RESEARCH PAPER

Cost-analysis of Healthcare in a Private-sector Neonatal Intensive Care Unit in India

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Objectives: To study the actual cost of care per patient in private-sector level IIIa Neonatal Intensive Care Unit (NICU).

Methods: Prospective cost-analysis study. Cost incurred by the family on the treatment of baby, separately for every newborn for entire length of hospitalization, was calculated.

Results: 126 newborns were enrolled; High level of intervention was needed for 25.4% babies. The mean cost of care was US $ 90.7 per patient per day.

Conclusions: Bulk of the cost of care was the hospital bill.

Keywords: *Expenditure, Out-of Pocket, Newborn, Public-private partnerships*.

Neonatal care in private sector has always been presumed to be expensive than the cost of care in the public sector. There are no studies in the published literature about the actual cost of care or the comparative studies with public sector to back this popular perception. The present infrastructure in the public sector is inadequate. Partnership with private sector (PPP) holds immense potential to ensure universal coverage and bridge the immediate quality care gaps in newborn healthcare. However, there are some ideological reservations for building partnerships, especially the diversion of public money to private sector [1]. This study was therefore undertaken to assess the actual costs of neonatal care to the family in a private sector Neonatal Intensive Care Unit (NICU) and to investigate how it compares with the existing knowledge about the cost of care.

METHODS

The study was prospective cost analysis study conducted at a 14 bed, Level IIIa [2], for-profit private sector NICU, in an urban set up in Pune, India for the period of one financial quarter from 1st July, 2014 to 30 September, 2014. The NICU is part of a pediatric hospital receiving about 40 - 45 newborns per month from all the socio-economic classes. The hospital does not receive any assistance or subsidies from anywhere. The NICU provides comprehensive care including advanced life support and surgeries (except cardiac surgeries) for infants >28 weeks gestation and >1000g. A trained neonatologist supervises the services. The nurse/patient ratio is adjusted to 1:1-3. The NICU receives only out-born babies, referred mostly by pediatricians and retrieves babies by well-equipped and staffed ambulance. Permission of hospital authorities was obtained to conduct the study.

All the neonates admitted to NICU during the study period were enrolled without any exclusion. Complete medical record of each baby and details of expenses incurred by the family for the entire duration of stay were tracked and recorded. Level of intervention was classified as high when any invasive intervention was performed (long lines, mechanical ventilation, parenteral nutrition, exchange transfusion, invasive BP monitoring or surgery) and low when none of these were performed. Standard definitions were used for the final diagnosis. All the expenses borne by the family towards the final hospital bill (charges for hospital stay, doctor's fees, nursing charges, charges towards various procedures, surgery and laboratory investigations, etc.) and bills for the drugs, consumables/disposable items and any other product/services used towards treatment of the newborn but not covered in the final hospital bill were recorded for each baby. The final hospital bill factors in the capital investments, running costs and profits for the organization. The actual total cost of care for individual newborn was calculated separately by adding all the expenses incurred by family towards the treatment of the baby for entire length of stay in NICU. Cost was calculated in Indian Rupees (INR) and was converted to

TABLE I COMPARISON OF DURATION OF HOSPITALIZATION, COST OF TREATMENT/DAY AND THE TOTAL COST OF TREATMENT IN DIFFERENT DIAGNOSIS GROUPS IN THE STUDY

Diagnosis group	*N*	*NICU stay d, Mean (SD)*	*Cost of treatment /d, (US $), Mean (SD)*	*Total expenses (US $), Median (range)*
Exaggerated Neonatal Hyperbilirubinemia	26	2.0 (0.8)	73.2 (12.3)	132.7 (64.8-287.0)
Perinatal asphyxia, Perinatal asphyxia with sepsis	15	4.1 (2.5)	114.7 (44.7)	368.0 (87.4-1050.6)
Sepsis	13	6.5 (3.3)	93.7 (39.8)	471.5 (215.1-1599.3)
Mild Hyaline Membrane disease	12	5.6 (4.4)	69.3 (11.3)	242.9 (175.6-1101.4)
Transient Tachypnea of Newborn	7	2.3 (0.5)	80.9 (4.1)	167.6 (145.4-243.1)
Sever Hyaline Membrane Disease	6	10.3 (13.9)	152.6 (61.2)	831.7 (241.3-3370.1)
Persistent Pulmonary Hypertension of Newborn	6	8.8 (3.6)	146.1 (49.6)	1109.7 (478.9-1496.0)
Hypoglycemia	5	3.6 (1.5)	79.4 (8.2)	300.8 (148.3-451.7)
Meconium Aspiration Syndrome	5	5.2 (2.8)	81.6 (8.2)	349.8 (224.5-742.5)
Surgery	5	9.2 (8.9)	109.8 (33.1)	586.2 (443.8-2732.4)
Necrotizing Enterocolitis	4	11.0 (6.5)	91.8 (40.4)	919.6 (305.6-1977.6)
Others*	22	3.3 (1.3)	75.9 (13.7)	224.2 (77.8-680.5)

**Others included the babies admitted for suspected sepsis, unexplained seizures, dehydration fever, infants of diabetic mothers admitted for observation etc.*

US$ using average price of US$ for the study period as 1 US$= INR 60.6 [3]. Hospital charges remained unchanged during the study period and the variations in the cost of drugs and consumables were marginal. Babies were grouped into categories based on primary medical condition in the final diagnosis for the analysis of the cost of treatment per diagnosis group. Final outcome of care given in NICU was noted as baby cured-discharged, discharged-on-request, transferred to other NICU (included left against medical advice) and death. Data thus obtained was analyzed using SPSS software version 17 for Windows.

RESULTS

A total of 126 newborns (86 males) were enrolled in this study. Amongst the 41.3% preterms, 73% were late preterms. Birthweight was >2500 g in 56.4%, 1500-2499 g in 36.5%, 1000-1499 g in 6.3% and one baby was <1000 g. High level of intervention was needed in 25.4% cases and advanced life support was needed for 14.3% of the total babies. More than half of the admitted newborns (52.4%) were hospitalized in the NICU within 6 hours of birth. Comparison of duration of hospitalization, cost of treatment/day and the total cost of treatment in different diagnosis groups are presented in ***Table* I**. Three fourth of the babies needed admission for less than 5 days and mean duration of hospitalization for the study population was 4.8 (4.75) days (range: 1 – 38 days). The mean cost of care was US $ 90.7 per patient per day. Median total cost of care for the whole group was US $ 272.4 (range: 64.9 – 3373.4). The details of expenses towards various items and services are presented in ***Table* II**. The expenses towards use of antibiotics were 1.0% of the total costs. Outcome was discharged cured in 80.2% and discharged expedited in 2.4%, transfer to other units in 11.9% (*n*=15) and death in 5.5%. Non affordability and unwillingness of parents to continue spending on the treatment of babies with poor prognostic outcome led to transfer of 12 babies to a nearby government hospital, whereas dissatisfied parents and unavailability of cardiac care were the reasons for transfer in the remaining three cases.

DISCUSSION

This study demonstrates that actual mean cost of care per patient per day in a Level IIIa private sector NICU in

TABLE II DETAILS OF EXPENSES TOWARDS VARIOUS ITEMS/ SERVICES AS PERCENTAGE OF TOTAL COST OF TREATMENT

Category	*Description*	*Percentage*
A	Hospital bill (excluding B, C and D)	63.1
B	Laboratory charges	9.0
C	Long line insertion, mechanical ventilation, parenteral nutrition	4.2
D	Imaging	3.2
E	Consumables/ drugs (excluding F and G)	17.5
F	Diapers	2.0
G	Antibiotics	1.0

WHAT THIS STUDY ADDS?

- The median (range) cost of neonatal care in a for-profit private sector level IIIa NICU was US $ 272.4 (64.9 – 3373.4).

India is US$ 90.7. The results of the present study are not necessarily representative of the whole of the private sector. The cost of care is bound to be different (higher or lower) in different NICU (public /private sector) due to different input costs, quality of care offered, and policies of the units.

There are no recent published studies which assess the actual cost of neonatal care in a for-profit private sector NICU in India or abroad or its comparison to public sector. Adjusting to cost of inflation over period of time [4], the average cost of care per patient per day was estimated to be US$198.7 in Chandigarh (2003) [5] and US$ 117.9 in Delhi (2010) in public sector NICUs [6]. These studies used different models to estimate the cost of care, had smaller sample size, used different inclusion criteria, and did not include all the input costs (especially land cost) which significantly influence the cost of care. Accordingly, comparison with these studies is difficult.

Currently we are unable to provide optimum care to every newborn. The existing neonatal healthcare infrastructure in public sector in India needs expansion by 30 to 50% [7]. This will not only involve substantial costs but also the time, resulting in potential denial of optimum care and consequently denial of right to life to some of the newborns until this task is achieved by the state. Therefore, there is an urgent need for similar studies which will include all the input costs to determine the amount of money spent on the newborn care by the state so that appropriate equitable terms may be set for the public – private linkages at least for a short term. We have already lost millions of babies due to late recognition of right to life of a newborn [8]. It is in the interest of every newborn [9], to strengthen the public-private linkages which would ensure no baby is denied right to life.

Contributors: GK, RK: contributed to the conception and design of the study; SM, RK: organized the conduct of the study, supervised acquisition of data and analyzed the data. GK, SM: reviewed the literature. All authors contributed to drafting of the work, discussed and critically revised and approved the final version of the article for publication, and agree to be accountable for all aspects of the work. SM shall act as the guarantor of the paper.

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