

Admission Source and Mortality in a Pediatric Intensive Care Unit

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ABSTRACT

Aim: To examine associations between mortality, length of stay, and the sources of admission to tertiary pediatric intensive care.

Methods: This retrospective study was carried out in a tertiary Children Hospital & ICH, Multan. All admissions between January 2011 and December 2013. We compared length of stay and mortality rate between the different sources of PICU admission.

Results: Among 1573 consecutive patients admitted in the above time period, 980(63%) were boys and 593 (37%) were girls. Out of the total cases 1240 (78.8%) were medical cases and 333(21.2%) were surgical cases. Further distribution of admission was that the patients were admitted from medical emergency (60%), surgical emergency (10%), medical ward (18.6%), surgical ward (1.16%) and from operation theatre (10%). The total admissions from emergency were 70%, from the ward were 20% and from operation theatre 10%. **Conclusions:** Outcomes of tertiary pediatric intensive care vary significantly by source of admission with patients originating from the same hospital's clinical wards being at greater risk.

Keywords: Source, mortality, ICU

INTRODUCTION

To improve the quality of care, discrepancies in health care delivery and their effects on patient outcomes must be identified. A lot of work, done in various different countries, has proved an association between the source of PICU admissions and the ultimate outcome of death. Patients transferred from wards within the same hospital show a greater ICU mortality when compared with those coming from other sources^{1,2}. Emergency departments (EDs) provide a pivotal role in the continuum of care for critically ill patients from the pre-hospital environment to the definitive setting of an intensive care unit (ICU). The management of critically ill patients is multidisciplinary and typically involves specialist physicians, nurses, other health professionals from the EDs, and inpatient teams.

In a study in adult patients a dose–response effect has also been identified, with longer stays in other wards being directly associated with higher mortality³. It is unknown if this is true for pediatric patients, because diagnostic case mix and morbidity are different in Pediatric Intensive Care Units (PICUs). Whether an association exists between patient outcomes and source of patient admission in PICU is still a question to be elaborated in our country.

It has been observed that the conditions of both adult and pediatric patients transferred from other

hospitals is generally worse than those of patients coming from within the same hospital^{4,5}. The patients transferred from other ICUs show a higher mortality than the patients transferred from same hospital⁶. In another study on pediatric trauma patients it was found that those patients admitted directly from the scene had a lower injury severity, higher Glasgow Coma Scale and lower adjusted mortality rate compared with those admitted from inter-hospital transfer⁷.

There is a lack of evidence in Pakistan showing the association between source of admission and mortality in the PICU. The primary aim of the present study was to evaluate the effect of admission source on mortality in a tertiary PICU in the city of Multan, Pakistan. We also evaluated the performance of the Pediatric Index of PRISM 111 as a predictor of death risk. The objectives of this study were to see the risk-adjusted mortality rates for indoor admissions, emergency department admissions and operation theatre admissions.

MATERIALS AND METHODS

We carried out an observational study in which retrospective analysis of prospectively collected data was done including all recorded admissions of patients up to 14 years of age admitted to the PICU of the Children Hospital & Institute of Child Health, Multan, Pakistan between January 2011 and December 2013. This hospital is a reference center for paediatric sub specialities.

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RESULTS

Among 1573 consecutive patients admitted in the above time period, 980 (63%) were boys and 593 (37%) were girls. Out of the total cases 1240 (78.8%) were medical cases and 333(21.16%) were surgical cases. Further distribution of admission was that the patients were admitted from medical emergency (60%), surgical emergency (10%), medical ward (18.6%), surgical ward (1.2%) and from operation theatre (10%). The total admissions from emergency were 70%, from the ward were 20% and from operation theatre 10%.

The average length of PICU stay was 4.5 (ranging from 1 to 271) days. Regarding the length of stay, the patients shifted from the ward had the maximum average length of stay. The patients shifted from the emergency department had the intermediate length of stay while the patients coming from the operation theatre had the shortest length of stay.

Table 1: Average duration of stay.

Source of admission	Average length of stay
Ward	8.5 days
Emergency	3.5 days
Operation theatre	1.5 days

Table 2: Mortality rate

Source of admission	n	Expiries	Mortality rate	Overall Mortality
Operation Theatre	158	15	9.5%	0.9%
Ward	315	85	29.0%	5.4%
Emergency	1100	200	18.2%	12.7%

Table 3: Patient characteristics

Variables	Numbers
Admissions	1573
Mean age (months)	18 months
Age less than one year	660(42%)
Males(%)	980(63%)
Females(%)	593(37%)
Medical admissions	1240(78.84%)
Surgical admissions	333(21.16%)
Mean PRISM 111 Score	13
PICU length of stay (days) average	5.4
Mortality (%)	19.07

DISCUSSION

Our study has showed that admission source is a significant factor associated with patients admitted from the hospital's wards when compared with patients admitted through the emergency department. Our finding is also consistent with those of other studies conducted in other countries, which included both children and adults^{1,2}. Haque et al also showed that the patients transferred from ward had

highest mortality as compared to those who were admitted either from Emergency Room or Operation Room due to late presentation at the height of their illness with maximal physiological derangements⁸.

Odetola FO et al also had similar findings in his study showing that compared with emergency department admissions, ward admissions had higher odds of mortality (odds ratio 1.65, 95% confidence interval 1.08-2.51), transfer admissions from non-PICU settings did not have elevated odds of mortality (odds ratio 0.80, 95% confidence interval 0.51-1.25), and inter-PICU transfer admissions had higher odds of mortality (odds ratio 1.43, 95% confidence interval 0.80-2.56), although not reaching statistical significance¹.

In a study in Brazil Over one-third of the patients (34.7%) were transferred from other facilities. Most other admissions originated from the hospital itself – 29.8% from wards, 21.5% from PER and 13.5% from OR. Only 0.7% of the patients were admitted directly from home. Mortality was highest among wards (17.4%) and lowest among OR (2.4%) patients⁹.

The reasons behind the association between admission source and fatal outcome are still unclear. In the present study, we found that mortality was approximately one and half times higher among patients of wards admissions as compared to the emergency department and even much higher than operation theatre admissions. The likely reason is that, unlike OR patients, certain patients transferred from wards would also have severe co morbidities refractory to treatment and/or acute diseases with poor response to routine treatment². Furthermore, these patients are also more likely to have had prior prolonged stays, favoring colonization and infection by resistant microorganisms, which, in patients weakened by co morbidities and prolonged hospital admission, could result in unfavorable progression. One of the most important factors to be considered is that most of the ward patients are under fluid-resuscitated resulting in continued SIRS response which results in a cascade leading ultimately to MODS and death. A previous study with adult subjects³, which may provide support for such a hypothesis, detected a direct correlation between length of stay in the wards prior to ICU admission and mortality. Whether a critically ill or injured patient admitted to ICU, comes directly from emergency department or ward, depends on factors which include the nature of the patient's condition, the severity and perceived progression of the patient's disease physiology and the ability of the clinician to recognize or predict the need for intensive care. In addition, indication for PICU admission depends on the clinical judgment of the hospital team. It is possible that the team responsible for the patients in

the wards may eventually delay shifting them to the PICU while they are clinically deteriorating. This potential delay in transferring a patient to intensive care in more severe scenarios may be related to worse prognosis.

Indirect admissions to ICU from wards, in the present data, frequently occurred soon after hospital admission (median 1 day in hospital) and presented at the ICU with the more severe case mix, often following CPR (one in six). Indirect admissions also experienced the higher unit and hospital mortality with the survivors staying longest in the ICU when compared with direct admissions¹⁰. Our results are consistent with the finding of other studies that among ward patients who have a cardiac arrest or are admitted to ICU, deteriorating physiology may have been either unrecognized or inadequately treated for several hours^{11,12,13}.

In our study, we have found that hemodynamic instability and post cardiac arrest care were more common problems necessitating admission from ward to ICU. This may possibly reflect a delay in identification of severity of problem or yet that those specific patients did not respond well to the usual therapeutics that were taken at any location other than ICU.

In our study we also identified that the patients shifted to PICU from the wards had the maximum length of stay. The average length of PICU stay was 4.5 (ranging from 1 to 271) days. Regarding the length of stay, the patients shifted from the ward had the maximum average length of stay (8.5) days. The patients shifted from the emergency department had the intermediate length of stay (3.5) days while the patients coming from the operation theatre had the shortest length of stay (1.5) days.

CONCLUSION

Outcomes of tertiary pediatric intensive care vary significantly by source of admission with patients

originating from the same hospital's clinical wards being at greater risk.

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