



# IMPRESS

## RESEARCH BRIEF #2

MARCH 2023

# Measuring Hospital Management in Malawi

## Background

Poor quality of care is a barrier to universal health coverage, responsible for between 5.7 million and 8.4 million deaths each year in low- and middle-income countries (LMICs)<sup>1</sup>. There is good evidence that clinical interventions such as training and audits can improve health outcomes<sup>2,3</sup>. By contrast, much less research attention has been given to broader, organisation-level factors, such as hospital management, that shape health service delivery<sup>4-6</sup>. Yet, clinical care in low and middle-income countries depends critically on factors at the organisational level, as exemplified by common problems such as drug stock-outs, staff absenteeism, and power outages. Improving management practices – so that hospitals effectively manage staff, drugs and medical supplies, have sound financial management and are data-driven in their decisions – could plausibly improve quality of care.

A first step in moving this research agenda forward is to develop a good measure of the quality of management in hospitals. Management is a challenging construct to define and measure because it is multi-faceted and difficult to observe. A widely cited definition of management in health care is “continuously developing the potential of an organisation to transform human and financial resources and other inputs into improved services and better health”<sup>7</sup>. Evaluating managers themselves is an inherently subjective exercise. Instead, a more promising avenue is to assess whether management practices, processes and systems have been adopted in the organisation. To ground the research, management is often examined through the lens of a specific hospital department. In Malawi, a clinical area that has received considerable attention in recent years is small and sick newborn care.

In this brief we present a tool used to measure hospital management in Malawi, with a specific focus on practices and systems in the neonatal unit.

## KEY MESSAGES

- There is a need to develop objective ways to measure management in hospitals.
- The Kamuzu University of Health Sciences (KUHeS), in collaboration with the London School of Hygiene & Tropical Medicine (LSHTM), developed a novel tool to measure hospital management practices in Malawi across five domains: delivery of clinical care in the neonatal unit, human resource management, target setting and monitoring, financial management, and leadership and governance.
- We provide a methodological assessment of the tool that was used in a national survey of hospital management in Malawi. This includes several commonly used tests to assess acceptability, validity and reliability (in the absence of a gold standard measure of management).
- The tool received positive feedback from hospitals, with respondents welcoming the opportunity to discuss these types of management issues in detail.
- Results from analytical testing were generally positive and demonstrated that the tool was acceptable, reliable and valid.
- Two questions on the survey relating to ‘layout of the neonatal unit’ and ‘handover’ were less correlated with the overall management score, in comparison to other questions. Results from analytical questions relating to financial management were not as reliable as those from other domains of management.
- We demonstrate that this is a valid and reliable tool for measuring management practices in Malawian hospitals.

## Purpose

We describe existing approaches to measuring hospital management (Box 1), how our tool was developed and then evaluate its performance. The research brief aims to address four questions.

1. Does the tool measure the right items?
2. Does the tool provide a valid approach to measuring management?
3. Does it measure management reliably?
4. Is the tool acceptable to the study participants?

To answer these questions, we report results from a range of statistical tests (Box 2). We also draw on a detailed description of the approach used to design and implement the tool, since this speaks directly to the validity and reliability of the tool.

## BOX 1: EXISTING APPROACHES TO MEASURING HOSPITAL MANAGEMENT

We conducted a scoping review of existing studies that have used tools to measure management practices, processes and systems in health care providers.

The World Management Survey (WMS) is the dominant approach to measuring management practices in hospitals<sup>8-10</sup>. It was originally developed to measure management in manufacturing firms in high-income countries. Over time, it has been adapted to other sectors and increasingly implemented in LMICs. The method involves: 1) identifying management practices within the following domains of management: operations, monitoring, targets, and incentives; 2) defining what 'good' and 'bad' practice is for each management practice using a discrete scale with a description for

all or some of the scores; and 3) using open-ended questioning by trained interviewers who evaluate and score participants' responses.

Other tools have adapted the WMS method, some more heavily than others<sup>11-15</sup>. For example, Yoo et al (2019) retain the original WMS domains and practices but expand the scoring grid to create potential for more variation between scores<sup>14</sup>. Macarayan et al (2019)<sup>12</sup> on the other hand, expanded on the domains from the WMS survey and created a survey with closed-ended questions and document review, more suitable to primary health care facilities in a LMIC context. We also found studies that measure management using non-WMS methods<sup>16-18</sup>.

## Measuring hospital management in Malawi

Using previous tools from the literature as our starting point, we developed a new tool for measuring hospital management in Malawi based on 28 management practices organised within five management domains (Figure 1). We asked open-ended questions on each management practice and trained research assistants to evaluate responses using a scoring grid on a scale of 1 to 5. The survey was administered to five categories of manager who answered questions on domains of management that were most relevant for their role (Table 1).

To generate an overall score of management for a hospital, we first calculated, for each management practice, the mean across the respondents within

each hospital and then took the mean across the 28 management practices.

- 5** Structured management practices and systems in place which are being fully and correctly implemented
- 4**
- 3** Some management practices or systems in place, but they are not being fully or correctly implemented
- 2**
- 1** Few structured management practices or systems in place

Table 1: Categories of manager responding to each domain of management

	Category of manager	Unit matron	Sister-in-charge of neonatal unit	Administrator	Chief nurse manager	Chief medical manager
Domains of management	1. Delivery of clinical care in neonatal unit	✓	✓	x	x	x
	2. Human resources	✓	✓	✓	✓	✓
	3. Targets and monitoring	✓	✓	✓	✓	✓
	4. Financial management	x	x	✓	✓	✓
	5. Leadership and governance	✓	✓	✓	✓	✓

Figure 1: Management survey tool domains and practices

DELIVERY OF CARE IN THE NEONATAL UNIT	HUMAN RESOURCE MANAGEMENT FOR HEALTHWORKERS	HOSPITAL AND NEONATAL UNIT LEVEL TARGET SETTING AND MONITORING OF PERFORMANCE	FINANCIAL MANAGEMENT	LEADERSHIP AND GOVERNANCE
<ul style="list-style-type: none"> <li>• Layout of neonatal unit</li> <li>• Triage for newborns</li> <li>• Protocols for small and sick newborn care</li> <li>• Protocols for Infection Prevention and Control</li> <li>• Handover between shifts</li> <li>• Referral system</li> <li>• Audit of neonatal deaths</li> <li>• Supervision</li> <li>• Equipment management</li> </ul>	<ul style="list-style-type: none"> <li>• Appraisal system</li> <li>• Promoting high performing health workers</li> <li>• Rewarding high performers</li> <li>• Dealing with poorly performing health workers</li> <li>• Recruiting skilled health workers</li> <li>• Hiring temporary and locum health workers</li> <li>• Health worker allocation</li> <li>• Programme for capacity strengthening</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring errors/safety</li> <li>• Performance review</li> <li>• User satisfaction</li> <li>• Setting an appropriate range of targets</li> <li>• Clarity and communication of targets</li> </ul>	<ul style="list-style-type: none"> <li>• Budget setting</li> <li>• Reviewing expenditure against the budget</li> </ul>	<ul style="list-style-type: none"> <li>• Senior leadership governance</li> <li>• Quality of care governance</li> <li>• Procurement process for medicines and supplies for the neonatal unit</li> <li>• Governance for infection prevention control</li> </ul>

## Rigorous development of the measurement tool

Designing the survey required an iterative process with repeated rounds of testing and refinement. This section describes the steps taken in the design of the tool and survey approach – as informed by best practice<sup>19</sup> – in order to strengthen its validity and reliability.

### Addressing validity at the design stage

Results from the scoping review were used to create an exhaustive list of management domains and practices and outline the key methodological decisions to provide the basis with which to develop draft zero of the tool. A five-day workshop between the KUHeS and LSHTM team members, comprising a range of academic and professional backgrounds including implementation science, social science, health economics, clinical, nursing, statistics and data management, was held. Participants considered which were the most relevant management domains and practices for the Malawian context and what would be considered the best and worst practice for each management practice.

These discussions were informed by:

1. Government of Malawi policies and guidelines ranging from procedures and systems covering the whole of government to specific clinical protocols for the care of infants and newborns;
2. Findings from in-depth interviews with managers from four hospitals;
3. Knowledge and expertise of the Malawian hospital context from the KUHeS team members;
4. A half-day pilot of the tool with a Matron and District Medical Officer from a district hospital helped to improve the tools’ content and language to ensure that it was understood by target respondents.

The tool included three post-interview questions to be completed by the research assistants to record their perceptions of the respondents’ knowledge of management practices, willingness to reveal information and patience in answering all the questions. These were scored on a scale of 1 (lowest) to 5 (highest) and give some indication of the perceived acceptability of the survey to the respondents.



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### Steps taken to improve reliability

Firstly, we used open-ended questions to inform the evaluation of each management practice. For example, on the practice about senior leadership governance, we began with the question: “Tell me how the hospital management team functions?” We continued with open questions focusing on actual practices and examples until the interviewer could make a judgement about the hospital’s actual management practices. Open-questions made the interview feel like a conversation and helped to avoid leading respondents in a certain direction. Respondents were not told in advance that they were being scored or shown the scoring grid, to minimise response bias. To score the responses, interviewers were guided by detailed descriptions of the management practices that would be present in a hospital with scores 1, 3 and 5.

Recognising that respondents in certain roles may be better informed than others for some management practices, we chose to interview five different types of manager per hospital to reduce measurement error and limit the influence of any single respondent.

Research assistants were trained to ensure that they each had a consistent understanding of the meaning of the questions and the terms used. Group scoring exercises during training aimed to calibrate scoring between interviewers, and after administering each survey, research assistants discussed and reached consensus on the final scores for each question. Study investigators were present in many of the interviews to supervise and informally assess inter-rater reliability by scoring the responses themselves.

## BOX 2: HOW TO EVALUATE TOOL PERFORMANCE

Guided by a framework from Smith et al (2005)<sup>20</sup>, we employed a series of commonly used tests to evaluate the acceptability, validity and reliability of the tool for providing scientifically credible information. Tests were performed at the item (question) level and on the overall management score.

Firstly, we performed item analysis and assessed the acceptability of the tool. Item analysis aims to identify items for possible elimination owing to weak performance using: principal component factor analysis to determine whether all items are measuring a single latent factor, inter-item correlation to assess for item redundancy, maximum endorsement frequencies to assess the proportion of respondents endorsing each response category, and floor and ceiling effects to assess the extent to which respondents are endorsing the bottom and top response categories. Acceptability refers to the quality of the data, assessed by the

completeness of data, floor and ceiling effects for the summary score, and qualitatively, through discussions with respondents.

Secondly, we assessed the tool’s reliability. Reliability is the degree to which the tool is free from measurement error, based on internal consistency and test-retest reliability. Here, we assessed for internal consistency using Cronbach’s alpha to describe the extent to which items comprising a scale measure the same construct. We assessed test-retest reliability by measuring the within-hospital variation between management scores using the intra-class correlation coefficient. This is not strictly test-retest because we compare the scores between different managers within the same hospital. However, since we are trying to quantify each individual hospital’s management score, it remains useful to understand the extent to which managers have different views about management practices.

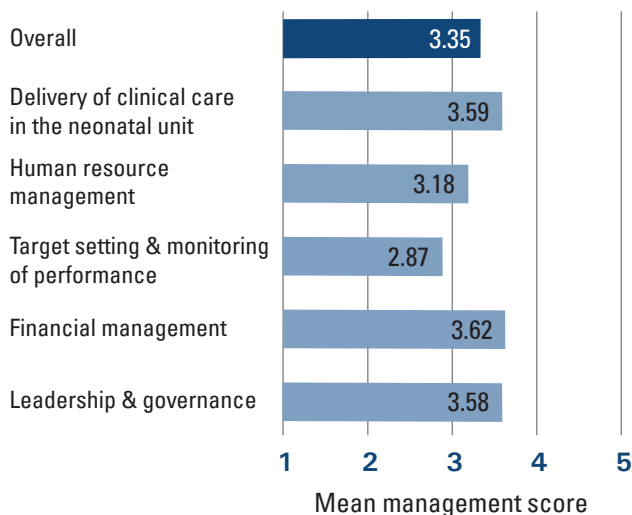
# Assessing acceptability, reliability and validity

## Descriptive results

Thirty-six hospitals participated in the management survey including district public (66.7%), central public (11.1%), and Christian Health Association of Malawi (CHAM) (22.2%) hospitals. A total of 180 managers were interviewed (5 managers per hospital). The mean age of managers was 37 years and 60% were female. Over a third (36.1%) of managers had a qualification in management, with the most frequent qualifications being a certificate in management (18.3%) or a BSc in Health Management (6.1%).

The average management score across all hospitals was 3.35 (on the scale of 1 to 5). There was most room for improvement in the target setting and monitoring domain of management (Figure 2).

Figure 2: Management score overall and by domain of management



## Acceptability

There were no missing data for the summary score and floor and ceiling effects were not present, with no hospital scoring the minimum score of 1 or the maximum score of 5 (Table 3, page 6).

Feedback from respondents during the hospital dissemination meetings suggests no major concerns about the acceptability of the survey. They expressed gratitude for being able to give their views on how the hospital is being managed, helped by the fact that the survey involved open questions that allowed for in-depth discussion of their experiences. Mean scores from post-interview observations (Table 2) show that interviewers perceived the respondents to be willing to answer the survey, patient when giving their responses and knowledgeable about the management practices they were asked about.

Table 2: Results from post-interview observations

Interviewers' perception of interviewee	Observations	Mean score*
Knowledge of management practices	180	3.94
Willingness to reveal information	180	4.71
Patience	180	4.72

\*1=lowest; 5=highest

## Item analysis

No item (question) failed the maximum endorsement frequency test, including floor and ceiling effects. All items loaded positively onto the first unrotated principal component factor demonstrating that the 28 items are measuring one latent factor. Of the 28 items, two failed to load more than 0.3: layout (0.23) and handover (0.26) which suggests that these items are least correlated with the overall measure of management compared to the other 26 items. None of the 28 items were redundant in the inter-item correlation test, with all items below the 0.75 threshold (Table 3).

## Reliability

The overall management score showed good internal consistency, which is a measure of how closely related the management practices are as a group. The Cronbach's alpha for the overall score was 0.92 which is above the 0.7 threshold. Intraclass correlation was highest between the unit matron and sister-in-charge of neonatal unit for the delivery of clinical care in the neonatal unit domain (ICC=0.40). All five respondents agreed to some degree on their scores within the HR (ICC=0.39), targets (ICC=0.30) and leadership (ICC=0.32) domains. Agreement between the administrator, chief nurse and chief medical manager was low for the financial management domain (ICC=0.13) suggesting that these management practices were not reliably measured (Table 3). Although respondents were only asked questions within domains for which we felt they would have reasonable knowledge, it is plausible that they will have varying levels of knowledge and perspectives about certain management practices. By asking the same questions to multiple managers, we aimed to limit measurement error for the overall management score.

## Validity

Feedback during dissemination meetings was positive, with few concerns about the content of the survey. Respondents were able to scrutinise their scores relative to other hospitals and the findings were accepted, providing evidence for the survey's face validity.

Table 3: Analytical tests

Property	Analysis	Acceptance criteria	Result	Criterion met (Y/N)	Interpretation
Acceptability	1. Data quality	Floor and ceiling effect of mean summary score <10%	% floor: 0% hospitals scored 1	Y	No hospitals obtained the minimum or maximum mean summary score
			% ceiling: 0% hospitals scored 5	Y	
		Missing data <5%	% missing: 0%	Y	Every hospital had a fully completed survey with no missing data.
Item analysis	2. Item analysis	Maximum endorsement frequency (MEF) should be ≤ 80% (includes floor and ceiling effect ≤ 80%)	No item failed	Y	None of the items had >80% respondents endorsing the same response category.
		Unrotated principal component factor analysis <ul style="list-style-type: none"> <li>All items load positively onto the first factor</li> <li>All items load on first unrotated factor &gt; 0.3</li> </ul>	All items load positively onto the first factor	Y	The 28 items measure a single factor. 2/28 items are less correlated with the first factor.
			2/28 failed: item 1 (layout) = 0.23 and item 5 (handover) = 0.26.	N	
	Inter-item correlation ≤ 0.75	All inter-item correlations ≤ 0.30	Y	Low inter-item correlation suggests that none of the items are redundant.	
Reliability	3. Internal consistency	Cronbach's alpha for summary score ≥ 0.70	Cronbach's alpha = 0.92	Y	Management practices are closely related as a group.
	4. Test- retest	Intraclass correlation (ICC)	<ul style="list-style-type: none"> <li>Domain 1*: ICC=0.40 (95% CI 0.13, 0.68)</li> <li>Domain 2: ICC=0.39 (95% CI 0.23, 0.55)</li> <li>Domain 3: ICC=0.30 (95% CI 0.15, 0.48)</li> <li>Domain 4: ICC=0.13 (95% CI 0.00, 0.34)</li> <li>Domain 5: ICC =0.32 (95% CI 0.16, 0.48)</li> </ul>	n/a	Evidence of low test-retest reliability between respondents for domain 4.

\*Domain 1= Delivery of clinical care in the neonatal unit; Domain 2= Human resource management for health workers; Domain 3= Hospital and neonatal unit level target setting and monitoring of performance; Domain 4= Financial management; Domain 5= Leadership and governance

## Comparing different measurement approaches

Our primary measure of management was based on interviews with hospital managers using open-ended questions and a scoring grid approach. However, we were also interested in exploring two less resource-intensive approaches to measuring management. The first used closed-ended questions that are answered with a yes or no response and are scored on a 0 to 1 scale, with the best response receiving 1 and the worst response 0. To generate the summary measure for a hospital, we take the mean across the 28 management practices. This is considered a subset of the primary method, to explore whether the same 28 practices can be measured using a light-touch data collection tool and generate similar results. When comparing the mean scores for the primary measure and the closed-ended scores there is a high level of correlation (correlation coefficient = 0.92) (Figure 3), suggesting that the less resource intensive method is a good alternative.

A rather different, complementary measure of management was based on a record review of documents in the hospital that used objectively verifiable items to test whether management systems were being used in the hospital and neonatal unit. Items included meeting minutes from quality improvement meetings, clinical care protocols and staff appraisal records. The presence of each item was mostly recorded as a binary response option. To generate the summary measure for a hospital, we took the mean across the 25 items, which is interpreted as the proportion of the maximum score obtainable. The advantage of this measure is that the presence of items in a hospital was easy to assess, even if the measure lacked in-depth exploration of management within the hospital. The correlation between the record review and primary management score was reasonable, with a correlation of 0.58 (Figure 4). This is higher than the correlation of 0.40 from a similar comparison of tools in a study of manufacturing firms in India<sup>21</sup>.

Figure 3: Scatter plot to show correlation between mean primary management score and mean closed-ended management score

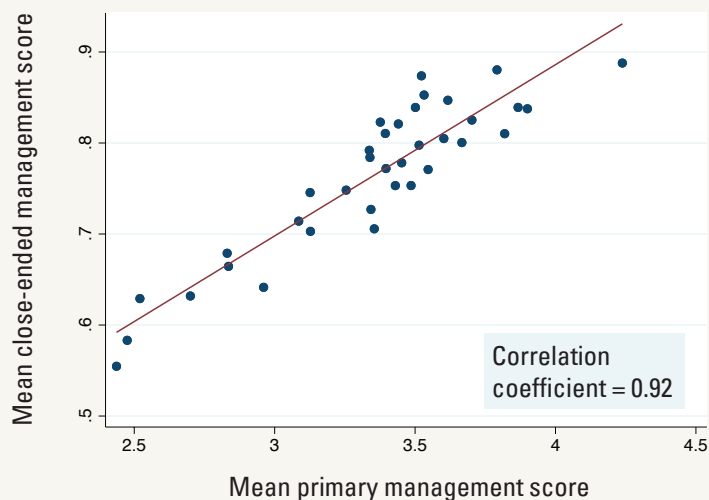
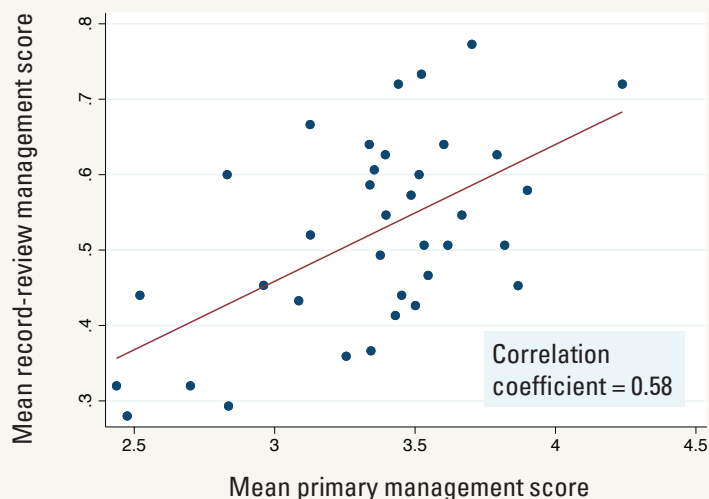


Figure 4: Scatter plot to show correlation between mean primary management score and mean record review management score



## Conclusion

This brief describes how we developed and tested a novel tool to measure management practices in Malawian hospitals. Our tool was informed by previous management survey tools, in particular the World Management Survey. While we retained core elements of the WMS approach, the tool itself was extensively adapted to the context in Malawian hospitals. There is no gold standard measure of management, instead we used several commonly used tests to assess the validity and reliability of our tool. The tool performed promisingly on most of the tests that were performed and during feedback sessions with the respondents

The survey was conducted in April 2022 and the results are guiding the development of a management intervention to support quality improvement in Malawian hospitals. It will be used for future survey rounds in Malawi, and can be tailored to and administered in similar settings.

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## About this brief

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More information on NEST360: <https://nest360.org> & [www.newborntoolkit.org](http://www.newborntoolkit.org)

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