



QUALITY OF CARE IN A PAEDIATRIC INTENSIVE CARE UNIT OF A TERTIARY CARE CENTRE

Paediatrics

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ABSTRACT

Background: The care of the critically ill children remains one of the most demanding and challenging aspects in the field of paediatrics. Paediatric intensive care unit (PICU) is an important component of any tertiary care centre. **Material:** An observational descriptive study was carried out for 2 years in PICU of a tertiary care teaching hospital after obtaining clearance from the Institute ethics committee. Total number of admissions in the study period was 6481. Admissions in PICU was 1261 of which sample size was n=500. **Results** Out of the 500 subjects studied, the mean age of patients was 6.92±3.56 years. Most of the children having age less than 5 years (72.8%) following to that 19.6% had age between 6-10 years and only 7.6% children had age greater than 10 years. Maximum number were seen in male group i.e., 279 (55.8%) and female being 221 (44.1%). **Conclusion:** Respiratory illness, infectious diseases, neurological problem are the most common cause for PICU admissions. These conditions can have greater impact of the simultaneous quality of care being provided in PICU and emphasis is therefore placed on maintaining the benchmark of each quality indicators and improving the outcome of patients. We also recommend better manpower and infrastructure to improve the outcome of patient admitted to PICU

KEYWORDS

Mortality, Morbidity, Outcome of care, Paediatric Medicine Intensive Care Unit, Quality of care

INTRODUCTION

Quality improvement is defined as the combined and unceasing efforts of everyone involved in healthcare including providers, patients and their families, researchers, planners and administrators to make changes that will lead to better patient outcomes, better health system performance and better professional development.

The care of the critically ill children remains one of the most demanding and challenging aspects in the field of paediatrics. Paediatric intensive care unit (PICU) is an important component of any tertiary care centre. Approximately 4 million ICU admissions per year occur in the INDIA with mortality rate reported 7.2%. The major causes of death in developing countries in under-five children are preventable and curable diseases like acute respiratory infections, diarrheal diseases and malaria.

With the advancement in intensive care facilities, there is a dramatic increase in survival of critically ill children.

Providing medical care to patient with latest gadgets and most updated scientific knowledge is the most obvious practice in any PICU.

The goal of paediatric intensive care is the surveillance and support of vital system functions in critically ill or injured children, and their eventual restoration to health. PICUs are regarded as making a substantial contribution to the health of children in developed and developing countries. The availability of paediatric intensive care is regarded as a reflection of the quality of a country's paediatric medical care.

Measures of the effectiveness of paediatric intensive care should include physical and psychological sequelae, as well as the quality of life in survivors and their families. It is important that every ICU formulates its indicators of quality as well as its standards to assess performance. The use of such indicators may help to identify problems and to develop methods to improve performance. Continuous measurement of the indicators is one method to assess an improvement of performance over time. Predominantly studied outcome measures include Mortality, morbidity, resource use and patient centered Outcomes (which incorporate patient preferences for their care and for their own functional status). Central focus of all these improvement measure and hypothesis in PICU is on resuscitation, stabilization, management of critical disease patient and reversal of organ failure.

A tertiary care PICU with a good quality care will shorten the length of stay of Patient in PICU and incidence of residual motor, psychiatric and behaviour problem as sequel of critical illness. This will help us in identifying the quality of care being rendered and measure which can

help improve the same. In India there are very few studies on outcome of care, hence, this research aimed to observe the outcome of care being provided in paediatric intensive care unit (PICU).

OBJECTIVES:

1. To study demographic profile of patients admitted to PICU
2. To study general profile of patients admitted to PICU in form of various intensive care treatment modalities
3. To study outcome of patients admitted in PICU

MATERIALS AND METHODS

An observational descriptive study was carried out from October 2020 to December 2022 in PICU of a tertiary care teaching hospital after obtaining clearance from the Institute ethics committee. Total 500 patients who were admitted to PICU, were included in the study fulfilling inclusion criteria during study period. Written informed valid consent was taken from patients in English and local language (Marathi) as per form approved by Institutional Ethical Committee.

Inclusion Criteria:

1. All children admitted in PICU between 1 month to 14 years.

Exclusion Criteria:

1. Children <1 month and >14 years age group
2. Children died within 24 hours of admission
3. Parents not willing to participate in the study

Data Collection And Methodology:

An observational descriptive study was carried out for 2 years in PICU of a tertiary care teaching hospital after obtaining clearance from the Institute ethics committee. Sample size included the patients admitted to PICU from OPD and casualty. Detailed History and clinical examination on admission of each patient was recorded. Demographic, morbidity and mortality parameters were studied. Prospective analysis of medical records of all the admitted PICU patients was conducted to study the outcome of intensive care provided.

PICU records of all admissions, transfers out, discharges, and deaths were utilized for the purpose of this study. Data extracted from the records included age, sex, diagnosis, duration of stay in the unit, and outcome as far as the unit is concerned. Outcome is classified as discharges, and death.

Quality Indicators:

A) "Improvement-" based quality indicators include:

- Return to PICU within 48 hrs
- Incidence of iatrogenic pneumothorax

- Percentage of unplanned extubation (UE)
- Incidence of re-intubation

B) "Accountability-" based quality indicators include:

- VAP rate
- Catheter-related bloodstream infection (CRBSI)
- CA-UTI rate
- Incidence of pressure sores
- Fall from bed
- Percentage of transfusion reactions

Investigations:

1. CBC
2. Differential Leukocyte Counts
3. Platelet Counts
4. Kidney Function Tests
5. Blood Culture
6. Urine Culture
7. Urine Routine Microscopy
8. Liver Function test

Statistical Analysis:

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi square test, Fisher Exact tests was used as test of significance for qualitative data continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. p value (Probability that the result is true) of 0.05 was considered as statistically significant after assuming all the rules of statistical tests. MS Excel and MS word used to obtain various types of graphs such as bar diagram.

OBSERVATIONS AND RESULTS

The observational study was conducted in department of paediatrics in tertiary care hospital on 500 patients aged between 1 month to 14 years. Total number of admissions in the study period was 6481. Admissions in PICU was 1261 of which sample size was n=500. This study was conducted to know the efficacy of quality indicators observed over time in comparison to that of the standard benchmark.

Sr. No.	Name of quality indicators	Number N = 500	Percentage
1	Average length of PICU stay (n=500)	<6 days	327 65.4
		>6 days	173 34.6
2	Return to PICU within 48 hours	Present	32 6
		Absent	468 93.6
3	Ventilator (n = 46)	Needed	146 29.2
		Not needed	354 70.8
4	Iatrogenic pneumothorax (n= 146)	Present	1 0.68
		Absent	145 99.3
5	Unplanned extubation (n= 146)	Present	10 6.84
		Absent	136 93.2
6	Incidence of reintubation (n=146)	Present	17 11.64
		Absent	129 88.36
7	Average ventilator days (n= 146)	< 3 days	16 10.95
		>3 days	130 89.05
8	Ventilator associated pneumonia (n= 146)	Present	18 12.32
		Absent	128 87.68
9	Central line use (n=60)	Present	60 12
		Absent	440 88
10	Central line related blood stream infection (n=60)	Present	11 18.3
		Absent	49 81.67
11	Foleys catheter use (n=100)	Present	100 20
		Absent	400 80
12	Foleys catheter associated UTI (n=100)	Present	8 8
		Absent	92 9
13	Pressure sores (n=500)	Present	7 1.4
		Absent	493 98.6
14	Fall from bed(n=500)	Present	8 1.6
		Absent	492 98.4

Out of the 500 subjects studied, the mean age of patients was 6.92±3.56 years. Most of the children having age less than 5 years (72.8%) following to that 19.6% had age between 6-10 years and only 7.6% children had age greater than 10 years. Maximum number were seen in male group i.e. 279 (55.8%) and female being 221 (44.1%).

In present study, the mean duration of stay for patients is 9.47±9.82 days. Maximum cases i.e. 197 (39.5%) had duration of stay between 6-10 days. Following to that 130 (26%) had hospital stay of 2-5 days followed by 86 (17.2%) cases had duration of stay 11-15 days, 11% cases had duration of stay 16-20 days, and only 6.4% cases had duration of stay more than 20 days.

Out of 500 subjects, 38% cases had respiratory system involvement, following to that 30.8% cases had CNS involvement, 12.4% cases had hemat system involvement, 7.8% cases had renal system involvement, 5.6% cases had CVS system involvement, 8.4% cases had GIT involvement, and 1.4% cases had skin system involvement. Most of the cases had death in case of CNS, RS and multisystem involvement. Out of 46 deaths, 15 cases had multisystem involvement, 12 cases had RS system involvement, 10 cases had CNS involvement, 8 cases had GIT system involvement, and only one case had CVS system involvement.

Out of 500 subjects, need for ventilation in PICU patient was in 146 (29.2%) cases who needed ventilation. Out of 42 reintubated cases, most of the cases (12 cases, 28.57%) had the reason of excessive salivation for reintubation preceding to that accidental extubation (7 cases), self extubation (6 cases), status epilepticus (6 cases) ETT related factors (5 cases), apnoeic spell (4 cases), circular failure (2 cases) are the reasons for reintubation.

Out of 500 subjects, distribution according to central line related blood stream infection in PICU patient (n=60) of which culture positive is 11(18.33) culture negative is 49 (81.67%).

Out of 500 subjects, Foleys catheter were used in 60 patient (12%) of which 8 cases had UTI (13%), 2 cases had urethral rupture (3%) and 2 cases had sepsis (35%). Our study had readmission rate within 48 hours in PICU of 32 cases (6.4%). Our study had incidence of bed sores of 7 (1.4%).

Out of 500 subjects, maximum deaths were seen in 1 month to 1 year age group as rate of admission is also high in this age group. Total deaths were 46 (9.2%) of which male were 25(54%) and female were 21 (46%).

Out of 146 intubated cases, 46 cases were reintubated. Out of reintubated cases 6 where recovered and 11 were dead. Out of 500 subjects, central line was used in cases, 34 (57%) cases were discharged and 26 (43%) cases were dead.

DISCUSSION

Present study was a hospital based prospective study in a teaching hospital. The study was conducted to understand the quality indicators of our PICU. The duration of study was 24 months. A total of 1261 patient aged >1 month to 14 years were admitted in Paediatric intensive care unit (PICU) during this study period and of which 500 cases were chosen on simple random sampling basis of which most of the children have age < 5 years (72.8%) followed by 6-10 years (19.6%). The source of admissions were patients presenting in critical condition to hospital directly and patients referred from peripheral hospitals who needed intensive care.

In present study, the mean duration of stay for patients is 9.47±9.82 days. Maximum cases i.e. 197 (39.5%) had duration of stay between 6-10 days. Most of the patients were mechanically ventilated for 1-3 days and stayed in the hospital for a period of >6-10 days. Statistically we found a highly significant association between duration of mechanical ventilation and length of hospital stay. Remtullah A et al.^[1] conducted a study on quality of care in acute pediatric care unit in Tanzania. The median duration of stay was 5 days, with a minimum of 4 h and a maximum of 32 days. In a study conducted by Siddarth V et al.,^[2] reported the quality of care in a PICU in a tertiary care hospital of New Delhi. Mean (median) hospital length of stay in patients who received PICU care was 16.82 (13) days (range 1 -84 days) respectively.

In the study conducted by Remtullah A et al.,^[1] all the underlying causes of death, 17 (70.8%), were infectious with septicaemia 13 (76.5%) being the most common. Septic shock accounted for many 9 (60%) of the immediate causes of death. Another study conducted by Teshager NW et al.,^[3] reported that one-third of patients had critical illness diagnoses, of which 41% had sepsis, 47% septic shock, and the remaining (12%) had acute respiratory distress syndrome. About one-

third of patients (30.7%) had MODS. Similar results were observed in present study.

According to Siddarth V et al.,^[2] of the total patients requiring mechanical ventilation, 36.61% (21) patients were reintubated within 48 hours of extubation. The most common cause for reintubation being excessive salivation. Comparative results were found in present study. In the present study, out of total cases central line was used in 60 (12%) cases. Out of 60 cases culture positive sepsis was seen in 11 (18.33%) cases. In 60 cases where central line was used, 34 (57%) cases were discharged and 26 (43%) cases were succumbed. Hatachi T et al.,^[4] reported that a total of 167 healthcare-associated infections were identified, including 67 bloodstream infections (40%), 43 pneumonias (26%), and 57 urinary tract infections (34%). There were 152 admissions with at least one healthcare associated infection (9.4% of admissions with a stay > 48 hr).

Our study shows that out of 500 cases Foleys was used in 60 (12%) cases. Out of 60 foleys catheterized subjects 8 had UTI, 2 cases had urethral rupture and 2 cases had sepsis. The organism most commonly detected were *Pseudomonas*, *E. coli*, *Kleibseilla*. Similar results were observed in other study.^[5]

We found that majority of the deaths were in the age group less than 1 year in the present study. Males had higher death rates when compared to females in the present study. Remtullah A et al.,^[1] documented mortality rates among males and females 54.2% and 45.8% respectively. Similar results were observed in other studies.^[2,3,6]

Our study revealed that the mortality rates of different organ systems were as follows: multisystem involved was 30%, respiratory system was 25%, CNS was 10%, cardiovascular system was 5.71%, GIT 17.86% in the present study, A study conducted by Teshager NW et al.,^[3] reported that severe sepsis or multiorgan failure (41.2%) was the leading immediate cause of death in the PICU followed by respiratory failure (23.5%), brain herniation (21.6%) and cardiac arrest (12.7%). Similar results were observed in other studies.^[2,7]

Present study shows that out of all cases readmission within 48 hours, were required in 32 cases (6.4%). In the study by Remtullah A et al.,^[1] The readmission rates were up to 5%. Of them 40% were males and 60% were females in their study. Siddarth V et al.,^[2] reported that. Only two patients (2.1%) were readmitted within 72 hours during their hospital stay after getting transferred out from PICU.

In the present study, out of 500 patients 8 cases where fall from bed (1.6%). We found that about 1.4 % of the patients had bed sores in the duration of stay between 6 to 10 days, Siddarth V et al.,^[2] reported. Prevalence of bed sore rate in PICU was 2.1%.

CONCLUSION

Benchmark of our PICU setup for different quality indicators meet the standard benchmark and is showing the overall good quality care of patients admitted in PICU.

Respiratory illness, infectious diseases, neurological problem are the most common cause for PICU admissions. These conditions can have greater impact of the simultaneous quality of care being provided in PICU and emphasis is therefore placed on maintaining the benchmark of each quality indicators and improving the outcome of patients. We also recommend better manpower and infrastructure to improve the outcome of patient admitted to PICU.

Morbidity following paediatric intensive care occurs frequently and appears to be increasing as mortality decreases. In our study patients discharged from the hospital with new functional status morbidity, a majority improved, while 9.2% died.

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