FUNDED BY NIHR | National Institute for Health and Care Research

UK International Development
Partnership | Progress | Prosperity

KEMRI | Wellcome

Newborn units as physical spaces for care delivery

HIGH-Q RESEARCH BRIEF 2, AUGUST 2025

Photo courtesy of KEMRI-Wellcome Trust Research Programme

About this brief

This brief is the second in a series based on the HIGH-Q (Harnessing Innovation in Global Health for Quality Care) project and related research on newborn care in Kenyan hospitals. This work was carried out by the KEMRI-Wellcome Trust Research Programme and the Kenya Paediatric Research Consortium (KEPRECON), with support from the University of Oxford.

HIGH-Q is a multi-disciplinary study evaluating how the introduction of new technologies and workforce innovations influences the quality of care in newborn units (NBU). Ethnographic and observational research has also explored the everyday experiences of nurses, the physical environment of NBUs, and mothers' experiences within these settings. Each brief focuses on a different aspect of this work.

The brief was written by members of the HIGH-Q research team.

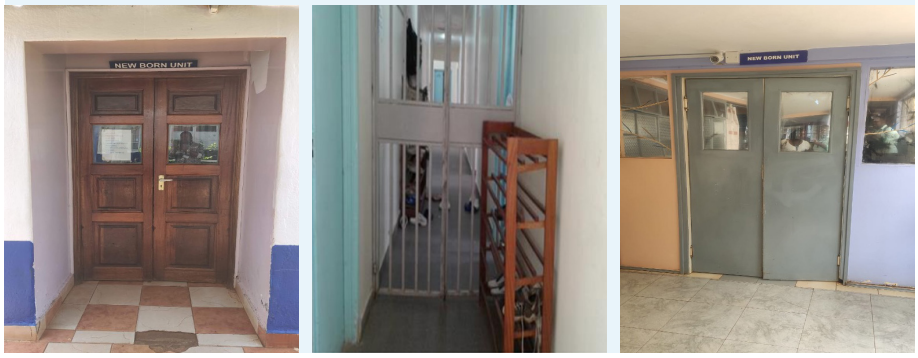
Introduction

Newborn units (NBUs) are specialised environments designed to care for small and sick infants. While medical technologies play a crucial role in newborn care, the physical environment — including the layout, spatial organisation, and infrastructure — also affects the quality of care and health outcomes for newborns.

International and national standards, such as WHO guidelines and Kenya's Comprehensive Newborn Care protocols, provide recommendations for designing NBUs. However, their implementation is often inconsistent, particularly in resource-constrained settings where many NBUs are repurposed from areas not originally intended for newborn care.

Ethnographic research from the HIGH-Q and Health Services that Deliver for Newborns (HSD-N) studies has explored how physical space shapes newborn care. HIGH-Q focused on four public hospitals and examined how layout affects workflows, communication, and maternal involvement in care. HSD-N investigated how nurses navigate these challenging environments and what they consider essential for delivering quality inpatient newborn care in five hospitals.

Figure 1: Entrance to newborn units



Physical layout of newborn units

The layout and organisation of NBUs vary across the studied hospitals. Some units are located in larger paediatric blocks with multiple adjoining rooms, while others occupy converted spaces in older hospital buildings. Despite these structural differences, common lessons emerge.

Care shaped by spaces: Decisions about how spaces are used within pre-existing layouts affect the provision of care. Ineffective layouts mean that staff and mothers must constantly adapt to deliver care in constrained spaces.

Congested layouts: Due to the high number of babies and lack of adequate space, cots are tightly arranged with minimal separation, and there is limited circulation space around high-traffic areas such as handwashing stations or nursing desks. Consequently, there is often overcrowding during ward rounds and routine infant care.

Improvised facilities: Many units lack dedicated areas for staff to change and for mothers to express breastmilk or to practice continuous Kangaroo Mother Care (KMC), leading to makeshift adaptations.

The consequences of overcrowding

Overcrowding poses a major challenge in all NBUs. Limited space and high patient numbers affect routine care. The involvement of interns and students creates additional crowding, particularly during ward rounds, when clinicians, nurses, students, and sometimes mothers are all present in confined areas.

The physical and psychological strain of overcrowding affects both staff and mothers. Nurses experience intense workload pressures, leading to exhaustion and stress. Persistent noise from the machines creates a stressful environment for mothers, adding to the duress of caring for their babies. For mothers, the lack of space and limited privacy makes care tasks more difficult, sometimes leading to frustration or conflict with others. Maintaining high standards of hygiene in such overcrowded and stressful conditions is challenging.

Workflows and communication among health professionals

The layout and organisation of space directly influence how health providers carry out key tasks, from patient monitoring and nursing rounds to care coordination and the use of newborn technologies such as CPAP and phototherapy. The location of babies on CPAP or phototherapy also varies across hospitals. In some units, these infants are spread across ward areas, making monitoring equipment and coordinating care difficult. Units with designated spaces for babies needing technological support facilitate closer monitoring, more staff interaction, and quicker clinical decision-making (Figure 2). In addition, coordination appears to be better in NBUs where workstations are shared between nurses, doctors, and other professionals. These shared spaces enable smoother communication and support team-based care, but spaces need to be sufficiently large to avoid the congestion issues noted above.

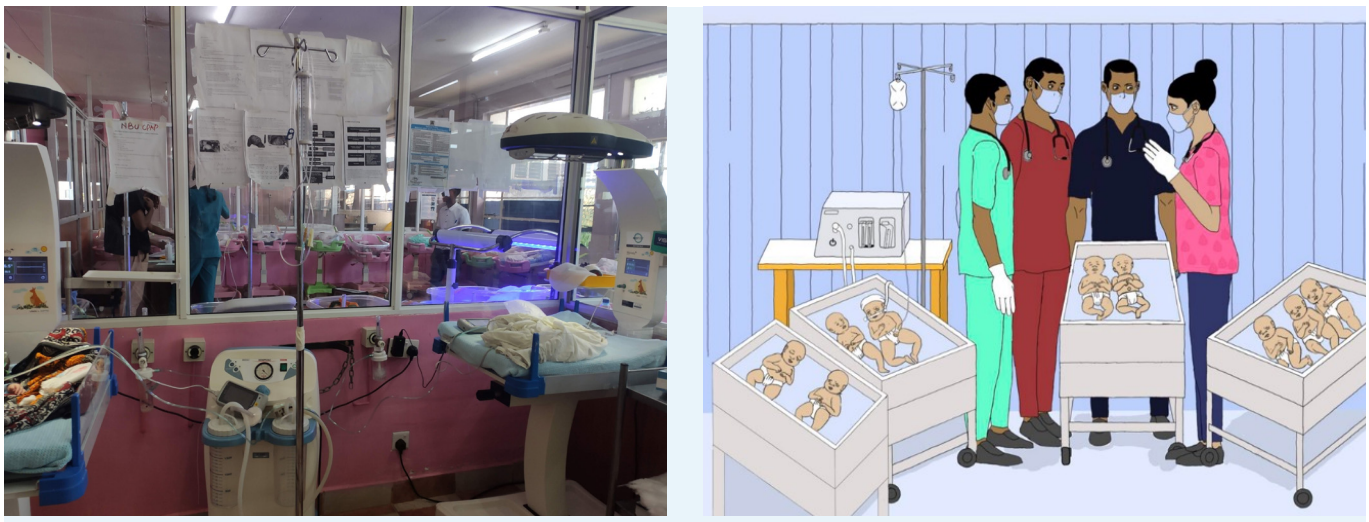


Figure 2: Left: Babies in a CPAP-designated area. Right: Illustration of a CPAP machine being brought to a cot

Communication between health providers and mothers

Communication between healthcare providers and mothers is also shaped by the layout of NBUs. Nursing stations act as key hubs for information exchange, and their visibility influences how easily staff can monitor entry points and identify new mothers. In units with clearly visible stations, orientation and oversight are more effective. In contrast, enclosed or poorly located stations make it difficult for mothers to find help and staff to maintain oversight.

Group health talks, common in public hospitals, are usually held near nursing stations, but limited space makes it difficult for mothers to hear what is said during these sessions. In many units, one-on-one communication on sensitive topics and critical updates are discussed in open spaces due to the lack of private rooms. The absence of private counselling rooms or family discussion spaces hinders respectful communication practices, particularly when talking about clinical deterioration or death.

Mothers' participation in care

The research also examined how space impacts mothers' involvement in their baby's care. Despite space limitations in public hospitals, mothers are expected to take on routine care duties, such as feeding, diaper changing, and basic hygiene. However, crowded incubators and cots make it challenging to perform these tasks.

Dedicated care spaces like KMC wards and areas for expressing breast milk are key to supporting maternal involvement. However, limited space in KMC rooms often restricts the number of mothers able to practice continuous KMC. In units lacking adequate space for continuous KMC, intermittent KMC is practiced in other spaces, which are often cramped and uncomfortable, hindering mothers' ability to carry out KMC effectively.

Designated space for expressing breastmilk fosters peer-to-peer support and allows nurses to identify and support struggling mothers. In some units, overcrowding, a lack of sufficient sitting space, or the total absence of such spaces forces mothers to express milk at the bedside, limiting comfort, making expressing challenging, and hindering the establishment of peer-to-peer and nurse support.

"We don't have even a place where that we can sit down and talk with the mother and tell the mother one, two, three... we don't have a place where we can go inside in a room, talk with the mother, because our reception area [nursing station], it's where we sit, and it's a place where the mother they're passing up and down." (Nurse)

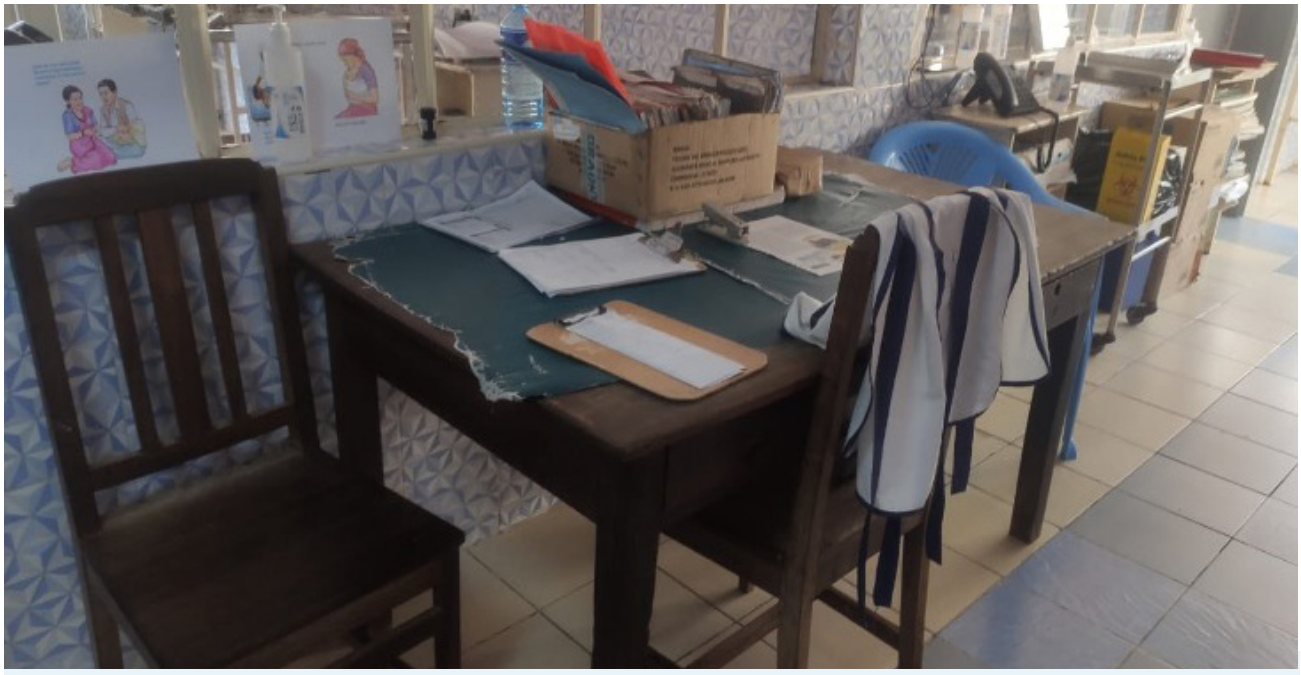


Figure 3: Adapted space (nurses' station)

Conclusion

The physical layout of NBUs is not only a backdrop to care, but also a key determinant of how effectively that care can be delivered. Poor spatial planning hinders vital interventions, strains staff, and compromises mothers' experiences.

Addressing these challenges requires investment in infrastructure, equipment and staffing, alongside better use of current spaces and improved spatial design to support effective workflows and infection control. Co-designing newborn spaces with healthcare providers, particularly nurses, can lead to more practical layouts that improve efficiency, communication, and care delivery.

Efforts to improve newborn care must go beyond technological advancements to address health system barriers, ensuring that hospitals – especially public facilities – have the resources and staffing necessary to provide consistent, high-quality, and safe newborn care.

Sources

This brief draws on both published and unpublished research, as well as presentations delivered at conferences and workshops. Key sources include:

1. McKnight J, Nzinga J, Jepkosgei J, English M. Collective strategies to cope with work-related stress among nurses in resource-constrained settings: An ethnography of newborn nursing in Kenya. *Soc Sci Med.* 2020;245:112698. https://doi.org/10.1016/j.socscimed.2019.112698.

2. Nyikuri M, Kumar P, Jones C, English M. "But you have to start somewhere…": Nurses' perceptions of what is required to provide quality newborn care in selected hospitals, Kenya [version 2; peer review: 2 approved]. *Wellcome Open Res.* 2020;4:195. https://doi.org/10.12688/wellcomeopenres.15592.2.

3. Oluoch D, Hinton L, English M, et al. Mothers' involvement in providing care for their hospitalised sick newborns in Kenya: a focused ethnographic account. *BMC Pregnancy Childbirth.* 2023;23:389. https://doi.org/10.1186/s12884-023-05686-3.

4. Oluoch D, Odinga N, Waithira C, Ngaiza G, Maluni J, Mutua E, et al. Examining the experiences of mothers of hospitalised small and sick newborns following the implementation of a staffing intervention in select Kenyan public hospitals. Draft manuscript.

5. Waithira C, Odinga N, Ngaiza G, Maluni J, Maina M, English M, et al. How important is the ward structure, space, and layout to communication and participation in care for mothers in newborn units: insights from a qualitative study in Kenya. Draft manuscript.

Acknowledgements: This work was supported by the NIHR (project reference: NIHR130812) using UK international development funding from the UK Government to support global health research. The views expressed in this publication are those of the author(s) and not necessarily those of the NIHR or the UK government.