



ORIGINAL RESEARCH PAPER

Paediatrics

THE FUNCTIONAL OUTCOME OF CHILDREN AFTER INTENSIVE CARE IN A TERTIARY CARE CENTRE

KEY WORDS: intensive care unit, functional outcome

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ABSTRACT

**Background:** The development of specialized pediatric intensive care units (PICUs) has contributed to the improved survival of critically ill children, although the long-term functional outcome and quality of survival of these children is often unknown. To evaluate the long term functional outcome of children at 6 month and 1 year after discharge from Pediatric Intensive Care Unit (PICU)

**Materials and methods:** Design: prospective cross sectional study.

**Setting:** outpatient follow up clinic of a teaching and referral institute.

**Subjects:** children aged 1-12 years, discharged from PICU between Dec 2016 and nov 2017. Children with ICU stay of less than 24 hrs, infants, and readmission to ICU were excluded.

**Methods:** Patients were evaluated at 6 months and 1 year after discharge from PICU using a modified Glasgow Outcome Score (GOS) to assess functional These were correlated with demographic data, indications of PICU admission, primary diagnosis, severity of illness (PRISM I and III scores), co morbidities, therapeutic interventions during PICU stay and length of ICU stay (days).

**Results:** 92 patients having a mean (SD) age 4.9(3.3) years, duration of PICU stay 13.9(17.9) days and PRISM score 14.67(9.12) were enrolled in the study. 69.5% of the children had a good functional outcome at 6 months follow up which improved to 78.7% at 1 year.

**Conclusion:** Long-term functional outcome improved significantly from 6 months to 1 year after discharge. Neurological illnesses were the most significant predictor for poor outcome.

Introduction

The development of specialized pediatric intensive care units (PICUs) has contributed to the improved survival of critically ill children, although the long-term functional outcome and quality of survival of these children is often unknown.<sup>1,2</sup> Success and utility of intensive care is generally presented as mortality rate adjusted for severity of illness, disregarding long-term survival and functional outcome.<sup>3</sup> Reduced mortality rate is of debatable benefit, if it is at the expense of increased severe long-term morbidities.<sup>1</sup> In an era, which focuses upon rationalization and optimization of health care resources, evaluation of long term outcome is fundamental in evaluating the effectiveness of intensive care.<sup>3,4</sup> Measuring long-term outcome in pediatric intensive care is necessary to equate the high cost of treatment with benefits to the patient. Outcome measure should reflect the functional health of child after a period of intensive care.<sup>3</sup> We conducted this study to evaluate the long-term functional outcome of children at 6 month and 1 year after discharge from PICU and to determine the predictors for long-term outcome.

Methods

A cross sectional study was conducted in PICU follows up clinic of a teaching and referral hospital in eastern India over 1 year (Dec 2016 to Nov2017). PICU is 6 Bedded, tertiary level at Patna Medical College and hospital, Patna. The functional outcome (FO) of children were assessed at two points, at 6 month and at 1year after discharge from PICU (except for children admitted between Jan 2016 to Dec 2016 who were assessed only once at 1year after discharge from PICU) with the help of modified Glasgow Outcome Scale (GOS).<sup>5</sup> The functional outcome of children were assessed. Deaths in PICU, ICU readmission and infants were excluded from the study.

The functional outcome categories were defined as good recovery (functionally normal or mild disability), moderate disability (disabled but independent), severe disability (conscious but disabled), persistent vegetative state and death [5]. Good recovery was given score 1, moderate disability assigned score 2, severe disability assigned score 3, persistent vegetative state (score 4) and death (score5).<sup>2,5,6</sup>

Data were retrieved retrospectively from case records with respect

to demographics, indications of PICU admission, primary diagnosis, severity of illness (PRISM 1 and III scores), co morbidities, therapeutic interventions during PICU stay, length of ICU stay (days) and nosocomial sepsis. Admissions to the ICU were classified into one of seven diagnostic groups: neurological, respiratory, infectious diseases, accident/trauma, cardiovascular, gastrointestinal (GI) disease and endocrine diseases.

Statistical analysis:

The functional outcome at 6 months and 1 year after discharge from PICU was compared using the Chi square test. The outcome was correlated with respect to different variables like primary diagnosis, therapeutic interventions etc. Odd ratio was calculated for all statistically significant univariate variables to identify predictors of outcome. Multiple logistic regressions (backward LR method) were carried out to find the independent predictors of outcome. P< 0.05 was taken as significant. SPSS version 16 was used for analysis.

Results

There were total 170 children interviewed after discharge from PICU during study period, 124 patients who fulfilled inclusion criteria were enrolled into study. 38 children lost to follow up, 92 children were continued in study.

Table 1: Break up of primary diagnosis groups

	Frequency	Percent
Neurological disorders	48	52.2%
Infectious disease	11	12%
Respiratory disease	9	9.8%
Gastrointestinal disease	8	8.7%
Cardiovascular disease	4	4.3%
Accidental disease	7	7.6%
Endocrinal disorders	5	5.4%

The study cohort comprised of 92 children whose mean +SD age was 4.9 + 3.3 (range 1- 12) years with 72 (78%) of the children were boys. The mean duration of PICU stay was 13.8 + 17.9 (range 2- 120) days. Most common indication of PICU admission was respiratory failure (n=36; 39%), followed by shock (n=33; 30%), raised intra cranial pressure [ICP] (n=24; 26%), neuromuscular

weakness (n=15; 16%) and others (n=11; 12%). Admissions to ICU were classified into one of seven diagnostic groups. Neurological disorders comprised major group of primary diagnosis, 42 (52.2%) children had neurological diagnosis. 11 (12%) children had infectious disease, 9 (9.8%) subjects had respiratory diseases, 8 (8.7%) subjects had gastrointestinal diseases, 4 (4.3%) children had Cardiovascular illness, 7 (7.6%) children had accidental causes, 5 children had endocrinal disorder.

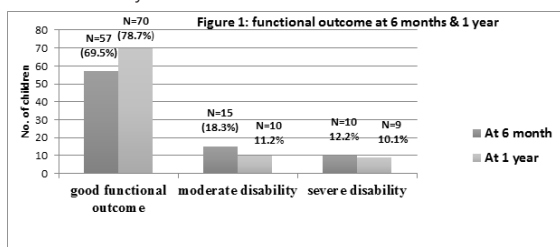
**Table 2: Baseline characteristics of study subjects**

Parameters	frequency	Mean(SD)	Range	Median
Age (years)	92	4.92+3.33	1- 12	4.42
Duration of PICU stay (days)	92	13.82+ 17.45	2- 120	13.82
PRISM1	76	14.67+9.12	0- 36	15.50
PRISM III	75	14.57+8.39	0 - 31	15
Intubation (days)	59 (64%)	10.56+10.77	1 – 73	7.0
Ventilation (days)	51 (55.4%)	10.82+14.01	1- 85	8.0
CVC-femoral (days)	53 (60%)	6.85 + 5.67	1-30	6.0
CVC-subclavian (days)	6.0 (6.7%)	5.17 +3.76	2 -12	3.50
Total CVC days	55 (59.7%)	7.16+6.04	1 – 30	5.0
Urinary catheter (days)	64 (68.5%)	7.56 + 5.79	1 – 30	6.0
Intercostal tube days (ICTD)	14 (15.2%)	6.43 +2.68	2 – 10	7.50
Tracheostomy days	14 (15.2%)	19.58 +13.04	2 – 44	22.0
Inotropes days	53 (57.6%)	4.72 +3.97	1 – 20	4.0
Sedation days	66 (71.7%)	9.11 +11.16	2 – 75	5.0
Analgesia days	66 (71.7%)	7.55+ 9.0	1 – 60	5.0

Co morbidities were present in 18 (19.6%) children at the time of admission; these were anemia, hemiparesis, gastro esophageal reflux, diabetes mellitus, post cardiac arrest, hemophilia, and cerebral palsy.

**Functional outcome at 6 month and 1 year (figure 1)**

Nearly two thirds (69.5%) had good functional outcome at 6 months which improved to 78.7% at 1 year post ICU discharge. Improvement was mainly noted in children with moderate disability that decreased from 18.2% at 6 months to 11.2% at 1 year. Majority of children with unfavourable functional outcome (84%) had neurological disorders while infectious, respiratory, cardiovascular and endocrinal diseases carried a better outcome at 6 months and 1 year.



**Discussion**

We measured the functional outcome by using Glasgow Outcome Scale at 6 month and 1 year.

We observed a male preponderance in our PICU admissions. A similar trend was observed in two other Indian studies, where 69.2% and 66.7% of admissions were boys respectively.<sup>7,8</sup> This possibly is a reflection of the social bias favouring boys which is prevalent in this part of India.

Nearly half of our study patients had neurological illnesses (52%), followed by infectious (12%), respiratory (9.8%), gastrointestinal (8%), and Cardiovascular (4.3%). This is in contrast, to previous Indian studies [10, 11] wherein respiratory illnesses (19.7%) were more common than neurological illnesses (18%). Co morbidities

were present in nearly one-fifth of our cohort at admission. This was similar to that reported by Ambuehl J et al<sup>10</sup> who found 31% of children had preexisting health care problems.

We found that nearly two thirds of children discharged from our PICU had a good functional outcome at 6 months, the number improving to nearly three fourth by 1 year. One third had an unfavorable outcome at 6 months, of which 18.3% and 12% children had moderate and severe disability/vegetative state respectively. However, this too improved at 1 year, wherein the proportion of children with moderate disability was reduced to 11%.

Our findings are in concurrence with previous studies where similar improvement in functional outcome has been shown with time. Butt et al<sup>1</sup> in their study had shown that 77% children were functionally normal while 8.4% had moderate/ severe handicap at 30-36 months after PICU admission. Also it was seen that 80% of the children survived 30 months or more and 91% of the survivors were capable of leading an independent life. Similarly Taylor et al<sup>2</sup> found that at 3.5 years after admission to PICU, 89.7% children had a favorable outcome, and were more likely to lead an independent existence. In another prospective study, Gemke et al<sup>3</sup> had found that the overall, pre-admission health status was impaired in 68.5% which after one year had improved or equaled the pre-admission state in 72.6%.

In a previous study majority of those who showed health impairment at 1 year was health impaired at admission itself reiterating the fact that pre-morbid status has an important bearing on the long term outcome<sup>9</sup>. Similarly Jones et al<sup>1</sup> found significant association between illness severity at admission as measured with PIM2, PRISM III and functional outcome at 6 months after admission. The more severe the illness the more impaired was the functional outcome.

In our cohort children with neurological disorder had an unfavorable functional outcome as compared to those with infectious, respiratory, gastrointestinal, cardiovascular, accidental and endocrine disorders. Similar findings were reported by in a previous study<sup>9</sup>. Morrison et al<sup>11</sup> also found that diagnostic categories of respiratory, trauma, and cardiac dysfunction were associated with a better outcome.

The major limitation of our study is the exclusion of infants who represent a sizeable portion of ICU admissions. Our results indicate that the long-term functional outcome after discharge from a pediatric intensive care unit is good or normal for the majority of surviving children. There is significant improvement in long-term outcome from 6 months to 1 year.

Conflict: none

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