



Adherence to standard admission and discharge criteria and its association with outcome of pediatric intensive care unit cases in Al-Ahrar Hospital Zagazig



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Abstract *Background:* The effective use of pediatric intensive care unit (PICU) beds is an important issue as they are expensive and have limited resources. Adherence to well-defined admission and discharge criteria for PICU cases will be very helpful for better PICU bed utilization.

Aim of the study: The aim of the present study is to evaluate of criteria of admission and discharge of all admitted and discharged patients to the PICU in Al-Ahrar Hospital, Zagazig, Egypt, in comparison to the standard criteria of admission and discharge of the American Academy of Pediatrics (AAP).

Methods: This study included 125 children admitted to the PICU with different diagnoses during a six month period from July 2013 to December 2013. The recorded data of the recruited patients include demographic data, cause of referral, criteria of admission, physical examination, provisional diagnoses at admission, diagnostic studies, definite diagnoses, outcome and criteria of discharge. Pediatric index of mortality second version (PIM-2) was calculated from the collected information within one hour period from the time of admission to the PICU.

Results: The admission of male children to PICU was slightly higher than females (51.2% versus 48.8%). Incompatible admission represented 18.4% of all admitted cases. Complicated gastroenteritis was the most frequent final diagnosis in our PICU (16.8%). This was followed by pneumonia (15.2%), traumatic brain injury (12%), status epilepticus (8.8%), sepsis (6.4%) and meningitis (4.8%). Overall mortality rate was 14.4% (18 out of 125). The highest mortality rate was in traumatic cases (33.3%), followed by multiple organ dysfunction syndrome (MODS) in sepsis cases (22.2%) and neurological cases (22.2%). Incompatible discharge represented 4.8% of all discharged

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cases. Average LOS and mean *PIM-2* were significantly higher in non-survivors group than in survivors group (18.3 days and 34.1% versus 5.4 days and 2.1%, respectively). These two factors were also the only significant predictors of outcome. The optimal cutoff value of *PIM-2* to predict mortality rate in the studied patients was > 5% with high sensitivity and specificity (100% and 95.3%, respectively).

Conclusion: PICU facilities at Al-Ahrar Hospital, Zagazig are insufficient to meet the demand. An admission score based on the *PIM-2* score could assist in the selection of patients for these limited PICU facilities.

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Introduction

During the last century, developed countries have seen significant decrease in children mortality. PICU played a small but significant role in these remarkable outcomes. Despite these advances, the majority of world's children living in developing countries and in the poorer areas of countries with mixed economies have not shared in this remarkable prosperity and progress.¹ Costs of care for a PICU patient have been estimated as being three times the costs of care for a general ward patient.²

The ratio of professional personals to patients is generally higher in PICU than in other areas of the hospital, reflecting the acuity of PICU patients and the risk of life-threatening complications. Complex technology and equipment is often in use, particularly mechanical ventilators and patient monitoring systems. Consequently, PICUs have a larger operating budget than many other departments within the hospital.³

The effective use of PICU beds is an important issue as they are expensive and have limited resources. These financial limitations and limited PICU facilities must be used to the best advantage in terms of cost and patient outcome. Monitoring PICU performance is, therefore, increasingly important in the fight to control hospital expenses. Adherence to well-defined admission and discharge criteria for PICU cases will be very helpful for better PICU bed utilization and provide intensive care to those patients who will have the best prognosis and utilize resources optimally.⁴

Generally speaking, in developing countries like Egypt there are ill-defined admission and discharge criteria for PICU cases.

Patients and methods

An official permission was obtained using proper channels of communication. The authorities of PICU in Al-Ahrar Hospital, Zagazig, Egypt agreed to allow the collection of uniform pediatric data set of all admitted cases during a six-month period from July 1, 2013 to December 31, 2013 by the main author. Al-Ahrar is a governmental educational hospital; PICU is level II including 7 beds and 2 isolation rooms fully equipped with mechanical ventilators (Dragger and Villa) and oxygen and suction and monitors. Personnel in charge include consultants, specialists and resident pediatricians available 24 h. Nursing staff are in a ratio of 1 nurse for 2–3 beds/8 h shift. Radiology and laboratory investigations are performed within the hospital. Infection control policy is available. The policy of our PICU is not to admit purely surgical or

postoperative cases. There is a Burn Unit in our hospital, so no burn cases had been admitted to our PICU according to the hospital policy. No cases with malignancy had been reported in our study either as a diagnosis or as co-morbidity.

The study included 125 children admitted to PICU during this period. Each care-giver of the recruited children was asked to give an informed consent to participate in the study after full explanation of the nature and the main aim of the study and its expected outcome benefits.

The data set included the demographic variables (age and gender), average length of stay (ALOS)/days, the main diagnosis at PICU admission (defined as the main reason for PICU admission), compatibility with admission criteria of the AAP, PICU outcome (died in PICU [mortality rate], discharged or transferred for further management), *PIM-2* variables, the diagnostic categories and co-morbidities according to mortality rate and compatibility with discharge criteria of the AAP. Patients 16 years or older were excluded. The patients were classified as PICU survivors or non-survivors. AAP admission and discharge criteria were revised before beginning research from the revised guidelines available on the AAP publications website to build a questionnaire including age, sex of patients and cause of admission including respiratory, cardiovascular, neurological, hematologic/oncologic diseases, endocrine/metabolic diseases, gastrointestinal diseases, surgery, renal diseases, multisystem diseases. Decision for referral or discharge home was based on criteria of the AAP guidelines including stable hemodynamic parameters, stable respiratory status, minimal oxygen requirements, no use of inotropic or antiarrhythmic supports, neurologic stability and no invasive monitoring devices.⁴²

PIM-2 was calculated from the information collected within a one hour period from the time of admission to the PICU. Because *PIM-2* describes the child morbidity at the time of intensive care admission, the recorded observations were those made at or about the time of first face-to-face (not telephone) contact between the patient and the physician from PICU. The first value of each variable was measured within the period from the time of first contact to one hour after arrival in the PICU. *PIM-2* score consists of ten variables; systolic blood pressure (mmHg), fixed pupillary reactions to bright light (yes/no), PaO₂, FIO₂ at the time of PaO₂ if oxygen via endotracheal tube or head-box, base excess in arterial or capillary blood, mechanical ventilation at any time during the first hour in PICU (yes/no), elective admission to PICU (yes/no), recovery from surgery or a procedure is the main reason for PICU admission (yes/no), admitted following cardiac bypass (yes/no), high risk diagnosis (yes/no), and low risk diagnosis (yes/no). Each of the previous variables is coded and included in

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