



Optimal utilization of equipment at Special Care Newborn Units

Issues and Solutions

Availability of adequate and functional equipment and commodities such as drugs and consumables is crucial for the effective functioning of Special Care Newborn Units (SCNUs). A large proportion of the investments in SCNUs goes towards this.

Introduction

The impact of shortage of functional equipment in SCNUs 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. Functioning incubators did not exist and babies were nursed in open cots.¹ In a maternity hospital in Kabul, Afghanistan, that conducts 14,000 deliveries annually, it was reported that none of the wards were equipped with resuscitation equipment, functioning warmers, or oxygen delivery systems.² District hospitals in Kenya lacked between 30 and 56% of equipment necessary for provision of quality care to newborns.³

Unfortunately, available equipment is often not functional. An audit of phototherapy units in India indicated that only 18 out of 58 units were working; 36% had all lights functional; and 31% provided an acceptable level of irradiance. This compromises the efficacy of treatment provided, and prolongs hospital stay and cost.⁴

According to a survey conducted in 1997 in Orissa, Himachal Pradesh and Haryana, most facilities were equipped with oxygen cylinders, mucus suckers, and weighing scales. However, resuscitation bags and radiant warmers were reported available in less than half the hospitals, and oxygen head boxes in only a fraction of

them, although all these are part of the equipment list recommended by the government. Equipment availability is even lower at sub-district hospitals.⁵

Equipment shortage was found in newborn care units even in many developed countries. A survey of SCBUs and ICUs (Intensive Care Units) in the Thames region found many units lacking some essential equipment. On the other hand, many small units had very expensive equipment which was probably used infrequently because extremely small or sick babies were rarely admitted there.⁶

While the necessary equipment may be supplied and functionally available, it may not be optimally used. In a survey of First Referral Units (FRUs) in India, Kit-N for essential newborn care was not used despite its availability. Some pediatricians and obstetricians were unaware about the importance of radiant warmers.⁷

An evaluation of equipment availability and functionality in SCNUs in India

Eight SCNUs across eight states of India were evaluated over one year. All units had been functional for at least twelve months. It was found that in many of these units, various equipment was not functional. This was especially true for radiant warmers, oxygen concentrators, and phototherapy units – the most essential

equipment necessary for special care of newborns (see Table 1).

Table 1: Number of units having adequate number of functional equipment

Radiant warmers	0
Phototherapy units	4
Suction machine	3
Oxygen concentrators	3
Autoclave	7
Washing machine	8
Refrigerator	8
Air conditioners	8
Generators	8

Power back-up and voltage stabilization

Availability of constant and stable power is a primary requirement to protect the sensitive equipment in SCNUs. Most units did not have the required power backup but relied on the shared generator(s) of the hospital. Voltage stabilizers were either not provided or not installed. Sudden power surge after a grid failure had led to mass breakdown of devices in one unit, while an incidental failure of the hospital generator had resulted in mass breakdown in another. In two others, short circuits had damaged equipment. At some of the units, the power generators needed to be started manually, resulting in critical time loss.

Annual Maintenance Contract

Annual maintenance contracts (AMCs) are meant to ensure provision of timely preventive and on-call corrective interventions. Preventive maintenance enhances maximum uptime for the medical equipment, assuring accuracy, efficiency, and clinical efficacy. On-call intervention aims at prompt response and repairing the device, thus limiting the downtime to the minimum. Much equipment in the surveyed SCNUs was not covered under AMCs. However, cover under an AMC proved to be no guarantee that the equipment would be repaired in time. In some cases the stipulated penalty in the AMC for non-performance is lower than the cost of sending technicians to the – often – rural locations of the units!

Timely repair of equipment

The average time for repairing damaged equipment varied from two weeks to six months in these units. Many reasons were cited for this. SCNUs are mostly built in remote, difficult-to-reach locations. The equipment companies have their offices often in the large cities of the state. Service engineers based at these city offices prepare their rosters for district visits to attend to the complaints but they prefer to plan their itinerary in such a way that all the districts falling on a particular route get covered together. Thus, the service engineers either tend to wait for the adequate number of complaints from districts on a particular route, or they are engaged in visiting units on a different route. This makes economic sense to the equipment-manufacturing company but it delays attending to the complaints in the SCNUs. As the equipment gets closer to its shelf life and the frequency of breakdowns increases, such delays can worsen matters.

Staff motivation

It is obviously very demotivating for qualified and skilled medical personnel to under-perform due to non-availability of adequate and functional equipment which will also lead to erosion of trust of the target group in the unit. This might increase the proportion of cases leaving the unit early against medical advice. Cohort analysis in two units in Madhya Pradesh has shown that the mortality rate in the first year, and specially in the first month after discharge, is substantially higher in the group which left the unit early against advice.

Potential solutions

Ensure stable and adequate power input

A thorough power audit of a facility before installation of the equipment will identify the necessary actions to ensure stable power supply for the unit (see box on page 3: Good practices in equipment maintenance).

Ensure adherence to standard specifications

A standard set of specifications is available in the document “Toolkit for setting up Special Care

Good practices in equipment maintenance

Innovative AMC in Madhya Pradesh

Provisions have been made to stock equipment spares in the unit to meet the demand for parts during breakdowns, especially for equipment that is regularly used. Two or three local technicians have been identified in the district for carrying out minor repairs of damaged equipment. A network of AMC agencies and local technicians has been created for attending to minor repairs. The Civil Surgeon has earmarked special contingency funds (₹ 15 lakh), exclusively for repair and maintenance of SCNU equipment. Breakdown time for essential equipment varies from 1-2 weeks, which is the lowest among the 8 SCNUs surveyed.

Power Audit in Assam

In Assam, a power audit of the proposed SCNUs revealed major faults in the electrical infrastructure. These were addressed through the following ways:

1. Electrical wiring was fully redrawn by engineers from NRHM with proper guidelines for all aspects of wiring, earthing, power backup (standardization of electrical systems). This increased expenses on electrical equipment.
2. A biomedical engineer's position was created to be based at the state capital and to manage regular maintenance. The position was filled soon after.
3. Advanced electrical equipment was procured and guidelines for electrification strictly followed.

Power audit has been made mandatory for all new SCNUs set up under NRHM across the state. Problems identified are rectified before the SCNUs are commissioned. Based on the audits, guidelines have been laid for electrification.

Newborn Units, Stabilization Units, and Newborn Care Corners".⁸ To ensure equipment quality and safety, standard specifications should be adhered to. The lowest bidder may not necessarily offer the required specifications and quality assurance mechanisms.

Have an AMC for all essential equipment

An AMC ensures that complaints are promptly handled. Usually, cost of a maintenance contract increases as equipment gets older, but if there are a number of equipment from the same source, an economic AMC package may be negotiated with the supplier. It is useful to have a multi-year AMC built into the procurement contract. The fee for non-performance should be laid down in

relation to the location of the unit and be high enough to deter contractors from adopting cost-cutting measures to maximize delay time.

Identify a local biomedical engineer

Most breakdowns require minor repairing. The agency providing the AMC can be asked to identify an engineer from the district itself who can be contacted in case of any breakdown. These engineers can be trained by the equipment suppliers or the contractor of the AMC.

Train hospital staff

Many problems related to equipment breakdown can be prevented by appropriate use, preventive maintenance, and simple troubleshooting. Hospital staff trained in these measures can prevent most problems. Equipment manufacturers should train all equipment users at a central point.

Allocate funds for local repair

Funds should be allocated exclusively for maintenance and repair of SCNU equipment. In most SCNUs, the administrative process from issuing a complaint to taking action is extremely tedious and involves a lot of paper work. Experience from Guna indicates that allocating earmarked funds expedites and simplifies the repair process.

Carry out periodic audit of equipment

Every SCNU-in-charge should be responsible for conducting an audit of the installed equipment on a periodic basis. This will improve maintenance of records; and any action that needs administrative support can be quickly addressed.

Conclusion

SCNUs require a complex set of clinical and managerial functions to be executed in a conducive environment. Failure or malfunctioning of a single component will impact on the quality of care and the outcomes. Comprehensive equipment management therefore is essential to improve neonatal outcomes admitted in the newborn care units.

Key Messages

Availability of appropriate and functional equipment is critical for optimal performance of SCNUs. In many units, however, both availability and/or functionality remain inadequate. The major reasons are:

- Unstable power supply.
- Limited skills in use of equipment, preventive maintenance, and troubleshooting.
- Absence of AMC for the equipment, or not honoring existing AMC-conditions by service provider.

The above issues can be addressed by taking some of the measures listed below:

- Carry out a power audit of the units and ensure stable power input (as in Assam).
- Build in a five-year AMC into procurement contracts (as in Madhya Pradesh).
- Provide automatic power backup and adequate power supply.
- Train SCNU staff in equipment use, preventive maintenance, and troubleshooting before installation.
- Engage biomedical engineers for repair of equipment.
- Earmark funds for local repair, and place these funds within the unit (as in Madhya Pradesh).
- Conduct regular audits of equipment functionality and performance.

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References

- 1 Mukasa GK. "Morbidity and mortality in the Special Care Baby Unit of New Mulago Hospital, Kampala." *Annals of Tropical Pediatrics* 1992; 12:289-95.
- 2 Williams JL, McCarthy B. Observations from a maternal and infant hospital in Kabul, Afghanistan –2003. *J Midwifery Women's Health* 2005; 50:e31-e35.
- 3 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." *Implementation Science* 2009; 4:42.
- 4 Pejaver RK, Vishwanath J. "An audit of phototherapy units." *Indian J Pediatr* 2000; 67:883-84.
- 5 Paul VK, Ramani AV. "Newborn care at peripheral health care facilities." *Indian Journal of Pediatrics* 2000; 67:378-82.
- 6 Alberman E, Collingwood J, Pharoah POD, Vaizey J, Oppe TE. "Arrangements for special and intensive care of the newborn." *British Medical Journal* 1977; 2:1045-47.
- 7 Ray SK, Mallik S, Kumar S, Biswas B. "An evaluation of first referral units in border districts of West Bengal." *J Obstet Gynecol India* 2005; 55:52-56.
- 8 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)

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