

# Quality of inpatient paediatric and newborn care in district hospitals: WHO indicators, measurement, and improvement

Mike English, Jalemba Aluvaala, Michuki Maina, Trevor Duke, Grace Irimu



Poor-quality paediatric and neonatal care in district hospitals in low-income and middle-income countries (LMICs) was first highlighted more than 20 years ago. WHO recently developed more than 1000 paediatric and neonatal quality indicators for hospitals. Prioritising these indicators should account for the challenges in producing reliable process and outcome data in these settings, and their measurement should not unduly narrow the focus of global and national actors to reports of measured indicators. A three-tier, long-term strategy for the improvement of paediatric and neonatal care in LMIC district hospitals is needed, comprising quality measurement, governance, and front-line support. Measurement should be better supported by integrating data from routine information systems to reduce the future cost of surveys. Governance and quality management processes need to address system-wide issues and develop supportive institutional norms and organisational culture. This strategy requires governments, regulators, professions, training institutions, and others to engage beyond the initial consultation on indicator selection, and to tackle the pervasive constraints that undermine the quality of district hospital care. Institutional development must be combined with direct support to hospitals. Too often the focus of indicator measurement as an improvement strategy is on reporting up to regional or national managers, but not on providing support down to hospitals to attain quality care.

## Introduction

Poor-quality hospital care is a global challenge. District hospitals typically offer first referral services, including inpatient care associated with the major clinical disciplines of internal medicine, surgery, obstetrics, and neonatal and paediatric care, to populations within the same administrative district or its equivalent in low-income and middle-income countries (LMICs). Such district hospitals have been regarded as a key component of primary health-care systems since the Alma-Ata Declaration in 1978, and have more recently been seen to support maternal, neonatal, paediatric, and surgical services as part of universal health coverage.<sup>1,2</sup> Studies conducted from 2000 onwards highlighted the poor quality of district hospital care provided to sick children and newborn babies in LMICs.<sup>3-5</sup> In the more than 20 intervening years since then, progress to improve this paediatric and newborn care has been too slow. To address this slow progress, WHO has developed indicators of the quality of facility-based care for women, newborn babies, and children.<sup>6-8</sup> Here we focus on the indicators for sick newborn and paediatric care as examples. We discuss challenges with developing reliable and efficient measurement approaches, and linking measurement to effective national and local governance and support for hospitals, and suggest a three-tier, long-term strategy is needed, comprising quality measurement, governance, and front-line support. We address the still common mantra, if it can't be measured, it can't be managed, by briefly exploring some specific measurement challenges and how measurement can inadvertently narrow the gaze of quality improvement, diverting attention from the poor foundations of many health systems and down-playing the importance of developing skilled quality management and distributed forms of governance.<sup>5</sup> This development requires the participation of multiple institutional

stakeholders at national, subnational, and hospital management levels who build and share a long-term vision. These institutions might need to make difficult decisions, for example, if a hospital cannot provide safe care. We emphasise that advancing the scale and scope of quality measurement must also result in better direct support for front-line hospital staff to improve the quality of care for patients and families.

## Progress in addressing quality and emerging concerns

To date, much of the focus for improving the quality of paediatric and neonatal hospital care in LMICs has been on addressing knowledge and practice deficits in the management of common, severe illnesses. Thus, standardised triage strategies, evidence-based clinical guidance, and training materials have been developed,<sup>9</sup> and some progress has been made in implementing these strategies.<sup>10</sup> Other efforts have focused on advancing specific services, formally introducing quality improvement teams, promoting effective supervision, or implementing national audit schemes.<sup>11-13</sup> Many initiatives focus only on the competence of front-line hospital staff or local team leaders.

Improvements in national and subnational systems that support the availability of foundational inputs have been slow. Challenges with such inputs span district hospitals' physical infrastructure, staffing, and therapeutic and diagnostic resources, among others. Inadequacies in the basic foundations of good health-service delivery, such as water, hygiene, and sanitation, and major deficits in the health workforce continue to preclude quality care.<sup>14,15</sup> Workforce deficits are a pervasive challenge. District hospitals are often short of personnel, and particularly personnel with specialist training in paediatric or neonatal health care. Workforce shortages threaten all aspects of provider or team-based care, and

*Lancet Glob Health* 2023;  
11: e1114-19

Published Online  
May 23, 2023  
[https://doi.org/10.1016/S2214-109X\(23\)00190-0](https://doi.org/10.1016/S2214-109X(23)00190-0)

Kenya Medical Research Institute-Wellcome Programme, Nairobi, Kenya (Prof M English FMedSci, J Aluvaala DPhil, M Maina PhD, Prof G Irimu PhD); Health Systems Collaborative, Nuffield Department of Medicine, University of Oxford, Oxford, UK (Prof M English); Department of Paediatrics and Child Health, University of Nairobi, Nairobi, Kenya (J Aluvaala, Prof G Irimu); Intensive Care Unit, Royal Melbourne Children's Hospital, Melbourne, VIC, Australia (Prof T Duke MD); Department of Paediatrics, University of Melbourne, Melbourne, VIC, Australia (Prof T Duke); School of Medicine and Health Sciences, University of Papua New Guinea, Port Moresby, Papua New Guinea (Prof T Duke)

Correspondence to:  
Mike English, Health Systems Collaborative, Nuffield Department of Medicine, University of Oxford, Oxford OX3 7BN, UK  
[mike.english@ndm.ox.ac.uk](mailto:mike.english@ndm.ox.ac.uk)

	Paediatric				Newborn			
	Input (n=232)	System (n=50)	Individual (n=228)	Total (N=510)	Input (n=305)	System (n=57)	Individual (n=218)	Total (N=586)
Receipt of evidence-based routine care according to WHO guidelines	84	5	133	222	135	6	125	270
Functioning health information system supporting data for action	15	3	11	29	11	4	7	23
Appropriate, timely, and effective referral	11	0	17	28	23	0	22	45
Communication with families is effective and responsive with meaningful participation	19	4	22	45	24	8	18	51
Rights are respected, protected, and fulfilled without discrimination, and preserving dignity	24	4	16	44	24	4	15	43
Provision of developmentally supportive care and follow-up with emotional and psychosocial support for families	14	4	14	32	15	1	16	32
Competent, motivated, empathetic, and multidisciplinary staff are consistently available	20	19	5	44	19	21	3	43
Appropriate and safe physical environments and adequate resources are available	45	11	10	66	54	13	12	79

Indicators are stratified by whether they are measured as an input or as requiring system-level or individual (patient or health worker)-level data as part of assessing process, output, or outcome indicators.

**Table 1: Number of indicators in the eight WHO Quality of Care domains**

often make it difficult or impossible to devote time to local improvement activities. Inadequate staffing, scarce resources, and poor physical infrastructure also contribute to burn-out and its adverse consequences for patients and provider teams.<sup>16</sup> Inadequate foundations for basic hospital care for children and newborn babies continue to be a major threat to patient safety in many LMICs.<sup>14,15</sup>

In many LMIC district hospitals, scarce diagnostic resources also restrict case management to a clinical syndromic approach. Hospitals' team leaders can also face substantial difficulties trying to reorganise a facility's physical space or personnel to benefit patient care. For example, efforts to redesign waiting areas, reallocate hospital staff to improve triage, retain trained staff, or improve referral systems might lack the necessary financial or senior administrative support—sometimes because children's services are not income generating (as there are no family copayments for the treatment of children under the age of 5 in some countries).<sup>17</sup>

### WHO indicators of the quality of inpatient care for sick newborn babies and children

To advance the quality care agenda, WHO has developed a comprehensive array of indicators to measure quality linked to a conceptual framework with eight domains (table 1).<sup>6</sup> There are more than 1000 indicators across paediatric and newborn hospital care. The WHO guidance does not suggest using all of these indicators;<sup>7,8</sup> rather, it recommends that countries and health facilities carefully select which indicators to measure as part of an integrated improvement programme. We agree with this recommendation, but acknowledge that, when presented with such a huge array of indicators, key actors could either feel overwhelmed (and avoid engaging in the

quality agenda) or feel under pressure to perform seemingly impossible measurement tasks. There is also a risk of narrowing the gaze of quality improvement to only measuring indicators without implementing subsequent improvement actions. Measurement should be considered as just one part of a skilled process of quality management that involves multiple actors. This skilled process must be developed in step with judicious measurement. Use of a small number of carefully measured quality indicators might be the best initial strategy.<sup>18</sup> This integration of measurement and quality-management capability requires a long-term view—one that sees measurement results as the product of multiple system attributes. Appreciating the challenges of producing accurate measurements will also be important.

In the recent WHO recommendations, there are more than 500 input indicators for paediatric and newborn hospital care quality, predominantly focused on infrastructure, resource availability, and local organisation of services (table 1).<sup>7,8</sup> Individual input indicators are typically evaluated at the whole-facility level or department level to yield a single data point (eg, achieved or not achieved) often at a single timepoint (table 2). Sets of input indicators can then be combined to create scores. Intermittent facility assessments, such as the Service Availability and Readiness Assessment surveys, have been used to collect such data. However, these assessments can be expensive and the periods between them can be long (5 years or more). In the long term, opportunities exist for much better data generation from routine information systems that could avoid over-reliance on costly surveys. For example, establishing a public facility's human resource complement and skill mix (ie, the total number of hospital staff and proportion of different professional and non-professional staff

## Requirements for data collection

## Input indicators

The health facility has basic laboratory and diagnostic tests and supplies (eg, otoscopes, blood glucose tests, malaria smear or rapid diagnostic tests, and urine tests) available for the appropriate assessment of children with fever

The health facility holds regular wellbeing clinics (eg, well child and immunisation clinics, counselling services, growth and development monitoring clinics, and adolescent clinics), which are used as opportunities for health promotion and preventive care

## Process indicators

Proportion of all children with pneumonia or severe pneumonia who received correct antibiotic treatment (ie, formulation, dose, frequency, and duration) according to WHO guidelines

All newborns are given vitamin K according to WHO guidelines

Proportion of liveborn newborns who were not breathing after additional stimulation and who were resuscitated with a bag and mask

Proportion of health-care staff in the health facility who demonstrate good communication skills: asking questions of and listening to children and carers, enabling children and carers to ask questions, explaining with examples to ensure patient and carer understanding, and verifying that understanding

Assessment of presence or absence of the diagnostic test or item of equipment in a facility; a locally suitable and potentially stratified definition of availability might be required—eg, should blood glucose tests be available in multiple locations in larger facilities (an agreed definition of availability and whether or how to assess functionality or effective use might also be needed)<sup>19</sup>

Clinic schedules and purpose, with a locally relevant definition of regular; ideally needs insight into content and a locally relevant definition of what comprises acceptable counselling, promotion, and prevention, and how this might be assessed

Minimum data for each child might be age, weight, clinician's diagnosis, and severity classification of pneumonia, as well as the names, doses, frequency, and duration of prescribed drugs; ideally, data might include all important clinical respiratory signs from each individual to determine if the correct pneumonia classification was used, and presence of comorbidities (eg, HIV) that help to assess whether the correct antibiotic was used

A record of all facility births and whether vitamin K was administered is the basic requirement (and might be recorded in maternity registers); difficulties might arise linking information if sick or preterm newborns are rapidly transferred to newborn wards where vitamin K might be given, or if correct dosing for preterm babies is part of the indicator definition

Clinical records, at a minimum, must enable the identification of a denominator population defined as not (sufficiently) breathing after additional stimulation and then documentation of intervention with bag and mask ventilation; difficulties might arise if there is variability in resuscitation practice, especially for extremely preterm babies; specifically, variability might affect documentation of resuscitation efforts and in knowing whether resuscitation was truly warranted or effective

Definitions of whether communication skills are good or bad need to be agreed on, and tools for assessing and recording findings, which might need to be based on expert observation, will be needed; it might be challenging to assess sufficient numbers of health-care staff in any one facility to establish a proportion with confidence

Two input indicators and four process indicators are used to illustrate data collection challenges and to show why engaging stakeholders in the selection and definition of indicators is important.

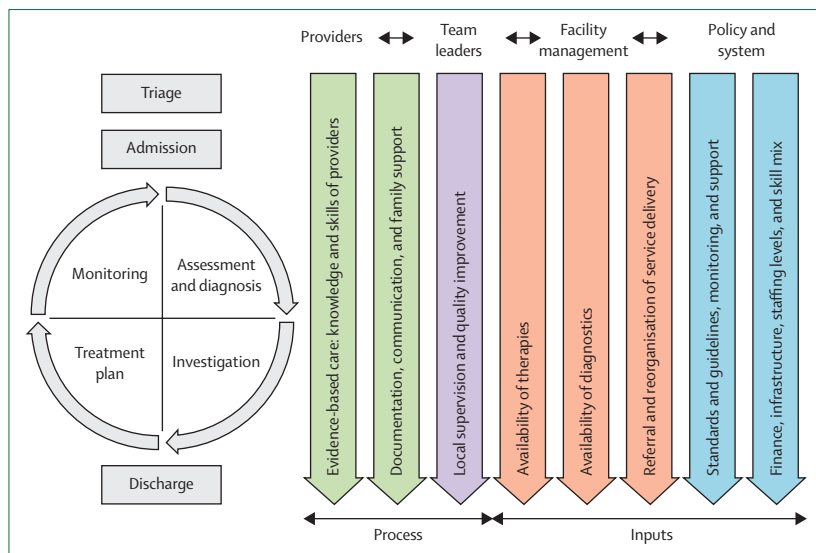
**Table 2: Example indicators selected from WHO standards of hospital care for sick newborn, paediatric, child, and adolescent populations**

groups) should be possible by integrating payroll data, regulatory body licensing, and continuing professional development data. This process could provide data to address important indicators, such as “[t]he health facility has sufficient numbers of competent, licensed, motivated, regulated newborn health professionals with a mix of appropriate skills, working in multidisciplinary teams.”<sup>18</sup> Similarly, it might be more efficient to use a facility's own inventories to assess the availability and functioning of equipment (eg, continuous positive airway pressure machines), or laboratory reporting systems to examine diagnostic test capability.<sup>20</sup> Better use and improvement of existing data will require work to map the administrative and management data useful for input, output, and outcome measurement, across potentially multiple offices of government. Building this capacity for government facilities is an important investment to gradually reduce the need for and complexity of surveys—although determining whether available resources are functional and effectively used might still require attention (table 2).<sup>21</sup>

There are also more than 500 process, output, or outcome indicators, 452 of which require data on individual patients or hospital staff. For example, there are 258 quality of case-management indicators that require data on the actual care received by individual patients (tables 1, 2). Other indicators require data on individual hospital staff members (eg, the proportion of staff who received training on neonatal emergency care in

the past 12 months).<sup>7,8</sup> When selecting from such a broad array of indicators, mapping them to the temporal sequence of a patient's journey (ie, initial triage, inpatient admission and stay, and discharge) can be helpful (figure). The admission phase can be further subdivided into initial assessment and diagnosis, investigation, treatment planning, and progress monitoring. However, attention to whole patient journeys, rather than specific practices, can highlight the influence of system capabilities that are hard to measure; for example, the quality of professional handovers (figure).

Individual patient data for core indicators (eg, age and diagnosis-stratified workloads and mortality rates) might be generated from routine health information systems. However, these crucial health service data are often unreliable.<sup>22</sup> Ensuring routine information systems can deliver such crucial data so that they are trustworthy and timely must be a priority. Other indicators require data collected from individual case records (eg, on treatment), from parents (eg, on discharge counselling), or from hospital staff (eg, on their knowledge). Currently many indicators would require additional data collection approaches. If the purpose of measurement is to compare individual facilities either with one another or over time, then data from large numbers of patients or hospital staff are needed. Comparisons based on imprecise estimates can be very misleading. Collecting large amounts of complex data from large numbers of patients, family members, or hospital staff increases the time, skills, and



**Figure:** The quality of care delivered by front-line providers is affected by activities at multiple levels of the health system

Providing quality admission and inpatient care requires effective governance mechanisms at all of these levels. Good outcomes are the product of good care throughout the patient journey, which might not be captured by a measurement based on a specific element of care aggregated across multiple patients.

costs required to conduct surveys. Investments in enhanced routine clinical data systems and analytical capacity, potentially harnessing the power of electronic medical records, can extend the scope and scale of the indicators used.<sup>23</sup> However, such systems require major investment, yet they still have significant limitations and are rarely able to examine an individual's care across the complete inpatient journey, which might be key to achieving better outcomes (figure).<sup>24,25</sup>

To reduce the costs of data collection, aggregated performance measures across multiple facilities are often produced. For those at the higher levels of the health system these measures might be useful to identify quality concerns across a region, but the results might then not apply to all facilities—preventing targeted interventions. Narrowing the gaze of quality assessment to indicators can also easily focus attention on front-line hospital staff's errors or omissions. This view risks a perpetual focus on training as the solution for improvement, and does not address the underlying systemic problems, such as the enabling or disabling role of essential hospital inputs and the need for skilled and effective quality management. The role of skilled quality management in tackling the multiple, complex pathways that produce poor-quality care is paid too little attention in the WHO framework.<sup>6</sup>

### Quality care as a shared concern

The question now is how might quality measurement be best designed and implemented? Standardised measurement, such as cause-specific mortality or morbidity rates, remains important; for example, in highlighting inequities in maternal and neonatal

mortality globally. However, we argue that measurement needs to be integrated with skilled quality management and aligned with local and national systems of governance, rather than being the end in itself.<sup>26</sup> Using quality measurement as a governance strategy requires being explicit about who is accountable to whom, what they are accountable for, and who bears the responsibility for recommended actions and subsequent review. Collaborative, consensus development of governance and measurement systems is needed to avoid institutions, organisations, and individuals rejecting or distancing themselves from accountability processes<sup>27</sup>—an outcome made more likely if the culture is one of blame or shame.<sup>28</sup>

Collective decision making for the improvement of care must therefore bring together multiple stakeholders and build ownership and capacity across the health system.<sup>27</sup> Ministries of Health might lead, but cannot work in isolation. Hospital care is provided by multiple professionals and teams—standardising, measuring, and regulating every process is not possible (even if desirable).<sup>29</sup> As illustrated in figure 1, the complexity of delivering care means that any set of measures can provide only a limited view of all of the local, regional, and national activities and actors that must work together to provide quality care in a district hospital. Improving the quality of district hospital care requires that the normative and cultural attributes of health systems complement enabling resource environments.<sup>30</sup> Professional associations, licensing bodies, and groups representing patients must create and promote quality by actively developing supportive institutional and professional norms and effective regulation.<sup>19,27,30</sup> The primary concern of professional leaders, nationally and locally, must become the quality of services at the district level, not the interests of the professions themselves. Initial goals must balance feasibility and aspiration. Striving for this balance could result in focused sets of indicators to support hospital improvement, as was successful in Ethiopia.<sup>31</sup> This process might show key decision makers and other stakeholders that solving quality problems is often not within the power of front-line hospital staff or team leaders. Such a beginning could help to create the comprehensive and active engagement of stakeholders necessary for large-scale change, which requires creating a shared stakeholder vision of a fundamentally new future state.<sup>32</sup> This important work is consistent with recent recommendations for country-level institutional development and action from WHO's Strategic and Technical Advisory Group of Experts for Maternal, Neonatal, Child and Adolescent Health.

In addition, those stakeholders sharing responsibilities for quality and its governance will need to consider whether it is safe to treat a patient in a specific facility. High-quality care in district hospitals is impossible without a minimum set of inputs spanning physical

infrastructure, human and material resources, and more. Strategies to manage identified risks (risk management) are used in many industries, but rarely in health in LMICs. For example, during the COVID-19 pandemic, authorities diverted admissions from some facilities in high-income settings because, at the time, safe patient care could not be provided. In LMICs, should a facility be offering inpatient neonatal care or care for severe acute malnutrition if basic water, sanitation, and hygiene are inadequate, or if the facility does not have appropriately trained hospital staff? Or if a hospital cannot offer reliable microbiology or clinical supervision, then should government or professional bodies reconsider its use as a site for training laboratory technologists or medical interns to manage the risk of producing hospital workers with low levels of skill or competency?<sup>20</sup> These risk management considerations should inform decisions on district hospital service provision in LMICs and must serve the long-term interests of improving quality, not the interests of individual professional groups or organisations, which might favour inaction over confronting the challenge of improving the quality of district hospital care.

### Ensuring measurement supports local improvement

District hospitals are specifically expected to offer care for acute and severe or more complex neonatal and paediatric illnesses that cannot be delivered in the community or in smaller, more local clinics. The key goal of measuring the quality of this district hospital care, especially through surveys, is often the production of national reports. These reports can support wider governance and improvement efforts, especially if the results are timely, but they might miss early opportunities to support local district hospital improvement efforts. If data collection is conducted or led by experienced practitioners, the practitioners can offer real-time support for careful and reflective team learning that helps identify how improvement might happen locally.<sup>12</sup> A simple walk through a hospital or discussion of a few process indicator findings from a small number of cases can identify needed system improvements.<sup>33</sup> Thus, aligning skilled supervision with quality measurement as part of localised governance procedures could directly support quality improvement and foster system connections and resilience more broadly.<sup>33</sup> However, skilled local personnel working in teams are key to the practice of effective local improvement. Dedicated and protected health-worker time is needed for the development of skilled teams. Adding quality improvement roles to the workloads of already overburdened local hospital staff is inappropriate and unlikely to result in improvements. We need to address the paradox that investments in system-wide quality measurement are often not linked to investments in the teams who can effect local improvements. Addressing this paradox requires that dedicated resources be made

available for the improvement of local care quality so that survey findings can be addressed. These resources should include funding for expert support from district or regional offices, the dedicated time of local quality improvement team members, and access to funding that might be needed to address the concerns that are a priority within each particular district hospital.

### Conclusion

The sophistication of guidance on quality measurement for inpatient paediatric and newborn care has advanced considerably in the past 5 years.<sup>7,8</sup> The time to advance a comprehensive improvement agenda for district hospitals is now. We recommend, as does WHO, that countries be careful in their selection of which quality indicators to measure. We highlight some of the challenges posed by measurement, and suggest improvements in mapping and integrating current and emerging health information tools that should support quality measurement. We warn, however, that paying the most attention to measurement could narrow the gaze to a limited set of metrics rather than to broadscale quality improvement, often resulting in a focus on staff knowledge and skill deficits as the causes of poor-quality care yet ignoring the foundational system inputs required for high-quality, safe care. We argue that quality measurement should be part of a three-tier approach that also includes the development of credible governance strategies and support for local improvement work. Governance strategies should be led by governments, but include national institutions, communities, and other stakeholders with a shared vision and responsibility (and power) to act. This three-tier approach is needed to develop the professional, normative, and cultural environment that can support the quality of district hospital care, and recognises the important roles that district hospitals play in offering multi-professional first or local paediatric and neonatal referral-level services in support of sometimes large numbers of primary care facilities. The approach must be complemented by efforts to ensure that foundational system inputs are sufficient. For the third tier, we highlight that quality measurement should provide an opportunity for skilled supervision and direct support for local hospitals and their improvement activities, adding to (but not syphoning) resources from these facilities. In sum, if we are to make better progress in improving the quality of hospital care, we must combine the best of quality measurement with strategies that reach effectively into all parts of health systems to tackle the deep-seated causes of poor-quality care.

#### Contributors

ME created the initial drafts of the manuscript, all of which were seen and discussed with all authors. The final draft was agreed on and approved for submission by all authors.

#### Declaration of interests

The authors all receive funding for research linked to the improvement of hospital care in low-income and middle-income countries. ME, TD,

JA, and GI have or have had roles as technical advisers to WHO in the fields of newborn and child health. MM declares no competing interests.

#### Acknowledgments

We acknowledge the invaluable contributions of all our research colleagues, the clinicians and health facility staff, and other stakeholders from whom we have learned so much that has helped us to prepare this Viewpoint. ME is supported by a Wellcome Senior Fellowship (207522) with further support for authors from a core grant awarded to the Kenya Medical Research Institute–Wellcome Trust Research Programme (092654). MM is supported by a grant from the National Institute for Health Research (NIHR; 130812). GI receives support from a grant to the NEST360 programme from the John D and Catherine T MacArthur Foundation, the Bill & Melinda Gates Foundation, ELMA Philanthropies, and The Children's Investment Fund Foundation UK under agreements to William Marsh Rice University. The funders had no role in the preparation of this Viewpoint. The views expressed in this Viewpoint are those of the authors and not necessarily those of the Wellcome Trust, NIHR, NEST360, or the UK Government.

#### References

- Rajbhandari R, McMahon DE, Rhatigan JJ, Farmer PE. The neglected hospital—the district hospital's central role in global health care delivery. *N Engl J Med* 2020; **382**: 397–400.
- Watkins D, Jamison D, Mills A, et al. Universal health coverage and essential packages of care. In: Jamison D, Horton S, Jha P, eds. *Disease control priorities*, 3rd edn. Washington: World Bank, 2016: 43–65.
- Nolan T, Angos P, Cunha AJ, et al. Quality of hospital care for seriously ill children in less-developed countries. *Lancet* 2001; **357**: 106–10.
- English M, Esamai F, Wasunna A, et al. Assessment of inpatient paediatric care in first referral level hospitals in 13 districts in Kenya. *Lancet* 2004; **363**: 1948–53.
- Duke T, Keshishiyev E, Kuttumuratova A, et al. Quality of hospital care for children in Kazakhstan, Republic of Moldova, and Russia: systematic observational assessment. *Lancet* 2006; **367**: 919–25.
- Brizuela V, Leslie HH, Sharma J, Langer A, Tunçalp Ö. Measuring quality of care for all women and newborns: how do we know if we are doing it right? A review of facility assessment tools. *Lancet Glob Health* 2019; **7**: e624–32.
- WHO. Standards for improving the quality of care for children and young adolescents in health facilities. April 11, 2018. <https://www.who.int/publications/i/item/9789241565554> (accessed May 12, 2022).
- WHO. Standards for improving quality of care for small and sick newborns in health facilities. 2020. <https://apps.who.int/iris/bitstream/handle/10665/334126/9789240010765-eng.pdf?sequence=1&isAllowed=y> (accessed May 12, 2022).
- Irimu G, Wamae A, Wasunna A, et al. Developing and introducing evidence based clinical practice guidelines for serious illness in Kenya. *Arch Dis Child* 2008; **93**: 799–804.
- Hands C, Hands S, Verriotis M, et al. Emergency triage assessment and treatment plus (ETAT+): adapting training to strengthen quality improvement and task-sharing in emergency paediatric care in Sierra Leone. *J Glob Health* 2021; **11**: 04069.
- Singh K, Speizer I, Handa S, et al. Impact evaluation of a quality improvement intervention on maternal and child health outcomes in Northern Ghana: early assessment of a national scale-up project. *Int J Qual Health Care* 2013; **25**: 477–87.
- Lazzerini M, Shukurova V, Davletbaeva M, et al. Improving the quality of hospital care for children by supportive supervision: a cluster randomized trial, Kyrgyzstan. *Bull World Health Organ* 2017; **95**: 397–407.
- Allanson ER, Pattinson RC. Quality-of-care audits and perinatal mortality in South Africa. *Bull World Health Organ* 2015; **93**: 424–28.
- Maina M, Tosas-Auguet O, McKnight J, et al. Evaluating the foundations that help avert antimicrobial resistance: performance of essential water sanitation and hygiene functions in hospitals and requirements for action in Kenya. *PLoS One* 2019; **14**: e0222922.
- Gathara D, Serem G, Murphy GAV, et al. Missed nursing care in newborn units: a cross-sectional direct observational study. *BMJ Qual Saf* 2020; **29**: 19–30.
- McKnight J, Nzinga J, Jekposgei J, English M. Collective strategies to cope with work related stress among nurses in resource constrained settings: an ethnography of neonatal nursing in Kenya. *Soc Sci Med* 2020; **245**: 112698.
- Barasa EW, Cleary S, English M, Molyneux S. The influence of power and actor relations on priority setting and resource allocation practices at the hospital level in Kenya: a case study. *BMC Health Serv Res* 2016; **16**: 536.
- Canavan ME, Brault MA, Tatak D, et al. Maternal and neonatal services in Ethiopia: measuring and improving quality. *Bull World Health Organ* 2017; **95**: 473–77.
- Suddaby R, Viale T. Professionals and field-level change: institutional work and the professional project. *Curr Sociol* 2011; **59**: 423–42.
- Bahati F, McKnight J, Swaleh F, et al. Reporting of diagnostic and laboratory tests by general hospitals as an indication of access to diagnostic laboratory services in Kenya. *PLoS One* 2022; **17**: e0266667.
- Graham HR, Olojede OE, Bakare AA, et al. Measuring oxygen access: lessons from health facility assessments in Lagos, Nigeria. *BMJ Glob Health* 2021; **6**: e006069.
- Hagel C, Paton C, Mbevi G, English M. Data for tracking SDGs: challenges in capturing neonatal data from hospitals in Kenya. *BMJ Glob Health* 2020; **5**: e002108.
- Tuti T, Bitok M, Malla L, et al. Improving documentation of clinical care within a clinical information network: an essential initial step in efforts to understand and improve care in Kenyan hospitals. *BMJ Glob Health* 2016; **1**: e000028.
- Deeny SR, Steventon A. Making sense of the shadows: priorities for creating a learning healthcare system based on routinely collected data. *BMJ Qual Saf* 2015; **24**: 505–15.
- Vincent CA, Mboga M, Gathara D, Were F, Amalberti R, English M. How to do no harm: empowering local leaders to make care safer in low-resource settings. *Arch Dis Child* 2021; **106**: 333–37.
- WHO. Commission on information and accountability for women's and children's health. 2014. [https://apps.who.int/iris/bitstream/handle/10665/44672/9789241564328\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/44672/9789241564328_eng.pdf?sequence=1&isAllowed=y) (accessed May 12, 2022).
- Braithwaite J. Responsive regulation and developing economies. *World Dev* 2006; **34**: 884–98.
- Mannion R, Braithwaite J. Unintended consequences of performance measurement in healthcare: 20 salutary lessons from the English National Health Service. *Intern Med J* 2012; **42**: 569–74.
- Mintzberg H. Managing the myths of health care. *World Hosp Health Serv* 2012; **48**: 4–7.
- Curry LA, Brault MA, Linnander EL, et al. Influencing organisational culture to improve hospital performance in care of patients with acute myocardial infarction: a mixed-methods intervention study. *BMJ Qual Saf* 2018; **27**: 207–17.
- Linnander E, McNatt Z, Sipsma H, et al. Use of a national collaborative to improve hospital quality in a low-income setting. *Int Health* 2016; **8**: 148–53.
- NHS England. Leading large scale change: a practical guide. 2018. <https://www.england.nhs.uk/wp-content/uploads/2017/09/practical-guide-large-scale-change-april-2018-smll.pdf> (accessed May 12, 2022).
- Tamburlini G, Bacci A, Daniele M, et al. Use of a participatory quality assessment and improvement tool for maternal and neonatal hospital care. Part 2: review of the results of quality cycles and of factors influencing change. *J Glob Health* 2020; **10**: 020433.

Copyright © 2023 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.