

Challenges in Scaling up of Special Care Newborn Units- Lessons from India

SUTAPA BANDYOPADHYAY NEOGI, SUMIT MALHOTRA, SANJAY ZODPEY AND *PAVITRA MOHAN

*From Indian Institute of Public Health-Delhi, Public Health Foundation of India and *UNICEF, India Country Office.*

Correspondence to: Dr Sutapa B Neogi, Associate Professor, Indian Institute of Public Health (IIPH- Delhi), Public Health Foundation of India (PHFI), Plot No 34, Sector 44, Gurgaon, Haryana, India. sutapa.bneogi@phfi.org

Neonatal mortality rate in India is high and stagnant. Special Care Newborn Units (SCNUs) are being set up to provide quality level II newborn care services in district hospitals of several districts to meet this challenge. The units are located in some of the remotest districts where the burden of neonatal deaths and accessibility to special care is a concern. A recently concluded evaluation of these units indicates that it is possible to provide quality level II newborn care in district hospitals. However, there are critical constraints such as availability and skills of human resources, maintenance of equipment and bed occupancy. It is not the SCNU alone but an active network of SCNU (level II care), neonatal stabilization units (level I care) and newborn care corners can impact neonatal mortality rate reduction higher. Number of beds is also not sufficient to cater to the increasing demand of such services. Available number of nurses is a problem in many such units. An effective and sustainable system to maintain and repair the equipment is essential. Scaling up these units would require squarely addressing these issues.

Facility based newborn care has assumed an importance in developing countries owing to its potential to reduce Neonatal Mortality Rate (NMR) by 23-50% in different settings [1]. Regionalized neonatal/perinatal care with a good network of facilities at various levels has emerged as an effective strategy to tackle neonatal disease burden [2,3]. Evidence supports that in places where regionalization is not present, secondary level units can also lower NMR significantly [4-9]. Establishing such neonatal units is currently one of the thrust areas in South-east Asian countries. However, scaling up of these units across the region to deliver quality services confront challenges in the health system. Infrastructure, human resource and equipment issues remain critical concerns to be addressed. This paper captures such challenges identified through a systematic process of evaluation in India and proposes solutions suitable for similar settings.

SPECIAL CARE NEWBORN UNITS (SCNUS) IN INDIA

Provision of secondary level care or Special Care Newborn Units (SCNUs) in India is a big leap to reduce the stagnant NMR. The first unit was

established in 2003 in one of the remote districts and within a span of 3-4 years of initial success, scaling up has taken place rapidly, now covering more than 150 districts [10]. An evaluation was undertaken in 2009-10 to gain an insight into the functioning of 8 such units across different states in India. These units are located in hospitals with an annual delivery load of more than 5000. The admission rate had progressively increased over a period of 3-4 years. Sepsis, birth asphyxia and low birth weight/prematurity were the prime morbidities managed at these units. Within 1 year of functioning, there had been a reduction in neonatal mortality rate among admitted cases by 4-40% across the SCNUs. Reduction was observed in mortality due to low birth weight and sepsis but not on asphyxia. The amount of reduction was greatly influenced by the trainings conducted and hand holding done during induction. Adherence of the staff to guidelines and protocols, aseptic measures followed in the units were the key determinants of the performance of a unit. However, a reversal of trend in the decline has been observed in some units in the second year of its functioning. Though indicative, the reversal was mostly related to shortage of beds in the units that compelled twin

or even in some cases triple admissions and poor adherence to admission and discharge criteria. In one unit, a sudden reduction in the number of nurses was the most probable factor behind rise in case fatality rate. Introspection into the performance of the units had indicated major challenges in terms of infrastructure, human resources and equipment. The assessment offered key learning that are pertinent while establishing and scaling up such units.

Infrastructure

The estimated number of beds was 12 for each SCNU assuming the delivery load to be 3000 per year. However, the requirement was far more than the number existing currently. One of the possible reasons was possibly the significant increase in numbers of births due to Janani Suraksha Yojana since the unit was set up. While the initial calculation of the number of beds was done based on the number of births at the time of setting up the unit, the number of births increased significantly in last two years making the number of neonatal beds insufficient. Apart from number of deliveries, a number of other parameters like average length of stay, proportion of babies requiring special care and proportion of low birth weight infants should also be considered for calculating bed strength per unit [11,12]. (**Table I**) An increase in the number of beds by 30-50% in the existing units can address much of the problem, though it will lead to a proportionate increase in infrastructure and resources and finally would add to the cost.

There were several factors that affected the admission rates. One was the delivery load of the institution. Secondly, it was also affected by the admission policies of the units. In some units, the admission policy was strict that led to several admissions in the pediatric wards, which were not captured in SCNU figures. On the other hand, there were units with very flexible admission policies leading to many “almost normal” newborns admitted to the unit, creating a situation with high admission rates but low mortality.

In the evaluation undertaken, bed occupancy rate ranged from 28-139% (median:103%). The reasons for low bed occupancy were related to increased

dependency on private sector and shortage of staff. In some of the units, twin sharing of beds was a common phenomenon. The relationship between bed occupancy rate and mortality followed a U-shaped distribution. Units with very low and very high occupancy rates had worse mortality figures.

While SCNU can influence facility based NMR, a good network of functional newborn care corners (NCC) at every site of delivery, neonatal stabilization units (NSU) at primary level, SCNU at secondary level and neonatal intensive care units (NICU) at tertiary level is essential to reduce NMR at the population level. Establishing a network of NCCs, NSUs and SCNU as an integrated unit has not been given due emphasis during inception. In our assessment, an attempt towards establishing such a system was not evident everywhere. In one of the units having good network with peripheral NSUs, the catchment area was wider in contrast to other units that derived patients from close vicinity.

Although we found that NCCs were available in every district hospital, yet not all of them were equipped to handle emergencies at birth. As a result, there was a tendency to refer neonates unnecessarily to SCNUs posing an additional burden. Even NCCs which were functional earlier had become redundant reflecting undue over dependence on SCNU.

In our assessment, expansion of SCNUs did not match with the corresponding increase in the number of NSUs and newborn care corners. Too much of an emphasis on setting up of such secondary level units

TABLE I REQUIREMENT OF BEDS IN ASSESSED SCNUs

| District SCNU (State) | Existing number of beds | Number of estimated beds [20] |
|--|-------------------------|-------------------------------|
| Tonk (Rajasthan) | 12 | 20 |
| Dibrugarh (Assam) | 17 | 23 |
| Mayurbhanj (Orissa) | 12 | 25 |
| Purulia (West Bengal) | 14 | 32 |
| Lalitpur (Uttar Pradesh) | 12 | 25 |
| Vaishali (Bihar) | 13 | 32 |
| Guna (Madhya Pradesh) | 20 | 32 |
| Port Blair (Andaman & Nicobar Islands) | 14 | 10 |

had resulted in admission overload in these units. Admissions beyond the limits of SCNUs are likely to dilute the impact that an SCNU might have. Settings developing neonatal care system should accord importance to operationalize a well coordinated network of neonatal units at different levels for enhancing wider coverage and reach with neonatal care services.

Human Resources

Availability of adequate number of doctors and nurses is critical for providing care. Besides numbers, the skills and motivation level of staff are prime pre requisites. It has been estimated that the odds of mortality of newborns admitted in SCNUs increase significantly when one nurse cares for more than 1.7 newborns [13]. Pediatric staff ratios are inversely related to mortality rates [14]. While nurses are critical, availability of doctors is important, especially for units providing higher levels of sophisticated care such as ventilation and for survival of very low birth weight babies [15].

In our assessment, it was noted that three out of eight units had less number of nurses than the recommended nurse: bed ratio of 1:1.2 and 3 had less number of doctors than recommended doctor: bed ratio of 1:4. Nurses appeared to play a crucial role in improving newborn survival in these units – the mortality rate across the units dropped with improved bed: nurse ratios. Units having poor ratios had worse outcomes. Almost 15% of the variation in neonatal mortality rate across the units could be explained by the nurses: bed ratio. Number of doctors, though important, did not influence NMR. Qualification of nurses and doctors (in terms of their post graduation status) did not appear to have any influence on the mortality rates. It is pertinent to note that almost 68% of the nurses and one-third of doctors were hired on a contractual basis in the SCNUs surveyed. This approach may help address shortages in specific circumstances, but not likely to resolve the problem in the long run.

Since district is a unit of planning, the estimated number of doctors for each district is 90 and for nurses it is 300. Investments directed towards recruiting, enhancing the competencies and retaining

the nursing staff to work with high motivation levels in neonatal units will go a long way in improving neonatal outcomes.

Equipment

Availability of adequate number of functional equipment and drugs are crucial to the functioning of SCNUs and is directly linked to quality of care. The major share of the investment that goes into setting up of each unit is on equipment, thus ensuring optimal utilization of the same is critical.

Shortage of basic equipments and supplies such as resuscitation equipment, oxygen delivery systems and feeding tubes at a Special Care Baby Unit (SCBU) in Uganda contributed to poor perinatal care [16]. In Kabul, Afghanistan, one of the maternity hospitals with 14000 deliveries annually, it was reported that none of the wards were equipped with resuscitation equipment, functioning warmers or oxygen delivery system [17]. District hospitals in Kenya also lacked between 30- 56% of items considered necessary for the provision of care to the ill born [18].

In the 8 units surveyed, the equipment were donated by the UNICEF during the initial phase of setting up. In the due course of time, the responsibility of maintenance and repair of equipment got transferred to the local government. With nearly 100 percent bed occupancy at most of the units, the load on equipment was huge. The major equipment on an average have a shelf life of 6 yrs beyond which they would need replacement. It was quite evident that more than the adequacy of essential equipment and drugs, availability of functional equipment was a problem. None of the units had an adequate number of functional baby warmers and only 50% of them had an adequate number of phototherapy units. Most of the equipment in the SCNUs visited did not have Annual Maintenance Contract (AMC). The average time for repair varied from 2 weeks to six months.

Having an AMC with a provision to cover both preventive and on-call corrective interventions should be considered while procuring equipment. Local engineers should be identified and imparted basic training to augment the process of repair.

Besides, capacity building of the hospital staff on preventive maintenance and troubleshooting is also suggested.

POLICY IMPLICATIONS

In the current analysis, we have focused on 3 major health system issues that have a bearing on the performance and outcomes of SCNUs. To address the challenges related to infrastructure, the bed requirement of every unit should be examined in the light of local parameters like prevalence of low birth weight babies and average length of stay in addition to delivery load. Where deficient, the numbers may be increased by a certain proportion, may be 30%. Attempts should be made to have functional newborn care corners at every site of delivery. An active network of NCC, NSU and SCNU can rationalize admissions of sick newborns in appropriate units. Equal emphasis should be given to up-gradation or creation of tertiary level neonatal units in medical colleges.

With a dearth of doctors and most importantly nurses affecting almost every unit and positions lying vacant, we need to consider the issue of task shifting. Graduate doctors with an additional training in newborn care can resolve the deficit to a great extent. Local women with 10-12 years of schooling and 6 months of hands-on training in SCNUs functioning as nursing aides can be a promising option, especially for performing less skilled activities [19]. Neonatal settings should resort to local innovative solutions to address the shortage of manpower. Added incentives to work in difficult areas will also attract personnel in these units. A provision for increase in salary of contractual staff could keep the motivation level of people high.

The challenges faced in the procurement and maintenance of equipment can be resolved by adhering to the standard specifications and ensuring AMC compulsorily. A local engineer trained by the organization providing AMC is also an immediate solution. In addition, there should be designated funds towards repair of equipment that should be made readily available, bypassing administrative hassles, in times of need.

CONCLUSION

Provision of secondary level care is a big step taken up by different countries to improve facility based newborn care. Scaling up is much needed but constraints existing in the currently running units ought to be addressed on a priority basis. Challenges are many and one size may not fit all. However, these lessons are important to learn and analyze before embarking on the massive task especially in middle and low income countries. Only then, all these efforts will pay rich dividends in the days to come.

Contributors: SBN: drafted the manuscript and would be the guarantor for the paper. SM : data collection, analysis and finalization of the manuscript. SZ : data analysis and approval of the final version. PM: inputs on the analysis and approved the final version.

Funding: None.

Competing interests: None stated.

REFERENCES

1. Darmstadt G, Bhutta ZA, Cousens S, Admas T, Walker N, Bernis LD. Evidence based, cost-effective interventions: how many newborn babies can we save? *Lancet*. 2005;365:977-88.
2. Mullem CV, Conway AE, Mounts K, Weber D, Browning CA. Regionalization of care in Winconsin: a changing health care environment. *WMJ*. 2004;103:35-8.
3. Kirby RS. Perinatal mortality: the role of hospital at birth. *J Perinatol*. 1996;16:43-9.
4. Jivani SKM. Evolution of neonatal intensive care in a district general hospital. *Arch Dis Child*. 1986;61:148-52.
5. Berge LN, Rasmussen S, Dahl LB. Evaluation of fetal and neonatal mortality at the University Hospital of Tromso, Norway, from 1976 to 1989. *Acta Obstet Gynecol Scand*. 1991;70:275-82.
6. Subramaniam C, Dadina ZK. Intensive care for high risk infants in Calcutta. *AJDC*. 1986;140:885-88.
7. Were FN, Mukhwana BO, Musoke RN. Neonatal survival of infants less than 2000 grams born at Kenyatta National hospital. *East Afr Med J*. 2002;79:77-9.
8. Mootabar H, Fox HE. Level 2 hospital delivery of low birth weight infants 1970-1979. *Int J Gynaecol Obstet*. 1983;21:27-32.
9. Hotrakitya S, Tejavej A, Siripoonya P. Early neonatal mortality and causes of death in Ramathibodi Hospital: 1981- 90. *J Med Assoc Thai*. 1993;76:119-29.
10. Sen A, Mahalanabis D, Singh AK, Som TK, Bandyopadhyay S. Impact of a district level newborn care unit on neonatal neonatal mortality rate: 2 year follow up. *J Perinatol*. 2009;29:150-5.
11. Swyer PR. The regional organization of special care for the neonate. *Ped Clin North Am*. 1970;17:761-76.

12. Northern neonatal network. Requirements for neonatal cots. *Arch Dis Child.* 1993;68:544-9.
 13. Laryea CCE, Nkyekyer K, Rodrigues OP. The impact of improved neonatal intensive care facilities on referral pattern and outcome at a teaching hospital in Ghana. *J Perinatol.* 2008;28:561-5.
 14. Mugford M, Szczepura A, Lodwick A, Stilwell J. Factors affecting the outcome of maternity care II: neonatal outcomes and resources beyond the hospital of birth. *J Epidemiol Community Health.* 1988;42:170-6.
 15. Cooper PA, Rothberg AD, Davies VA, Herman AA. Needs for special care beds for the newborn in the Witwatersrand area. *S Afr Med J.* 1987;71:645-6.
 16. Mukasa GK. Morbidity and mortality in the Special Care Baby Unit of New Mulago Hospital, Kampala. *Ann Trop Paediatr.* 1992;12:289-95.
 17. Williams JL, McCarthy B. Observations from a maternal and infant hospital in Kabul, Afghanistan-2003. *J Midwifery Womens Health.* 2005;50:e31-5.
 18. English M, Ntoburi S, Wagai J, Mbindyo P, Opiyo N, Ayieko P, *et al.* An intervention to improve pediatric and newborn care in Kenyan district hospitals: understanding the context. *Implement Sci.* 2009;4:42.
 19. Sen A, Mahalanabis D, Singh AK, Som TK, Bandyopadhyay S, Roy S. Newborn aides: an innovative approach in sick newborn care at district level special care unit. *J Health Popul Nutr.* 2007;25:495-501.
 20. Toolkit for setting up of special care newborn units, stabilization units and newborn corners. Available at : http://www.unicef.org/india/SCNU_book1_April_6.pdf (Accessed on August 20, 2009).
-