The Profile and Outcome of Patients Admitted to a Pediatric Intensive Care Unit

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Abstract. The records of all admissions to a 6-bed pediatric intensive care unit (PICU) over a period of 6 years were reviewed. The age, diagnosis, clinical service provided, duration of stay and outcome were recorded. Of the 3025 children admitted, 2092 (69.2%) were males. Neonates constituted 13.1% (400) and infants 57.1% (1727) of total admissions. The duration of stay ranged from 6 hours to 46 days, and 61 patients stayed for longer than 13 days (long-stay patients). The most common cause for admission was septicemia, seen in 459 patients (14.8%); 418 (13.8%) children had congenital heart disease, 407 (13.5%) lower respiratory tract infections (LRTI) and 261 (8.6%) meningitis. The most common conditions necessitating long-stay in the PICU were meningitis (20%), Landry-Guillain-Barre syndrome (16.6%), acute renal failure (20%), and septicemia (16.6%). There were 721 deaths giving a mortality of 23.5%. Of these 134 (18.6%) were due to septicemia, 103 (14.2%) due to congenital heart disease, 77 (10.6%) due to meningitis and 55 (7.6%) due to LRTI. The highest case fatality rate was seen with encephalitis (52.6%), followed by hepatic coma (51.3%), malignancies (43.2%), septicemia (29.1%) and meningitis (29.5%). The mortality was lower (9.8%) in long-stay patients than in short-stay patients (24.6%). There was gradual increase in proportion of cases requiring interventions including artificial ventilation (1% to 35%), peritoneal dialysis (1.5% to 11%), insertion of central venous pressure lines (0 to 10%), over the last 6 years. The comparison of case fatality rates before and after the PICU was made a functionally independent unit eleven months ago, reveals a declining trend for certain diseases including LGB syndrome (22.5% to 0%) ($p < 0.02$), dengue hemorrhagic fever (44% to 9%) ($p < 0.02$), meningitis (34% to 20%). renal failure (17% to 10%), encephalitis (55% to 26%). The ventilator survival increased from 22% to 42% ($p < 0.001$). **(Indian J Pediatr 1993; 60 : 5-10)**

Key words: *Intensive care; Long-stay*

Children have special medical needs and it is appropriate, therefore, that critical care be provided to them in units dedicated exclusively to children, where care is provided by pediatric specialists.[1]

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The recent explosion of knowledge in the field of critical care medicine, along with technologic advances in patient monitoring, therapy and improved transport facilities have significantly altered the nature of critical care.[1] The special needs of critically ill children require a high level of expertise provided by a team of physicians, nurses and ancillary personnel in special units with a wide variety of spe-

cial equipment. The development of pediatric intensive care units (PICU) in this country has been slow as compared to a much faster growth of adult Intensive Care Units (ICUs). Since October 1986, a 6-bed PICU is operational in the pediatric wards of our institute. We describe our experience in the type of patients cared for in this unit, and factors associated with the outcome.

MATERIAL AND METHODS

The All-India Institute of Medical Sciences is a major referral hospital in North India. The 6-bed PICU was initially staffed by a senior resident (pediatrics), nurses and ancillary staff. Since January 1992, the physician coverage includes 24-hours in-house coverage by pediatricians at faculty, senior resident and junior resident levels. In addition, a full range of pediatric sub-specialists are on call at all times. The nurse to patient ratio averages between 1 : 3 and 1 : 2. The PICU has facilities for ventilating upto 4 children at a time. Three beds have capabilities for monitoring blood pressure in addition to E.C.G., respiration, temperature and pulse oxymetry.

All infants and children requiring intensive care, excluding post surgical cases, were admitted to the PICU. The sick in-born neonates are admitted to the neonatal intensive care unit (NICU), but neonates born outside the hospital are usually admitted to PICU. Admissions and discharges from PICU were determined by the primary care service and were not formally screened by the PICU staff.

The records of all patients admitted to the PICU from November 1986 to November 1992 were reviewed. The age, diagnosis, clinical service provided, duration of stay and outcome was recorded. Long stay intensive care patients were defined as those remaining in PICU for more than 13 days.

RESULTS

Data were obtained from 3025 children consecutively admitted in the PICU over a period of 6 years. Of these, 2092 (69.2%) were males. The age ranged from 1 day to 14 years with a mean of 32.4 months. Infants less than one year of age constituted 57.1% (1727) of the total admission and of these, 400 (13.2%) were neonates (Table 1). The duration of stay of the patients range from 6 hours to 46 days. Two hundred (6.6%) patients stayed longer than 7 days, out of which 61 (2%) stayed for longer than 13 days (long-stay patients).

Septicemia was the most common cause for admission and was seen in 459 (14.8%) cases. Other chief causes were congenital heart disease (13.8%), lower respiratory tract infection (13.5%) and

TABLE 1. Age and Sex Distribution and Age Related Mortality (n = 3025)

Age	Males	Females	Total	Deaths (%)
1 day-1 mo	292	108	400	103 (25.7)
1 mo-1 yr	989	338	1327	276 (20.8)
1 yr-5 yr	304	285	589	189 (32.1)
5 yr-10 yr	350	147	497	104 (20.9)
10 years and more	157	55	212	49 (23.1)
Total	2092	933	3025	721 (23.5)

meningitis (8.6%) (Table 2). Poisonings, most common of which was kerosene ingestion (60%), were seen in 68 (2.2%) patients. Other poisonings seen were dilantin ingestion, dhatura poisoining, snake bite, and ingestion of naphthalene balls, salicylate and iron tablets. The category 'Others' in the table include complicated enteric fever, gastrointestinal bleed, severe malaria, Reye syndrome, drowning, chronic liver disease, connective tissue disorders, inborn errors of metabolism, storage diseases, degenerative brain disease and tetanus.

There were 61 (2%) patients who stayed in PICU for longer than 13 days (long-stay patients). Most common conditions associated with long stay were meningitis (20%), Landry-Guillain-Barre (LGB) syndrome (16.6%), acute renal failure (20%) and sepsis (16.6%). Other conditions, seen with long stay, were congenital heart disease (8.3%), malabsorption (10%) (Table 3).

TABLE 2. Major Causes of Admissions and Deaths (n = 3025)

Conditions	No. of Admissions	No. of Deaths	Case Fatality Rate (%)
Septicemia	459	134	29.1
CHD	418	103	24.6
LRTI	407	55	13.5
Meningitis	261	77	29.5
Renal failure	194	30	15.4
Polio/LGB	85	18	21.0
Malignancies	81	35	43.2
Encephalitis	76	40	52.6
Hepatic coma	72	37	51.3
Poisonings	68	4	5.5
Status epilepticus	68	10	14.7
Status asthmaticus	52	2	3.8
DHF	36	12	33.3
Others	748	164	21.9
Total	3025	721	23.5

CHD - congenital heart dsease;
DHF - dengue hemorrhagic fever;
LRTI - respiratory tract infections

TABLE 3. Conditions Necessitating Long Stay (more than 13 days) (n = 61)

Conditions	No.	Deaths
Neurologic (n=29)		
Meningitis	12	3
LGB syndrome	10	2
Poliomyelitis	3	1
Tetanus	3	0
Miscellaneous	1	0
Renal (n=12)		
Hemolytic Uremic Syndrome	3	0
Acute tubular necrosis	9	0
Septicemia (n - 10)		
Neonatal	6	0
Post-neonatal	4	0
Congenital Heart Disease	5	0
Malabsorption	5	0

There were 721 deaths giving overall mortality of 23.5%. Of these, 134 (18.6%) deaths were due to septicemia, 103 (14.2%) due to congenital heart disease, 77 (10.6%) due to meningitis and 55 (7.6%) were due to lower respiratory tract infection. The highest case fatality rate was seen with encephalitis (52.6%), followed by hepatic coma (51.3%), malignancies (43.2%), septicemia (29.1%), meningitis (29.5%), dengue hemorrhagic fever (28.5%) and congenital heart disease (24.6%) (Table 2). The age related mortality was distributed uniformly over all age groups. However, it was highest (32.1%) in age group 1-5 years,

and lowest (20.8%) in age group of 1 month to 1 year (Table 1). The mortality among long-stay patients was 9.8% as compared to 18% in those having stayed for 7-14 days and 24.6% in those who stayed for less than 7 days in PICU.

The number of admissions in PICU ranged between 332 and 617 per year over the last six years. The highest mortality was seen in 1988 (29%) and lowest in 1992 (19.8%). The proportion of patients who would score higher marks on Therapeutic Intervention Scoring System (TISS)[2] seems to have increased over the years. This is evidenced by increasingly higher proportion of cases requiring interventions. There was a increase in the therapeutic interventions including artificial ventilation (from 1% to 35%), peritoneal dialysis (1.5% to 11%), insertion of central venous lines (0% to 10%) (Figure 1).

Comparison of case fatality rates before and after the PICU was made a functionally independent unit, showed a decline in the mortality due to acute poliomyelitis (28% to 0%) ($p < 0.02$), LGB syndrome (22.5% to 0%) ($p < 0.02$), dengue hemorrhagic fever (44% to 9%) ($p < 0.02$), meningitis (34% to 20%), renal failure (17% to 10%) and acute encephalitis (55% to 30%) (Figure 2). There was a reduction in case fatality rates of lower respiratory tract infection and septicemia. Ventilator survival increased from 22% to 42% ($p < 0.01$).

DISCUSSION

Most commonly, the patients admitted to the PICU at this centre were children with complicated medical diseases such as septicemia, congenital heart disease, LRTI and meningitis. In this way this PICU is different from PICUs in the west where the proportion of surgical cases ranges from 20% to 70% of all PICU ad-

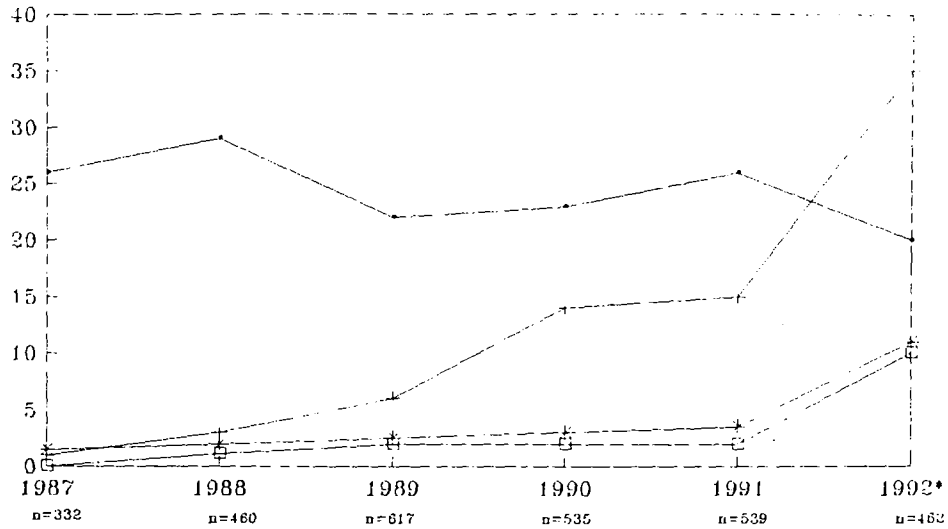
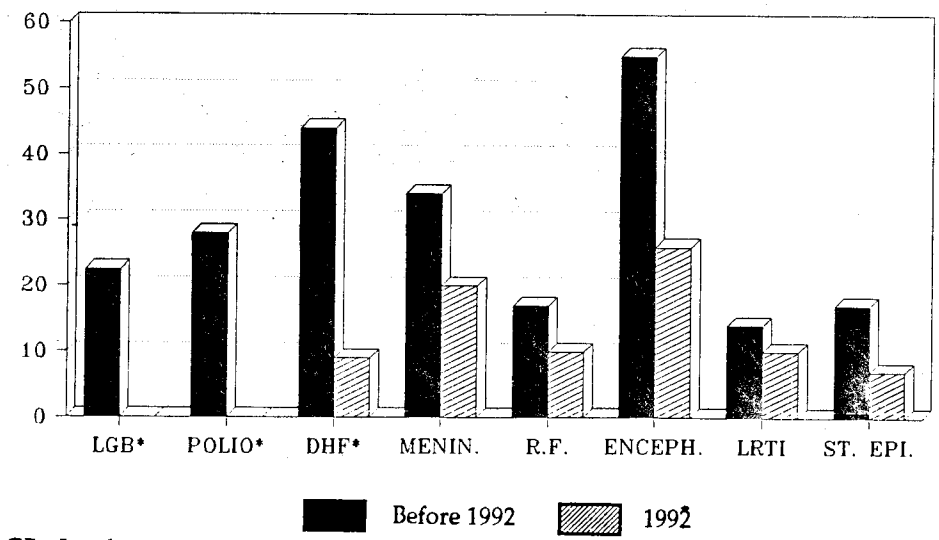


Fig. 1 Mortality and intervention trends in the PICU over last 6 years (percentage)
* indicates 11 months

missions.[3,4] The proportion of long-stay patients in our PICU was lower (2%), as compared to 7.1% reported in a study by Pollock et al[5] from Washington. The admitting conditions necessitating long-stay in our PICU also were different from the ones reported in that study. LGB syndrome, meningitis and sepsis were the most common conditions associated with long stay in our PICU, whereas the surgical conditions like trauma and post-operative states were observed in more than 50% by Pollock et al.[5] Tetanus, poliomyelitis and malabsorption was not observed among their long-stay patients (Table 3).

Mortality in our PICU has been higher (Figure 1) as compared to other centres though it has shown some decline lately. But these figures cannot be the basis for evaluation of therapies at different centres, or at a given centre at different times unless we apply a control for the effect of different levels of severity of illness that are seen at different places or at different times.[3] Therefore, there is a need to classify our patients into different risk groups for mortality using TISS or Physiologic Stability Index (PSI).[2,3] Retrospectively, we can say that there has been a gradual increase in proportion of our patients who would have been in moderate to high risk group. Several high scoring therapeutic and monitoring categories in TISS system including artificial ventilation, peritoneal dialysis, muscle paralysis, cardiac resuscitation, intratracheal suctioning, concentrated potassium infusions, frequent blood gas measurements and central venous pressure monitoring were very commonly used in our patients.

Mortality was 9.8% among long-stay patients and 24.1% among short stay patients at our centre. These results are opposite to the ones reported by Pollock



LGB : Landry Guillain Syndrome; DHF : Dengue Hemorrhagic Fever; LRTI : Lower Respiratory Tract Infection; Menin : Meningits; R.F. : Renal Failure; ENCEPH : Encephalitis; ST. EPI : Status Epilepticus

Fig. 2 Changes in case fatality rates before and in 1992. (percentage) *indicate $P < 0.02$.

et al.[5] The incidence of severe chronic disease among these patients was also much lower (10%) at our PICU as compared to 46% reported in the above study.

Intensive Care is a labour intensive and technology intensive speciality.[6] The Committee on Hospital Care and Pediatric Section of the Society of Critical Care Medicine of American Academy of Pediatrics recommends round the clock coverage by pediatricians and surgeons with full range of pediatric subspecialists on call at all the time.[1] Most of the PICUs in the west have 3 or 4 full time pediatric intensivists along with pediatric anaesthesiologists, fellows and residents. For the last one year, round the clock physician coverage is being provided at our PICU. The nurse to patient ratio now ranges between 1 : 3 and 1 : 2. These changes have resulted in some improvements in the form of declining trends in the case fatality rates of diseases which require early intervention, continuous ventilatory support and intensive monitoring (Figure 2).

The principal role of intensive care is life support for patients with severe physiologic dysfunction. This type of care makes use of advanced technologies and require a large commitment of personnel. Therefore, it is very expensive.[6-10] Some studies have shown that much of the resources in PICUs are used by patients who require only monitoring or those who have chronic diseases and therefore stay for long in PICUs.[2,5,6] Therefore, while on the one hand, efforts should be made to establish more PICUs, on the other hand, these should be utilized properly and optimally,[11] especially in the developing countries like India.

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