

# Transforming care in Kenyan hospitals: Progress within the Clinical Information Network



## Key points

- The Clinical Information Network (CIN), established in 2013, is a collaborative initiative aimed at improving the quality of paediatric and neonatal hospital care in Kenya through strategies that promote adherence to recommended care practices and the use of information to support learning and improvement.
- Despite the complexities of its multi-faceted design and variability across hospital settings, longitudinal research in CIN hospitals reveals improvements in clinical documentation, greater adherence to recommended care practices, and increased adoption of basic technologies, some of which are associated with better patient outcomes.
- CIN-N, which focuses on newborn care, has contributed to progress in clinical documentation, prescribing practices, and improvements in neonatal care, for example reductions in neonatal hypothermia, a key contributor to newborn mortality.
- This brief highlights this progress, illustrating CIN's potential to enhance care quality and outcomes in Kenyan hospitals, while recognising the challenges in attributing specific impacts to individual network activities.

## ABOUT THIS SERIES

This is **Brief 3** in a series exploring the evolution, implementation, and impact of the Clinical Information Network (CIN) in Kenya. Each brief focuses on a distinct aspect of CIN's work.



### Laying the foundations for better care:

Developing tools, guidelines, and information architecture to support learning and improvement in Kenya's hospitals



### A theory-informed approach:

Applying theoretical frameworks to guide the development of CIN and its interventions



### Transforming care in Kenyan hospitals:

Showcasing CIN's progress in improving care processes and outcomes



### Assessing quality of care at scale:

Demonstrating research contributions, including validating tools, evaluating guidelines, clinical trials



### System influences and interventions:

Presenting research on health system barriers and system interventions to improve care



### Exploring behavioural and organisational dynamics:

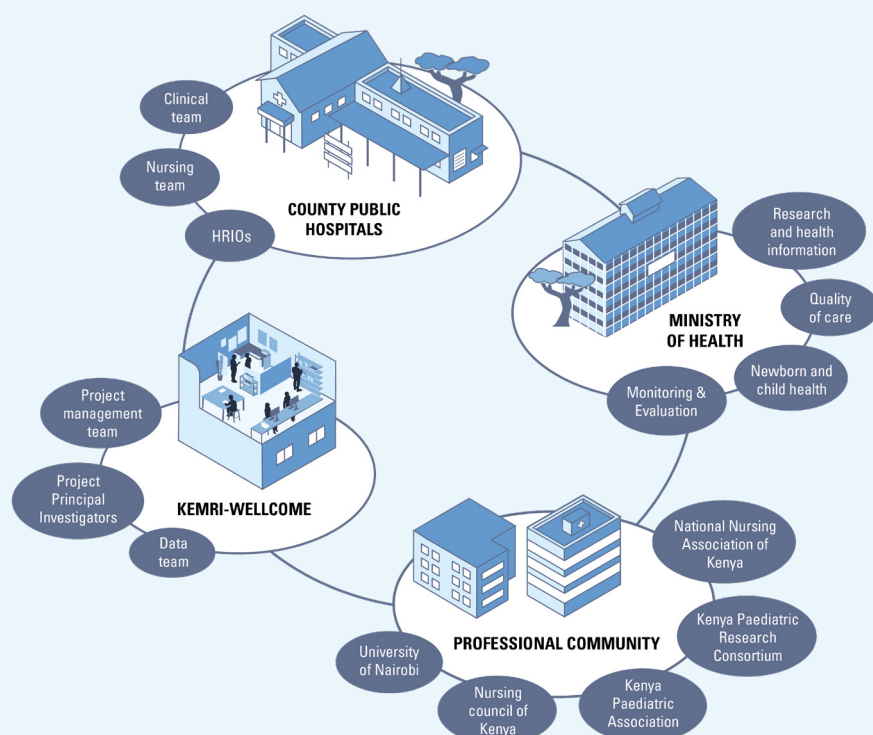
Investigating the human and organisational factors shaping care practices

## The Clinical Information Network at a glance

Established in 2013, CIN is a collaborative initiative uniting Kenyan hospitals, government agencies, research institutions, and professional associations to improve the quality of paediatric and neonatal hospital care. CIN supports better clinical practices through a range of strategies including:

- The use of standardised forms such as the Paediatric Admission Record (PAR) to enhance documentation, data quality and support clinical decision-making.
- Development and dissemination of evidence-based clinical practice guidelines, supported by training, to improve the management of severe illness.
- Audit and Feedback (A&F) cycles to promote adherence to evidence-based guidelines and foster continuous learning.
- Mentorship, peer-to-peer collaboration, and leadership development initiatives to strengthen clinical leadership and embed a culture of improvement.

CIN currently operates across 24 hospitals in 19 counties, creating a platform for data-driven care improvements, real-world research, and policy influence (see Brief 2 for more details).



## Laying the foundation: Testing the effectiveness of interventions

Before CIN's establishment, research evaluated strategies that would later form its interventions (see Brief 1 for details). This early work focused on improving the availability and quality of hospital data. At the time, medical records were poorly maintained, with limited documentation and weak health information systems resulting in a lack of data-driven practices to inform and improve care.

One key study, a cluster randomised trial (2006-2008) conducted in eight rural district\* hospitals, assessed the effectiveness of a multi-faceted intervention including outreach, A&F cycles, evidence-based guidelines, training, job aides, local facilitation, and supervision.<sup>1</sup> The intervention group of four hospitals showed significant improvements in adherence to clinical guidelines and care processes compared to the control hospitals that received only partial interventions, such as written feedback and guidelines. For example, adequate

prescriptions of intravenous fluids for severe dehydration were more common in the intervention hospitals (67.2% versus 40.6%) and the proportion of children receiving inappropriate doses of drugs was lower.

Additionally, an 11-year observational study (2002–2012) tracked changes in paediatric hospital care and the adoption of clinical practice guidelines.<sup>2</sup> The study revealed slow but steady improvements in adherence to guidelines after 2006 when efforts were made to disseminate and scale up their access in hospitals. In particular, prescribing practices improved: quinine loading doses, formerly used for severe malaria, rose from 4% in 2002 to 89% in 2012 and compliance with once-daily gentamicin dosing for severe bacterial infections increased from below 11% to 68%–89% by 2012. The research also highlighted persistent inadequacies in the availability of basic resources and limited adoption and use of essential diagnostics and technology.

Together, these studies demonstrated the potential of strategies like A&F, training, and local facilitation, which were later integrated into CIN.

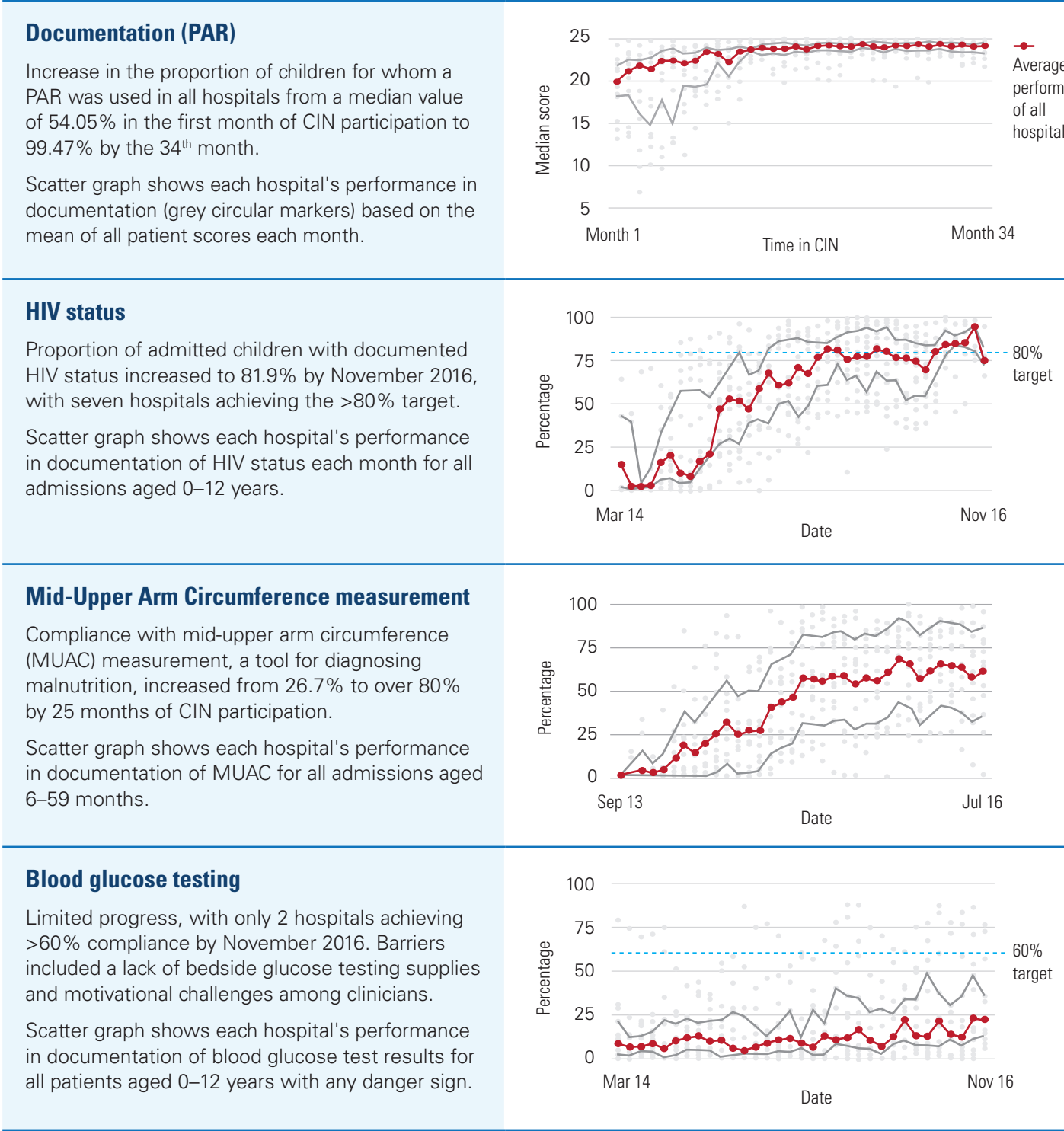
\* In 2013, Kenya adopted a devolved system of government, reclassifying public hospitals from district and sub-district hospitals to county and sub-county hospitals. We will use the term "district hospitals" when referring to periods before 2013 and "county hospitals" when discussing periods after. In global contexts, "District Hospitals" may be used generically.

Key achievements: Documentation, adherence to guidelines, and uptake of technologies

A study using data from 60,214 discharge records from 14 hospitals in the CIN evaluated the impact of A&F cycles on adherence to national clinical guidelines during the first 25 months of CIN participation (2013–2016).<sup>3</sup> The findings revealed substantial improvements in 24 out of 34 indicators of adherence, with the most consistent

progress observed in simple documentation tasks. Indicators requiring cognitive effort showed greater variability in improvement. While the type of feedback (passive or active) did not directly influence outcomes, task type and the use of the PAR were strongly linked to better documentation practices. However, variability in adoption and adherence across hospitals and indicators remained evident. Figure 1 shows trends in selected indicators of documentation and guideline adherence, highlighting progress and challenges.

Figure 1 Trends in selected indicators of adherence to guidelines



Source: Adapted from Irimu et al, 2018<sup>4</sup>

## Adoption of Pulse Oximetry

Pulse oximetry is an inexpensive yet critical tool for assessing hypoxaemia in severe childhood illnesses such as sepsis, meningitis, severe acute malnutrition, and malaria. CIN research tracked pulse oximetry adoption over seven years (2014–2020) in 14 CIN hospitals to understand its uptake in low- and middle-income countries (LMICs) and the factors influencing its use.<sup>5</sup>

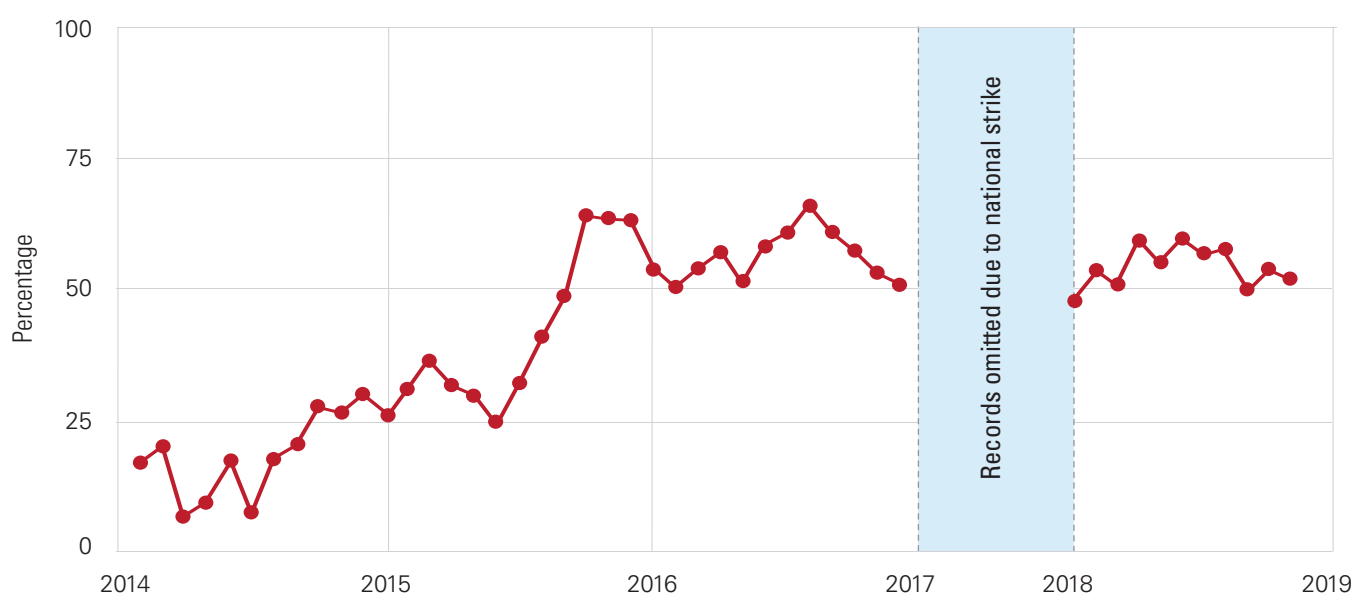
At the time of joining CIN, most hospitals used pulse oximetry in less than 25% of paediatric admissions,

with only three hospitals equipped with pulse oximeters. By late 2016, 12 hospitals had acquired pulse oximeters. Month-to-month participation in CIN was associated with steady gains, suggesting that A&F cycles, resource advocacy, and integration into the PAR system encouraged adoption (see figure 2).

Despite these gains, the study's findings emphasise that adoption of pulse oximetry has been slow and erratic, with hospital-level factors, such as a lack of resources and organisational constraints hindering its universal adoption.

**Figure 2**

**Average pulse oximetry use at admission over time in early entrant CIN hospitals (2014–2019)**



Source: Adapted from Tuti et al, 2021

## Improving processes of care and outcomes for children with diarrhoea and dehydration

Diarrhoea and dehydration (DD) is a major cause of death in children under 5 years in sub-Saharan Africa and adherence to evidence-based guidelines is key to reducing the number of deaths. Research evaluating the CIN's impact over its first three years (2013–2016) across 13 hospitals revealed improvements in the quality of care for children admitted with DD.<sup>6</sup> Using the Paediatric Admission Quality of Care (PAQC) score – a composite measure of assessment, diagnosis, and treatment – results demonstrated a mean increase of 13.8% during

the first year of network participation. The greatest improvements were seen in the assessment domain, although gains plateaued thereafter, underscoring the need for sustained interventions to maintain momentum.

Further research established a link between improved fluid prescribing practices and reduced mortality in children with DD.<sup>7</sup> An analysis of 8,562 admissions across the CIN found that adherence to WHO-recommended rehydration guidelines was significantly associated with a lower odds of death. These results underscore CIN's potential to not only enhance care quality but also drive meaningful reductions in child mortality.



## Neonatal care

Complementing the broader CIN initiative, the Clinical Information Network–Newborn (CIN-N) aims to improve the quality of care in Newborn Units (NBUs) in Kenya by addressing gaps in record keeping and routine monitoring. Through interventions like the Neonatal Admission Record (NAR) and A&F cycles, CIN-N aims to support better documentation and decision-making for small and sick newborns.

At Pumwani Maternity Hospital – the largest public maternity hospital in Kenya, serving an urban poor population – a three-year study (2014–2016) evaluated the impact of these interventions.<sup>8</sup> The findings revealed significant improvements in clinical documentation, with recording of gestational age increasing from 15% at baseline to over 75%. There were also notable advancements in prescribing practices, including more accurate dosing of gentamicin – an antibiotic used to treat babies with neonatal sepsis – for newborns weighing less than 2 kg, with accuracy rising from 60% to 83%.

Across 20 CIN-N hospitals, a multisite retrospective cohort study involving 80,060 neonatal admissions (2018–2021) revealed statistically significant month-to-month improvements in documentation and prescribing accuracy.<sup>9</sup> For instance, monitoring documentation improved by 7.6% monthly, while accuracy in feeds and fluids prescriptions increased by 2.8% and 1.4%

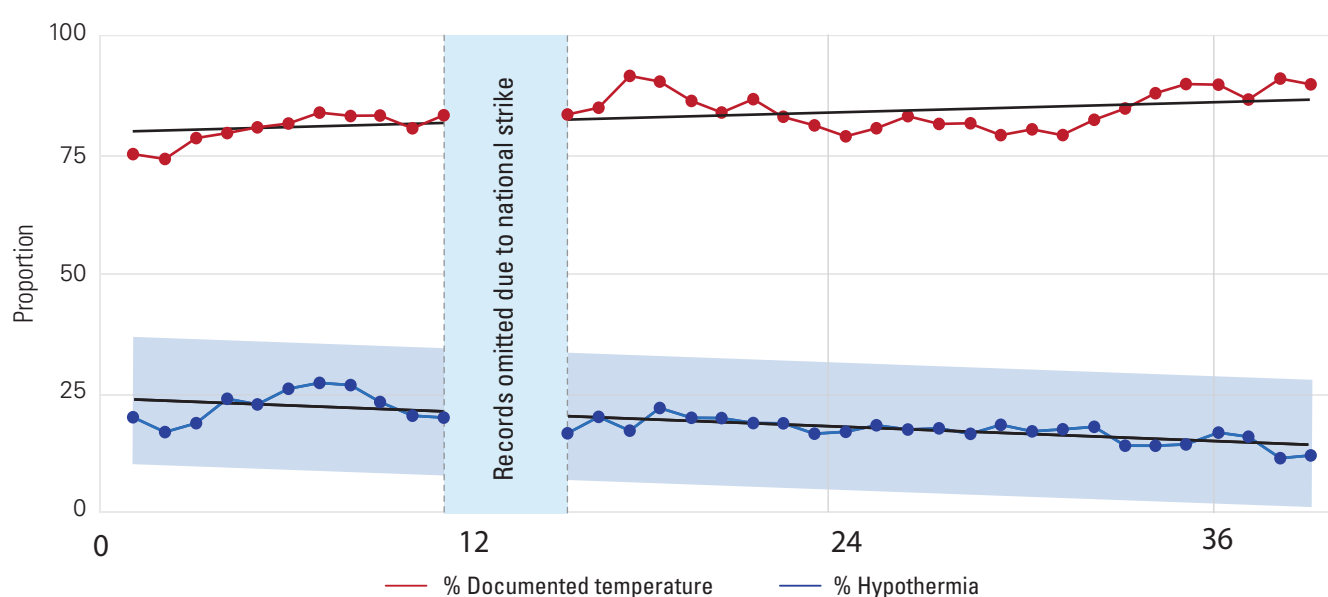


respectively. However, antibiotic prescribing accuracy remained a challenge, with considerable variability across hospitals.

Hypothermia, a condition linked to significant neonatal mortality and present in 17.5% of newborn admissions, was a key focus of CIN-N research. Data from 21 NBUs (2020–2023) showed that temperature documentation increased from 74% to 91%, while hypothermia prevalence at admission dropped from 20% to 12% (see figure 3).<sup>10</sup> Longer participation in CIN-N was associated with reduced odds of hypothermia demonstrating the network's contribution to measurable improvements in neonatal outcomes, beyond enhancing care processes.

**Figure 3**

**Trend in neonatal temperature documentation and hypothermia at admission (2020–2023)**



Source: Adapted from Wainaina et al, 2024

## Lessons from enhanced audit and feedback

Research examined whether modifying CIN intervention components can improve their effectiveness.<sup>12</sup> A cluster randomised controlled trial tested whether enhanced A&F – featuring increased feedback frequency, clear goal-aligned messaging, and outreach from senior paediatricians – could improve adherence to pneumonia treatment guidelines compared to standard feedback. The findings showed that enhanced A&F did not lead to overall improvement in guideline adherence compared to standard feedback. However, enhanced feedback appeared to promote more sustained improvements over time suggesting a potential cumulative effect of repeated enhanced feedback cycles.

## Conclusion

The CIN has demonstrated its potential to improve the quality of care in Kenyan hospitals through structured interventions such as A&F, standardised documentation, and peer-to-peer support. These efforts have enhanced adherence to evidence-based guidelines in many areas, with measurable effects on care processes and clinical outcomes. Notably, improvements in DD care and the management of neonatal hypothermia are examples of effects that will help reduce mortality.

Research investigating enhanced A&F highlighted the importance of sustained engagement. The findings show that maintaining feedback cycles and mentoring over time can promote incremental improvements and embed best practices within hospital routines.

CIN exemplifies the transformative potential of clinical networks in improving care quality and outcomes, especially in resource-limited settings. Evaluating its impact as a single entity remains a challenge. Realist evaluation, which synthesises context, mechanisms, and outcomes, provides a promising framework for assessing the effects of such complex health system interventions.<sup>11</sup>

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