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ICU without walls project. Effect of the early detection of patients at risk☆

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Abstract
Objectives: To describe and evaluate the impact of a system for early detection and intervention in patients at risk outside the ICU upon the outcome of patients admitted to the ICU and the number of cases of hospital cardiopulmonary arrest.
Setting: A second-level hospital in the Community of Madrid (Spain) with electronic clinical histories.
Methods: An intensivist reviewed each of the patients meeting the inclusion criteria, and decided the need or not for intervention. Posteriorly, in collaboration with the physician supervising the patient, the needed level of care was decided, along with the subsequent management protocol.
Design: A descriptive and quasi-experimental ''before-after'' study was made.
Results: A total of 202 patients were intervened during the study period, with the inclusion of 147 patients after detecting altered laboratory test results through our software application. During the control period, the mortality rate in the ICU was 9%, versus 4.4% during the intervention period ($p = 0.03$). In the multivariate analysis, the two factors significantly related to mortality were admission during the intervention period (OR = 0.42; 95%CI: 0.18–0.98; $p = 0.04$) and SAPS 3 (OR = 1.11; 95%CI: 1.07–1.14; $p < 0.05$). There were 10 cardiopulmonary arrest alerts during the control period, versus three in the intervention period ($p = 0.07$).
Conclusions: Early detection activities in patients at risk outside the ICU can have beneficial effects upon the patients admitted to the ICU, and can contribute to reduce the number of hospital cardiopulmonary arrests.

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PALABRAS CLAVE
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Equipos de respuesta rápida

Proyecto UCI sin paredes. Efecto de la detección precoz de los pacientes de riesgo

Resumen
Objetivos: Describir y evaluar la repercusión de un sistema de detección e intervención precoz en pacientes de riesgo fuera de la UCI en la evolución de los pacientes ingresados en UCI y el número de paradas cardiorrespiratorias (PCR) hospitalarias.
Ámbito: Hospital de nivel 2 en la Comunidad de Madrid con historia clínica electrónica.
Métodos: Un intensivista revisa cada uno de los pacientes que cumplan los criterios de inclusión y decide la necesidad o no de intervención. Posteriormente, junto al médico a cargo del paciente, se determina cuál es el nivel de cuidados que necesita y se decide la pauta a seguir a continuación.
Diseño: Estudio descriptivo y cuasi-experimental «before-after».
Resultados: En el periodo de estudio se intervino en un total de 202 pacientes. Ciento cuarenta y siete fueron incluidos tras detectarse analíticas alteradas a través de nuestro programa informático. En el periodo de control la mortalidad en UCI fue 9 frente al 4,4% en el periodo de intervención (p = 0,03). En el análisis multivariable, los 2 factores que guardaron relación significativa con la mortalidad fueron el haber ingresado durante el periodo de intervención OR 0,42 (IC95%; 0,18 a 0,98) (p = 0,04) y el SAPS 3 OR 1,11 (IC95%; 1,07 a 1,14) (p < 0,05). El número de avisos por PCR en el periodo control fue 10 frente 3 en el periodo de intervención (p = 0,07).
Conclusiones: La actividad de detección precoz de pacientes en riesgo fuera de la UCI puede producir un efecto beneficioso sobre los pacientes ingresados en UCI así como una reducción de las PCR hospitalarias.

Introduction

The aim of Intensive Care Medicine and of the Intensive Care Unit (ICU) is to offer critically ill patients quality treatment adjusted to their needs, and in the safest manner possible.[1] In the United States, it is considered that over one-half of the population will require admission to the ICU at some point in life, and that an important percentage of individuals will die in such Units, consuming between 0.5 and 1% of the gross domestic product.[2]

A broad and more balanced hospital perspective is needed for the treatment of patients at risk, classifying them according to the required level of care and not according to where they happen to be located. Hospitalization of the seriously ill patient should be regarded as continuous from before to after admission to the ICU.[3,4]

Delays in the treatment of hospitalized patients often result in emergency admission to the ICU, which in turn implies a prolongation of hospital stay and even increased mortality.[5] It has been estimated that over 50% of hospitalized patients failed to receive optimum management before admission to the ICU, and that 40% of all admissions to the Unit are in fact avoidable.[6] On the other hand, delays in admission to the ICU – mainly due to a limitation or shortage of available beds – has been associated to mortality, as described by Cardoso et al.,[7] who reported a 1.5% and 1% mortality increase in the ICU and in hospital, respectively, for every hour of delayed admission. On considering those patients who after discharge from the ICU require subsequent readmission to the Unit because of clinical worsening, mortality in the ICU and the duration of hospital stay increase 4- and 2.5-fold, respectively.[8]

It must be taken into account that life-threatening situations are usually preceded by physiopathological alterations that are detectable and avoidable. This is particularly relevant in the case of the so-called ''time-dependent'' diseases such as sepsis, acute coronary syndrome and cardiac arrest.[9–12]

On the basis of these premises, we raised the hypothesis that management of the seriously ill patient, while centered on the ICU, can be extended beyond the Unit, constituting a continuous process throughout the duration of patient hospital stay. Any change within the process can have a positive impact upon patient outcome. The aim of this study was to describe a system designed to allow early detection and intervention in patients at risk outside the ICU and to evaluate its repercussions upon the course of those patients admitted to Intensive Care and upon the number of cases of in-hospital cardiac arrest.

Patients and methods

Study setting

The study was carried out in a 210-bed second level hospital in the Community of Madrid (Spain), with a polyvalent adult clinical–surgical ICU (8 beds). The hospital is fully digitalized with a common electronic clinical record (Selene®) and data exploitation software (Datawarehouse®).

Methods

During the intervention period, on working days, one of the intensivists reviews each of the patients meeting the inclusion criteria based on the electronic clinical record in Selene®, and decides whether intervention is needed or not. Posteriorly, together with the physician in charge of