

Cost of Neonatal Intensive Care

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Abstract : Neonates are among those patients generating the highest hospital costs in recent years. There are no published data on the costs of neonatal intensive care in our country. The aim of our study was to analyse the cost of neonatal intensive care in a tertiary care unit. The average hospital charges per day were higher among non-survivors (Rs. 1857) compared to survivors (Rs. 727). Care of more than 1250 gms infant is cost beneficial in our set up. (Indian J Pediatr 1998; 65 : 249-255)

Key words : Neonates; Cost; Intensive care.

During the past decade neonatal intensive care has evolved into a highly specialised and effective system of treating newborn infants with life threatening diseases. Neonates have been shown to be among those patients generating the highest hospital costs in recent years, for they are the costliest of all hospitalised patients. It is also known that neonatal intensive care is financially stressful to families. The aim of our study was to analyse the cost of neonatal intensive care in a tertiary care unit and also to study the attitude of the fathers whose infants received expensive intensive care.

MATERIALS AND METHODS

The Childs Trust Hospital (CTH), Chennai is a private, non-profit organisation. The NICU has been operational since May 1991 and currently represents a core 28 bed fa-

cility providing level III care to an exclusively out born population. It caters to around 850 of the 33,000 deliveries that take place per year in the private sector (90,000 deliveries take place in the city of Chennai per year). Eleven per cent of total admissions are ventilated per year. The unit is staffed and equipped to provide intensive and intermediate care, transport of sick infants and follow-up. Over one month period, the financial and medical records of 81 neonates admitted to the NICU were analysed prospectively. Total patient days were 709.5 with the average hospital stay being 8.76 days.

Data collected included primary diagnosis, length of hospital stay (LOS), hospital charges and duration of assisted ventilation. Total costs, hospital costs, average daily costs were tabulated by birth weight groupings of 500 gms and descriptive statistics computed.

Length of stay (LOS) was defined as the duration of hospitalisation from admission to discharge home and/or death. LOS is a frequently used crude indicator of resource

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utilisation. Costs referred to the financial resources the hospital required to provide neonatal care. Charges were bills the hospital sent out for these services. The average cost per patient was determined by dividing total cost by number of patients in the group. Average cost per survivor was calculated by dividing total cost for a group by number of survivors in the group.

The contribution of lab services, radiology, nursing care and room charges to the cost was also analysed.

RESULTS

The capital cost of establishing our 28 bedded our level III Care Unit was Rs. 80 lacs (in 1990). Cost per bed is Rs. 2.85 lacs, i.e., (Capital cost/total no. of beds) Table 1. The monthly expenses are 3.68 lacs. The break-

TABLE 1. The Childs Trust Hospital Neonatal Intensive Care Unit Capital Cost

Capital Cost	Rs. 80 Lacs
Total no. of beds	28
Cost per bed	Rs. 2.85 Lacs
Monthly expenses	Rs. 3.68 Lacs
No. of patients treated per month	81
Expenses per patient/month	Rs. 4,542.00
Expenses per bed/month	Rs. 13,139.00

TABLE 2. Monthly Expenses

Salary	Rs. 78,883.00
Electricity	Rs. 33,000.00
Consumables	Rs. 45,000.00
Depreciation	Rs. 1,15,000.00
Interest on long term loans	Rs. 96,000.00
Total	Rs. 3,67,883.00

up is as shown in Table 2.

The average length of stay for survivors was 12.5 days in the 1000-1499 gms birth weight group (Table 3). The length of stay (LOS) was inversely proportional to birth weight. Non-survivors beyond 1500 gms had a longer stay due to increased intervention and intensity of care.

The average cost of care was highest in 1000-1499 gms birth weight group i.e., Rs. 8,962 (Table 4). They were sicker and required more intervention than the heavier babies. Also the outborn status added to the cost as the sicker infants are referred.

The average hospital charges per day were higher among non-survivors (Rs.

TABLE 3. Duration of Hospitalisation

Birth weight (in gms)	Survivors		Non-survivors	
	No.	LOS (Mean) days	No.	LOS (Mean) days
< 1000	-	-	1	2
1000-1499	4	12.5	1	10
1500-1999	15	10.1	2	39.5
2000-2499	17	7.1	-	-
> 2500	39	5.7	2	5.1
Total	75		6	

TABLE 4. Average Total Cost

Birth weight (in gms)	No.	Total cost (in Rs.)	Average cost (in Rs.)
< 1000	1	3,080	3,080.00
1000-1499	7	62,740	8,962.25
1500-1999	21	1,44,835	6,896.90
2000-2499	13	66,354	5,104.15
> 2500	39	2,56,484.50	6,576.50

TABLE 5. Hospitalisation Cost for Study Infants

Birth weight (in gms)	Survivors		Non-survivors		Hospital charge	
	n	Cost in Rs.	n	Cost in Rs.		
1000 - 1499	6	45,110	1	17,630	626	1602
1500 - 1999	19	1,33,366	2	11,469	662	2549
2000 - 2499	12	62,648.50	1	3,705.50	870	2470
> 2500	36	1,67,242.50	3	99,242	752	807
Total	73	3,98,367	7	1,32,046.50	727.50	1857

1,857/-) compared to survivors (Rs. 727/-) (Table 5). This reflects the high cost during the intensive care days initially, with lower cost during recovery days, while those who died remained critically ill throughout hospitalisation.

Fig 1 shows distribution of average daily costs. Cost to produce a survivor in the 1000-1499 gms birth weight was Rs. 7,518. (Table 6). As the percentage of survivors in 1000-1499 gms birth weight group increased from 55.5% (in 1994) to 85.7% (in 1996), the cost to produce a survivor dropped from Rs. 14,500 to Rs. 7578. Comparing data of 2 years (1994 and 1996), we found that there was a gradual improvement in the survival rate of these infants.

The average ventilator charge per day is Rs. 1,793 (Table 7).

Charges of specific components of intensive care at CTH are shown in Table 8. The charges may vary from one hospital to another and make it difficult to compare our data with those from other hospitals. Because hospital charges are used for making inter hospital comparisons, our

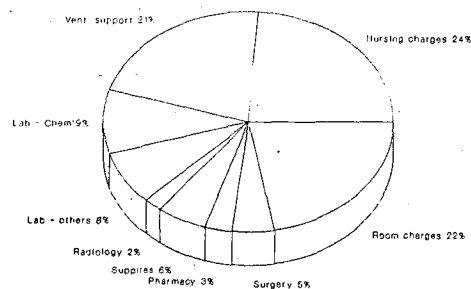


Fig. 1. Distribution of average daily costs

TABLE 6. Cost Per Survivor

Birth weight (in gms)	1994		1996	
	% of survivor	Cost/survivor in Rs.	% of survivor	Cost/survivor in Rs.
1000 - 1499	55.5	14535	85.7	7518
1500 - 1999	92	5099	90.4	7019
2000 - 2499	83	5927	92.3	5220
> 2500	92	6722	92.3	4367

TABLE 7. Ventilator Charges Per Day

Birth weight (in gms)	Ventilator charges/day (in Rs.)
1000 - 1499	1,560.00
1500 - 1999	2,035.60
2000 - 2499	1,723.60
> 2500	1,853.76

TABLE 8. Charges for Common Components of Neonatal Intensive Care at CTH

Care component	Cost in rupees
<i>Daily hospital rate</i>	
Intensive care (Nurse patient ratio 1 : 2, 1 : 3)	550/- day
Intermediate care (Nurse patient ratio 1 : 4)	225/- day
<i>Respiratory therapy</i>	
Mechanical ventilation	1000/- day
O ₂ by hood	330/- day
<i>Laboratory</i>	
Portable chest X-ray	80/-
Portable USG	350/-
Serum electrolytes	150/-
Blood sugar	40/-
Blood gas measurements	125/-

study was limited only to examination of cost related elements as reflected in billed charges. Professional charges are not included in our analysis.

In the second part of the study, we also looked into the attitude of the fathers towards neonatal intensive care. Thirty five fathers were interviewed on a questionnaire basis and the results are as follows : Out of the 35 fathers who were interviewed, 83% agreed to continue treatment despite low chances of survival of their infants (Table 9). The heartening observation

TABLE 9. Attitude of Fathers for Continuation of Treatment Despite Poor Chances of Survival

Opinion	n	%
Continue treatment	29	82.86
Will not continue treatment	5	14.29
Not mentioned	1	2.86
Total	35	

TABLE 10. Mode of Payment

Means	No.	%
Reimbursement	4	11.43
Medical insurance	1	2.86
<i>Loan :</i>		
(a) Relatives	11	31.43
(b) Loan on property	8	22.86
Savings	5	14.29
Not mentioned	6	
Total	35	

was that 94% of fathers were willing to bear expenses of NIC irrespective of the gender of the child. Forty three per cent of fathers felt that cost of care was a source of worry to them. Only 11% were reimbursed by the employers and the medical insurance coverage was available to a mere 2.86% (Table 10). Fifty five per cent depended on loan for their financial support and 14% paid from their savings.

DISCUSSION

In developed countries, intensive care of neonates is widespread, with dramatic improvement in survival of critically ill infants. In India too, intensive care is in vogue but the resources are extremely lim-

ited. Hence, the question regarding cost effectiveness and cost benefits of neonatal intensive care in the face of limited financial resources, inadequate man power and absence of health insurance is debatable.

The cost of establishing our level III care unit at The Childs Trust Hospital Chennai was Rs. 80 lacs (in 1990). The average cost of care was highest in babies in 1000-1499 gms birth weight group as they were sicker and required more intervention than heavier babies. Also, the outborn status added to the cost, as only the sicker infants were referred. The length of stay was inversely proportional to birth weight. Non-survivors beyond 1500 gms. had a longer stay due to the intensity of care. These data are comparable with reports from Western literature¹. Neonates requiring assisted ventilation had total charges that are on an average Rs. 1793/day higher, independent of primary diagnosis and birth weight. In addition, parents spent about Rs. 200/day towards drugs and disposables, Kannaraj *et al* from AIIMS, have reported average cost of ventilated baby to be Rs. 1902/day and Rs. 254/day for disposables.² In a study conducted by Bhakoo *et al*, all inclusive costs as charged by various private hospitals varied between Rs. 1,800/- to Rs. 3,000/- per day³.

The distribution of average daily costs revealed : 24% of total cost for nursing care, 22% for room charges and 21.3% for ventilatory support. This is similar to western data, where despite improvement in technology, personal involvement and expertise are irreplaceable^{1,4}. Since room charges form a considerable portion of total cost (22%), early discharge minimises total cost.

The cost to produce a survivor increased rapidly as birth weight decreased. Comparing our data over 2 years 1994 and

1996, we found that the percentage of survivors gradually increased, thereby reducing the cost⁵. Outborn referrals, degree of illness, presence of complications all added to the cost in the low birth weight group with survivors being less compared to higher birth weight group.⁴

Thirty six out of 81 neonates (44%) received active intensive therapy, where as the remaining 45 (55%) received only intensive monitoring from the present study. The proportions requiring monitoring may only seem more. These type of patients may not need admission to an NICU, if such observation could be provided in a less costly setting. In practice, however, NICU and neonatal intermediate care units are often run as a combined unit.

In recent years, the media has created an increasing awareness among the people about latest medical advances leading to their high expectations in level of care. Tertiary care neonatal referral centres are more expensive than non-referral centres. This poses a major financial stress on the family. In our study of 35 fathers regarding their attitude towards intensive care, 83% were willing to bear the cost despite poor chances of survival, 94% of them were willing to continue the treatment irrespective of the gender of the child. Although 43% felt that the cost incurred was worrisome, 77% opined that cost justified the treatment given.

Despite the non-availability of medical insurance coverage a considerable number were willing to bear the cost of intensive care by either borrowing loan on property or utilising their savings. These indirect and intangible costs add to the total cost.

Is neonatal intensive care affordable ? Economically, a 28 bed NICU may seem to be most viable in terms of capital costs,

running costs and profits. Establishment and running of a smaller tertiary care unit may not be cost effective considering the heavy investment in infrastructure and equipment. It has been shown by E. John *et al* that units less than 6 ventilator cots are not cost efficient.⁶ With good antenatal care,^{7,8} judicious use of laboratory and radiological investigations, early discharge and regionalisation of high tech care, costs can be contained.⁹ Government institutions have to cater to the needs of a vast majority of people with primary and preventive care being their priority. Privatisation of health care could help fulfil the need for tertiary care. Boyle *et al* observed that by every measure of economic evaluation, the impact of neonatal intensive care was more favourable among infants in 1000-1499 gms, than those below 1000 gms.¹⁰ This is also true of our study where benefits and outcome were positive in case of infants weighing 1000 gms and above compared to the very low birth weight groups. Hence, care of more than 1000 gm infant (especially 1250 gm and above) is cost beneficial in our setup. The problem of limited financial resources, inadequate manpower and absence of health insurance are the major deterrents of effective health care delivery system in any developing country. Choices must therefore be made to define the beneficiaries and allocate available resources effectively in order to serve as many as possible without limiting the advanced care to the small number of the more fortunate, affordable ones.

CONCLUSION

Neonatal intensive care for more than 1000 gms infant is cost beneficial in our set up. The data on cost are crucial not for patient

management decisions but for us all to actually see the numbers and know how much money is being spent. However, with our stress on small family norm, can we deny this level of care to our population.⁷

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