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Predictors of pulmonary critical care recidivism

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Abstract   *Background:* Many patients need readmission to intensive care unit (recidivism) which make ICU moderation burdensome. Readmitted patients mostly carry poor prognosis compared to newly admitted ones, in addition to the bad psychological impact for both patient and his family.

Study design: In this retrospective study data of the admitted patients to the pulmonary critical care unit, Mansoura University Hospital included: demographic, clinical, laboratory, and ventilatory data in addition time of discharge and readmission were collected, analyzed and interpreted.

Aim: The aim of this work is to study the predictors of pulmonary critical care recidivism.

Patients and methods: In this retrospective study 1562 pulmonary critical care unit patients admitted to pulmonary critical care unit, Mansoura University Hospital from August 2009 till the end of December 2013 were subjected to: recording of demographic data, body mass index, admission severity scoring, type of respiratory failure, presence of co morbidity, need for pressors, presence of acute kidney injury at the time of admission, duration of mechanical ventilation, protocolized versus non protocolized weaning, need for tracheostomy, time of discharge, and discharging oxygen saturation using pulse oxymetry.

Results: Of the total number was 1562 patients 69 patients were transferred to other ICUs. From the remaining 1493 patients, 327 died within the first 24 h of ICU admission and 1166 survived, 395 patients needed readmission and 771 were non readmission. The incidence of recidivism was more in: patients with type II respiratory failure (66.8%), age above 50 years (69.9%), BMI above 35 (70.4%), non recovered acute kidney injury (53.2%), pressor receivers (87.6%), who underwent tracheostomy (67.8%), had longer duration of mechanical ventilation (17 ± 7 days vs. 9 ± 4 days in non readmitted) and patients who were discharged between 8 pm and 8 am (72.4%) on hot days (82.1%), in all the *p* value was < 0.005. On the other hand, there was no statistically significant difference in both readmitted and non readmitted patients as regards: sex and weaning method (protocolized 49.4% or non protocolized 50.6%), in all the *p* value was > 0.005.

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Conclusion: Age above 50 years, obesity, non recovered AKI, presence of type II respiratory failure, nocturnal and hot day discharge, need for pressors and tracheostomy are considered to be predictors of recidivism to pulmonary critical care unit.

Introduction

How big is this problem, what are the reasons for ICU readmission, and what can we do to prevent Intensive care unit (ICU) readmission and improve this relatively common under addressed problem. The foremost question is: Why were patients readmitted to the ICU? It is likely that some ICU readmissions are not preventable because it is fully expected that some patients will be readmitted. Furthermore, some patients and families have unrealistic expectations and create pressure for an ultimately fruitless futile ICU readmission, thereby increasing incidence and mortality of ICU readmissions [1].

What of potentially preventable ICU readmissions? Was there a difference in reasons for index ICU admission versus readmission? This helps us understand whether primary problems were resolved and a new problem arose, or whether the primary problem was incompletely resolved or recurred. Brown and coworkers found [1] that about 40% of readmitted patients were readmitted for a similar diagnosis as their index admission, which is worrisome, intriguing, and could be correctible. When patients were discharged, was there inadequate resolution of the primary problem or underestimation of the risk of deterioration outside ICU? [2].

Criteria for ICU admission, discharge, and readmission likely vary dramatically from ICU to ICU and from country to country. The study of Brown and colleagues focused on U.S. ICUs, so we do not know whether it applies well to other countries. Should there be clear(er) criteria regarding resolution of the primary ICU diagnosis that must be met before ICU discharge? We use sepsis and ventilator checklists to improve ICU care. Should there be checklists for ICU discharge to decrease the risk of ICU readmission [3]?

Clinical characteristics at the index ICU admission mark patients at increased risk of ICU readmission. Readmitted patients had higher Mortality Prediction Model III (MPM-III) scores, [4] increased vasopressor use, and were more likely ventilated than patients who were never readmitted. Furthermore, patients with comorbid conditions (chronic cardiovascular disease, chronic respiratory disease, and baseline serum creatinine, 2 mg/dl) were more likely to be readmitted. It appears that ICU readmission of such sicker patients with more comorbidities may have been due to inadequate resolution of the primary problem and increased risk of a new problem (e.g., nosocomial or aspiration pneumonia, myocardial infarction, pulmonary thromboembolism) [5].

Evening and night ICU discharges have higher risk for ICU readmission so closer attention must be paid to these patients [6]. An Australian study of 250,000 ICU admissions emphasized that ICU discharges between 6:00 pm and 6:00 am are at increased risk of ICU readmission, which Brown and colleagues validated. Perhaps such patients may be discharged to create room in an ICU, suggesting that they are less "ready"

for ICU discharge [3,10]. Differences in ICU night staffing, discharge protocols, or handoff quality could also explain these findings [7].

Patients readmitted to ICU have dramatically increased mortality rates compared with never-readmitted patients. Comparing never-readmitted patients with those readmitted within 48 h, 3.7% versus 20.7% died, 64.4% versus 36.6% were discharged home, and median hospital length of stay was 8 versus 15 days, respectively ($p < 0.001$) [5]. In Australia ICU readmitted patients had nearly identical mortality rates of 21% (ICU readmitted) compared with 4.4% (not ICU readmitted). This fivefold increase in mortality rate shows that the ICU readmitted patient has clearly "taken a turn for the worse" [1].

Indeed, many have suggested that ICU readmissions are a measure of ICU and hospital quality of care therefore, we suggest that it is timely for critical care groups (societies) to address proactive issues such as monitoring of the incidence and outcomes of ICU readmission, ICU discharge processes and perhaps ICU discharge bundles, enhanced ward clinician coverage of patients at increased risk of ICU readmission [8].

Intensive care unit readmissions are associated with mortality, cost, and length of stay [9]. They may also capture a component of hospital efficiency through optimal patient flow management [10] and have been proposed as an appropriate measure of the quality of ICU care. However, little is known regarding the epidemiology of ICU readmissions in the United States: how commonly they occur, when, and where they occur, or whether rates have changed over time. Past experiences in ICU are few in number [11].

Using heterogeneous definitions of ICU readmission have estimated rates from 4.6% to 13.4%, and a recent larger study in Australia examined patient risk factors for ICU readmission [6]. Thus, although ICU readmission rate is a promising measure for assessing patient triage decisions and ICU performance, its use as a quality metric depends on a better understanding of their incidence and the hospital-level factors associated with their occurrence [12].

Readmission to the intensive care unit during the same hospital stay has been associated with a greater risk of in-hospital mortality and has been suggested as a marker of quality of care [13]. About one in 10 patients surviving an episode of intensive care will be readmitted to the ICU during the same hospitalization [14].

It is not clear whether the decision to discharge patients from the ICU or the level of care given to these patients in the general wards, or a combination of both, results in readmission to the ICU. Therefore, the ability to identify patients at high risk of readmission to the ICU during the same hospitalization could allow objective decisions to be made by clinicians regarding the timing of discharge from intensive care, the level of care required by patients in the ward and the need for follow-up by ICU staff. To date, there is a lack of published