to us are not all that actually exist; and there is a monopoly dominated by a few and selected Units.

Evaluation indicators have not been described, and research in this field is not easy. There are important con-

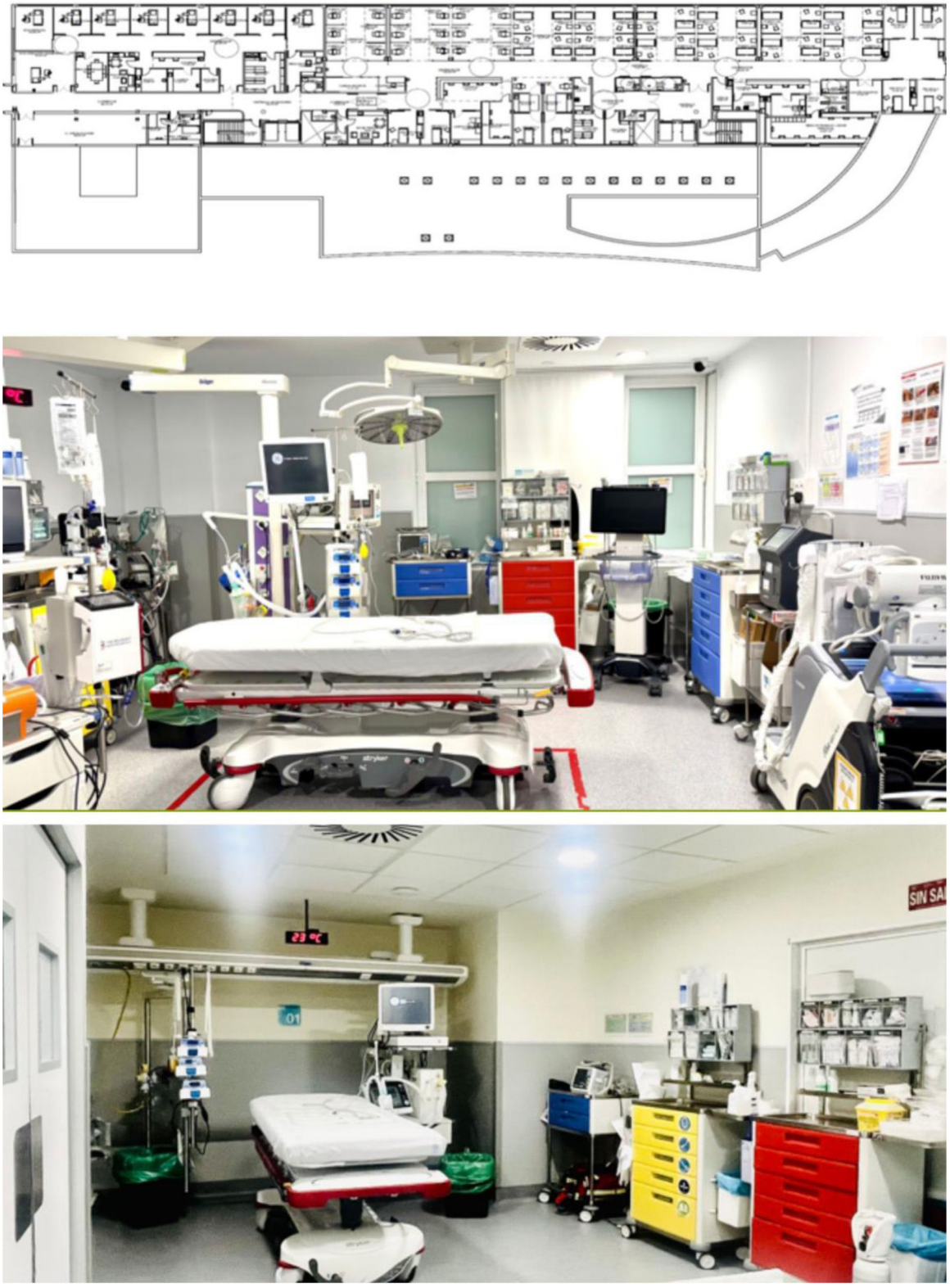

Figure 1 Examples of spaces for the initial care of critical patients, and the ICU in the Emergency Department of the Hospital Universitario "12 de Octubre" in Madrid, Spain.

Table 2 Main characteristics and diseases leading to EICU care.

Disease groups	Subgroup	Procedures
Metabolic alterations	Blood glucose decompensation Severe ionic disturbances Adrenal insufficiency and thyrotoxic crises	Initial resuscitation and clinical stabilization
Gastrointestinal disease	Gastrointestinal bleeding Severe acute pancreatitis Severe acute cirrhotic decompensation	Resuscitation and digestive tract endoscopy
Acute neurological impairment	Agitation difficult to treat Severe intoxication Severe coma Status epilepticus	Initial care and clinical diagnosis
Trauma care	Severe trauma Potentially severely ill patient Multiple victim incident	Initial resuscitation REBOA Resuscitation thoracotomy
Initial management of sepsis	Septic shock with organic repercussions	Initial resuscitation Early diagnosis
Acute cardiac patient care	Heart failure Arrhythmia with repercussion Ischemic cardiomyopathy Aortic syndrome	Initial resuscitation Ventilatory support
CRA care	Conventional CRA care Refractory CRA Post-resuscitation syndrome	Initial resuscitation Clinical diagnosis ECMO-CPR
Respiratory disease care	Asthmatic crisis Exacerbation COPD Pulmonary thromboembolism Severe infection: CAP	Ventilatory support: IMV, NIMV or HFO Initial fibrinolytic and antibiotic therapy
Onco-hematologic emergencies	Infectious: Septic shock in immunosuppressed patients Acute toxicity due to treatment (QT/immunotherapy)	Support and resuscitation
Potential donor care	Intensive care to facilitate organ donation (ICOD) Uncontrolled asystole Medical aid in dying (AID)	Initial assessment Certification of death Preservation maneuvers: ECMO-TAP
Techniques in the critically ill patient	Central venous catheters, peripheral and arterial access Endothoracic drainage ECMO Renal replacement therapy Conscious sedation Clinical support in special situations (e.g., anaphylaxis)	

ECMO-CPR: extracorporeal membrane oxygenation cardiopulmonary resuscitation; CAP: community-acquired pneumonia; CRA: cardiorespiratory arrest; ECMO-TAP: extracorporeal membrane oxygenation thoraco-abdominal perfusion; HFO: high-flow oxygen therapy; CT: chemotherapy; REBOA: resuscitative endovascular balloon occlusion of the aorta; EICU, Emergency Intensive Care Unit; IMV: invasive mechanical ventilation; NIMV, noninvasive mechanical ventilation.

founding factors related to the indications for admission, different sensitivities in the strategic planning of the organization, which requires a rigorous design, the allocation of resources, with difficulties in generating specific teams for Units of this kind, in addition to specialized and integrated training between critical care and the ED. Modifications of the architectural structure of the ED are even needed in some cases.[10]

Conclusions

The EICU can be considered the most advanced solution to reduce the *gap* in critical patient care in different geographical areas and contexts. It is not a single-type solution. Although there are many experiences with units of this kind, the model that can provide the greatest benefit to each organization has not been defined to date. The EICU can be an area of expansion of intensive care medicine in a line different from that which has been proposed on other occasions, characterized by collaboration with other specialties involved in the continuous process of critical patient care. Our goal should be to achieve a zero *gap* in the management of the critically ill patient.

> "Resuscitation often does not have a place to call home in our organizations."
>
> Evan Leibner. Institute of Critical Care Medicine and Department of Emergency Medicine. Mount Sinai Hospital. New York City. USA

Authorship

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