A national system for monitoring the performance of hospitals in Ethiopia

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Abstract Many countries struggle to develop and implement strategies to monitor hospitals nationally. The challenge is particularly acute in low-income countries where resources for measurement and reporting are scarce. We examined the experience of developing and implementing a national system for monitoring the performance of 130 government hospitals in Ethiopia. Using participatory observation, we found that the monitoring system resulted in more consistent hospital reporting of performance data to regional health bureaus and the federal government, increased transparency about hospital performance and the development of multiple quality-improvement projects. The development and implementation of the system, which required technical and political investment and support, would not have been possible without strong hospital-level management capacity. Thorough assessment of the health sector’s readiness to change and desire to prioritize hospital quality can be helpful in the early stages of design and implementation. This assessment may include interviews with key informants, collection of data about health facilities and human resources and discussion with academic partners. Aligning partners and donors with the government’s vision for quality improvement can enhance acceptability and political support. Such alignment can enable resources to be focused strategically towards one national effort – rather than be diluted across dozens of potentially competing projects. Initial stages benefit from having modest goals and the flexibility for continuous modification and improvement, through active engagement with all stakeholders.

Introduction

Improvement in the quality of hospital care is a fundamental aspect of health system strengthening that is directly linked to the service delivery dimension of the World Health Organization (WHO) building blocks of a health system. While the monitoring of hospital performance is a key ingredient to such improvement, many countries struggle to develop and implement feasible strategies to monitor hospitals nationally. The challenge is particularly acute in low-income countries where resources for measurement and reporting are scarce.

In the field of global health, research on performance monitoring often focuses broadly on health systems rather than on hospitals. The literature on the development and implementation of systems for monitoring hospital performance is largely dominated by case studies and reports from high-income countries with national health systems – e.g. Canada and Denmark, the United Kingdom of Great Britain and Northern Ireland and other countries in western Europe. Although there has also been some relevant research in the United States of America, it has tended to focus on a narrow set of quality measures in specific populations. The WHO performance assessment tool for quality improvement in hospitals is a donor-led, externally designed measurement project rather than a country-led, internally developed initiative. This tool has been applied in only one middle-income country (South Africa). Most attempts to monitor hospital performance in low-income settings have involved small numbers of facilities and narrowly defined clinical measures of performance. When creating their accreditation systems for hospitals, both Liberia and Zambia monitored hospital performance for just a year, to collect baseline data.

We could find no peer-reviewed studies done in low-income countries that described the development and sustained implementation of a national system for monitoring hospital performance, based upon a comprehensive set of key performance indicators. We therefore sought to describe the creation and implementation of such a national system in a low-income country. We considered Ethiopia to be a good setting in which to conduct our case study because of recent hospital reform in the country. The reform led to the creation of: (i) the role of hospital chief executive officer – qualified through a master’s degree programme in hospital and health-care administration; (ii) private wings in hospitals that allowed revenue generation and (iii) hospital governing boards.

The many new government hospitals that were built during the ongoing reform process led to improved hospital access in both rural and urban settings. We describe the development of key performance indicators, the process of monitoring hospital performance relative to these indicators and the trend in performance since 2010, which marked the implementation of Ethiopia’s national system of hospital monitoring. Findings from this case study may be helpful to other low-income countries seeking to elevate the quality of facility-based health care through performance monitoring and accountability.

Key performance indicators

Development

We developed performance indicators that were relevant for hospitals and consistent throughout the country. The first indicator developed was the most fundamental – adherence
to national guidelines on hospital management. In 2009, Ethiopia partnered with the Clinton Health Access Initiative and the Yale Global Health Leadership Institute to develop national guidelines for the management of hospitals: the Ethiopian Hospital Reform Implementation Guidelines.26,27 These guidelines included 124 hospital management standards, each of which was a statement – e.g. “the hospital conducts a physical inventory of all pharmaceuticals in the store and each dispensing unit at a minimum of once per year.” Hospitals were asked to report quarterly whether each standard was met.

The success of the rollout of Ethiopia’s first attempt to monitor hospital performance, in 2010, was probably the result of simplicity and focus on hospital management. The guidelines leveraged the Ethiopian Federal Ministry of Health’s investment in the training of hospital chief executive officers via the master’s of hospital and health-care administration degree programme.28,29 The guidelines, the associated scoring sheet, the promotion of adherence to the guidelines and the building of management capacity were made integral parts of the two-year programme. The students in the programme were selected by regional health bureaus.32 At the time of writing, more than 90% of those who successfully completed the degree programme remain employed in the Ethiopian health-care sector (D Tatek, unpublished observations, 2014).

Given the reality that, in 2009–2010, government hospitals were understaffed, financially limited and often did not have 24-hour access to basic resources such as water and electricity, the ministry of health agreed that, before launching reporting on other aspects of hospital performance, in 2010, was probably the result of simplicity and focus on hospital management. The guidelines leveraged the Ethiopian Federal Ministry of Health’s investment in the training of hospital chief executive officers via the master’s of hospital and health-care administration degree programme.28,29 The guidelines, the associated scoring sheet, the promotion of adherence to the guidelines and the building of management capacity were made integral parts of the two-year programme. The students in the programme were selected by regional health bureaus.32 At the time of writing, more than 90% of those who successfully completed the degree programme remain employed in the Ethiopian health-care sector (D Tatek, unpublished observations, 2014).

The ministry of health worked on-site training. Data on the indicators were initially collected on paper forms and then compiled and submitted as reporting applications. Each hospital had several individuals – so-called data owners – who were each dedicated to collecting data on the performance indicators that were relevant to their department. For example, a midwife could be the data owner for neonatal mortality. In addition, each hospital had an indicator collaborator who worked closely with each data owner and was responsible for the collation of data on all the indicators. Instead of hiring new personnel to undertake these tasks, most hospitals modified the job descriptions of current employees and provided additional short-term, on-site training. Data on the indicators were initially collected on paper forms and then compiled and submitted as spreadsheet computer files. Health and development partners provided technical support for designing data entry and reporting applications.

At bureau and ministry level, the curative and rehabilitation teams and the medical services directorate were dedicated to the performance indicators and hospital operations. These teams were responsible for training hospital
### Table 1. Hospital key performance indicators, Ethiopia, 2010

| Category, indicator code | Category | Indicator |
|--------------------------|----------|-----------|
| KPI 1                    | Hospital management | Proportion of EHRIG operational standards met |
| KPI 2                    | Outpatient services | Outpatient attendees |
| KPI 3                    | Outpatient attendees seen by private-wing service |
| KPI 4                    | Outpatient waiting time to treatment |
| KPI 5                    | Outpatients not seen on same day |
| KPI 6                    | Emergency services | ED attendees |
| KPI 7                    | ED patients triaged within 5 minutes of arrival at ED |
| KPI 8                    | ED attendances with stay longer than 24 hours |
| KPI 9                    | ED mortality |
| KPI 10                   | Inpatient services | Inpatient admissions |
| KPI 11                   | Inpatient admissions to private wing |
| KPI 12                   | Inpatient mortality |
| KPI 13                   | Delay for elective surgical admission |
| KPI 14                   | Bed occupancy |
| KPI 15                   | Mean length of stay |
| KPI 16                   | Incidence of pressure ulcer |
| KPI 17                   | Percentage of surgical sites infected |
| KPI 18                   | Completeness of inpatient medical records |
| KPI 19                   | Maternity services | Deliveries – i.e. live births and stillbirths – attended |
| KPI 20                   | Births by surgical, instrumental or assisted vaginal delivery |
| KPI 21                   | Institutional maternal mortality |
| KPI 22                   | Institutional neonatal deaths within 24 hours of birth |
| KPI 23                   | Referral services | Referrals made |
| KPI 24                   | Rate of referrals |
| KPI 25                   | Emergency referrals, as a proportion of all referrals made |
| KPI 26                   | Pharmacy services | Mean stock-out duration of hospital-specific tracer drugs |
| KPI 27                   | Productivity | Patient-day equivalents per physician |
| KPI 28                   | Patient-day equivalents per nurse or midwife |
| KPI 29                   | Major surgeries per surgeon |
| KPI 30                   | Major surgeries conducted in private wing |
| KPI 31                   | Human resources | Attrition rate among physicians |
| KPI 32                   | Staff experience, as a staff satisfaction rating |
| KPI 33                   | Finance | Cost per patient-day equivalent |
| KPI 34                   | Raised revenue, as a proportion of total operating revenue |
| KPI 35                   | Revenue utilization – i.e. the proportion of budget used |
| KPI 36                   | Patient experience | Patient experience, as a patient satisfaction rating |

ED: emergency department; EHRIG: Ethiopian hospital reform implementation guidelines; KPI: key performance indicator.

The main challenges that arose during implementation were errors in data collection and calculation at hospital level and the fear of reprisal for poor performance. For instance, some hospital employees were unsure which denominators or patient populations they should be using. Some hospitals repeatedly failed to report data on particular indicators and some were afraid to report data that highlighted poor performance – especially poor clinical indicators. In the first year of the system, rates of surgical site infection and neonatal mortality were often found to be underreported. Hospitals that appeared to be struggling in reporting reasonably accurate data on the key performance indicators were offered additional on-site training and one-on-one coaching. In their hospital-wide meetings, hospital chief executive officers were encouraged to cultivate an accountable but non-punitive environment. Regional health bureaus reinforced the importance of the data-collection efforts and, by improving the timeliness of their feedback on the summary data to hospitals, helped prompt more immediate exploration and correction of data errors.

The costs of the monitoring system were originally covered by a grant from the United States CDC. Implementing partners were unable to quantify such costs accurately or to separate them from those of other programmatic activities. In addition to the efforts of the nongovernmental organization and university partners, the ministry of health and regional health bureaus made both financial and in-kind contributions to the establishment and maintenance of the monitoring system. Future efforts would benefit from a more explicit analysis of costs.
The national monitoring system was fully implemented, rates of hospital reporting of performance indicators increased. This trend indicated changes in hospital functioning and encouraged improvements in performance. In September 2011, 40% of the 114 government hospitals then in Ethiopia were regularly reporting their performance in terms of all 36 key indicators; by September 2013 this had risen to 78%, and by September 2014, 84%. Our five-year experience of the development and implementation of the national system for monitoring hospital performance – with support from key champions, including the Minister of Health – led to several key observations.

First, technical investment was critical throughout the process. Many hours of research, writing and development of guidelines were needed to develop a core set of performance indicators that were evidence-based, comprehensive but not overwhelming, and precisely described to allow their consistent calculation and reporting. Ethiopia’s ministry of health led the initiative between 2009 and 2014 and now has full operational responsibility. The ministry has a department exclusively charged with overseeing the country’s management of hospital performance – with support from key champions, including the Minister of Health.

Second, while technical support was critical in the development of the indicators and related documentation, political support was paramount to successful implementation. The ministry of health set a consistent direction and held partners accountable to deliver on its vision for quality improvement. The regional health bureaus also demonstrated strong leadership in advocating for additional performance indicators that fit their regional needs and ensured government and hospital ownership of the monitoring system. Although disagreement emerged, senior government officials continued discussions until a negotiated consensus brought a stable solution that all parties could then support. The process of identifying the best key indicators conferred momentum and helped sustain the monitoring efforts. Although such characteristics may be key to making lasting changes, they can be challenging to embed in any large-scale national efforts.

Lastly, both the technical and political inputs were accomplished because of the ability to leverage strong management capacity – which was built at hospital level and supported by the executive master’s degree programme. The importance of management capacity – with support from key champions, including the Minister of Health – was pivotal in the successful implementation of the system for monitoring performance. Without the management capacity provided by this model, the ideas and strategies written in technical and political arenas would not have been translated into practice at the hospital level. Once adequate man-

### Table 2. National summary data on nine key performance indicators for 121 government hospitals, Ethiopia, 2013

| Indicator                     | Code | Quarter of year | First | Second | Third | Fourth | All   |
|-------------------------------|------|-----------------|-------|--------|-------|--------|-------|
| **Hospital management**       |      |                 |       |        |       |        |       |
| Proportion of EHRIG           | KPI 1|                 | 70.6  | 74.7   | 75.3  | 77.5   | 74.5  |
| operational standards met, %  |      |                 |       |        |       |        |       |
| **Outpatient services**       |      |                 |       |        |       |        |       |
| Outpatient attendees, No.     | KPI 2|                 | 586.33| 618.442| 648.910| 648.125| 625.453|
| Outpatient attendees seen by | KPI 3|                 | 7.0   | 6.6    | 5.9   | 6.0    | 6.4   |
| private-wing services, %      |      |                 |       |        |       |        |       |
| Outpatient waiting time to    | KPI 4|                 | 37.1  | 40.3   | 44.9  | 41.4   | 41.0  |
| treatment, minutes            |      |                 |       |        |       |        |       |
| Outpatients not seen on same | KPI 5|                 | 0.5   | 0.5    | 0.2   | 0.2    | 0.3   |
| day, %                        |      |                 |       |        |       |        |       |
| **Emergency services**        |      |                 |       |        |       |        |       |
| ED attendees, No.             | KPI 6|                 | 198.078| 203.496| 212.982| 213.570| 828.126|
| ED patients triaged within 5  | KPI 7|                 | 93.6  | 76.3   | 94.9  | NR     | 93.0  |
| minutes of arrival at ED, %   |      |                 |       |        |       |        |       |
| ED attendees with stay longer | KPI 8|                 | 2.4   | 2.1    | 2.3   | 2.0    | 2.2   |
| than 24 hours, %              |      |                 |       |        |       |        |       |
| ED mortality, %               | KPI 9|                 | 0.3   | 0.2    | 0.2   | 0.2    | 0.2   |

ED: emergency department; EHRIG: Ethiopian hospital reform implementation guidelines; KPI: key performance indicator; NR, not reported.

### Impact of monitoring

As the national monitoring system was implemented, rates of hospital reporting of performance indicators increased. This trend indicated changes in hospital functioning and encouraged improvements in performance. In September 2011, 40% of the 114 government hospitals then in Ethiopia were regularly reporting their performance in terms of all 36 key indicators; by September 2013 this had risen to 78%, and by September 2014, 84%. The collection and analysis of performance data reportedly motivated hospital-based performance-improvement projects – e.g. the introduction of hourly nurse rounding, distinct staff uniforms, continuous pharmaceutical stock reporting and outpatient appointment systems. Between 2012 and 2013, mean adherence to the operational standards increased from 68.2% to 74.5% while the mean number of deliveries attended each month increased from 12,187 to 16,001.

The national monitoring system also improved evidence-based decision-making at both hospital and government level. Comparative performance results were presented at quarterly meetings with hospitals and regional health bureau staff and this allowed for the open review of performance results, feedback and problem solving. Managers at all levels of the health sector aimed to sustain the enthusiasm for performance monitoring. This required continuous investment in the use of data for tangible improvements, media attention and team and organizational rewards and may, in the long term, include institutional accreditation by national bodies. One example was Ethiopia’s recent integration of the 36 performance indicators into a national quality campaign: the Ethiopian Hospital Alliance for Quality. In 2012, the alliance financially rewarded the 15 hospitals that, according to the relevant performance indicators, offered the most positive patient experiences – with about 55,000 United States dollars each. In 2014, the ministry of health began the alliance’s second cycle and prioritized institutional maternal mortality.

### General observations

Our five-year experience of the development and implementation of a national system for monitoring hospital performance led to several key observations.
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Management capacity has been built, performance management and reporting become achievable – and even desirable for facility-level staff who wish to assess their own progress. The combination of leverage from existing hospital management capacity, technical inputs and political support provided the conditions and tools needed to enable success in this country-led effort to elevate the performance of hospitals in Ethiopia.

Conclusion

Ethiopia's implementation of a national system for monitoring hospital performance serves as an example of a low-income country that aims to improve health service delivery via the creation of a culture of accountability. A limitation of our study is that we lacked outcome data and thus were unable to evaluate the impact of the monitoring system on population health. Such an evaluation would require a long and comprehensive follow-up of patients. Despite this limitation, our observations may be helpful to other low-income countries that are seeking to improve the quality of their hospital care. We offer several recommendations. First, a thorough assessment of the health sector's readiness to change and desire to prioritize hospital quality can enhance acceptability and political support. This alignment can enable resources to be focused strategically towards one national effort rather than be distributed across dozens of potentially competing projects. Finally, early phases of implementation benefit from having modest early goals and the facility for continuous modification and improvement to the performance monitoring system, through active engagement with all stakeholders.

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ملخص

نظام قومي لمراقبة أداء المستشفيات في إثيوبيا

تتناول دول كبيرة من أجل تطوير وتطبيق استراتيجيات لمراقبة المستشفيات على المستوى المحلي، وتبني هذا التحدي بالصعوبة وخاصة في الدول ذات الدخل المنخفض حيث تبدو الأوضاع الأازمة للفلاسفة والسجل. وسنجد على انفتاح إمكانية تحقيق تطور وتحقيق نظام قومي لمراقبة أداء عدد من المستشفيات في إثيوبيا يبلغ 130 مستشفى تابعة للقطاع الحكومي. وتوصلنا استخدام الملاحظة القائمة على المشاركة إلى أن نظام المراقبة أدى إلى تسجيل المزيد من الاستفادة في بيانات الأداء للاكاديميين والحكومات على أن يكون نظام المراقبة تمثل القائمة على المشاركة الذي على أن يكون نظام المراقبة الذي يساهم في تحسين مستوي الجودة. وفي هذه النصائح، أن يكون على أعلى إعداده تحقيق هدف قومي واحد - بدلاً من تشتيت الجهود بين العوامل التي من الممكن أن نستلم بالنفاذ في نهاية المطاف. وقد تحقق الاستفادة في محل الأمور نتيجة العمل المستمر، وذلك من خلال مشاركة الفاعلية جميع الجهات المعنية.

摘要

埃塞俄比亚全国医院绩效监测体系

许多国家正在尽力制定和完善监测监测全国医院的战国家。这一挑战在于制定和评估报告稀缺的低收入国家尤为严重。我们研究了埃塞俄比亚建立和实施监测130个政府医院绩效监测体系的国家体系的经验。通过参与观察，我们发现，监测体系不仅能有效监测医院向地区卫生局和联邦政府报告的绩效数据的一致性和医院绩效的透明度，而且能够促进多个质量改进项目的开发。监测体系需要技术和政治上的投资与支持，该体系的建立和完善离不开强大的医院管理能力。因此，全面评估卫生部门和重点改进医院质量的期望在设计和实施的早期阶段有所帮助。这项评估可能包括采访关键的知情人、收集与卫生设施和人力资源相关的数据，以及与合作伙伴展开讨论。协调合作伙伴、捐赠者和政府对于质量改进的愿景能够提高该体系的公众接受度和政治支持。此类协调能够将资源战略性集中于一个国家项目，而非分摊到数十个潜在的竞争项目中。通过所有利益相关方的积极参与，设立切实可行的目标，以灵活的方式不断改良和完善，在初期阶段获益匪浅。
Un sistema nacional para monitorizar el rendimiento de los hospitales en Etiopía

Muchos países tienen dificultades para desarrollar e implementar estrategias a nivel nacional para monitorizar los hospitales. El reto es especialmente complicado en países de ingresos bajos donde los recursos para la medición y la notificación son escasos. Se examinó la experiencia a la hora de desarrollar e implementar un sistema nacional para monitorizar el rendimiento de 130 hospitales del gobierno en Etiopía. Haciendo uso de un observatorio participativo, se observó que el sistema de monitorización se tradujo en una notificación de Etiopía. Haciendo uso de un observatorio participativo, se observó una mejora en el rendimiento de los hospitales y el desarrollo de diferentes proyectos para la mejora de la calidad. El desarrollo y la implementación de dicho sistema, que requería de inversiones y soporte tanto técnico como en materia de inversión, no hubieran sido posibles sin una fuerte habilidad de gestión a nivel hospitalario. Una meticulosa valoración de la disposición del sector sanitario a cambiar y el deseo de este a priorizar la calidad hospitalaria podría ser de gran ayuda en las primeras fases del diseño y la implementación. Esta evaluación podría incluir entrevistas con informadores clave, una recopilación de datos sobre instalaciones sanitarias, recursos humanos y debates con asociados del mundo académico. Poner en consonancia la visión del gobierno sobre la mejora de la calidad con los asociados y contribuyentes puede hacer aumentar la aceptación y el apoyo político. Dicho alineamiento puede permitir la focalización estratégica de los recursos respecto a un solo esfuerzo nacional, antes que esparcirlos en docenas de proyectos potencialmente conflictivos. Las fases iniciales son las principales beneficiadas de tener objetivos modestos y flexibilidad para modificar y mejorar de forma continua, a través de un compromiso activo con todos los accionistas.
References

1. Berwick DM. Lessons from developing nations on improving health care. BMJ. 2004 May 8;328(7448):1124–9. doi: http://dx.doi.org/10.1136/bmj.328.7448.1124.PMID:15310864

2. Better hospitals, better health systems, better health. Consultation draft. Washington: Center for Global Development; 2014. Available from: http://www.cgdev.org/sites/default/files/Hospitals%20for%20Health%20consultation%20draft%20June2014-22.pdf [cited 2015 Apr 17].

3. McCannon CJ, Berwick DM, Massoud MR. The science of large-scale change in global health. JAMA. 2007 Oct 24;298(16):1937–9. doi: http://dx.doi.org/10.1001/jama.298.16.1937.PMID:17954547

4. Smits HL, Leatherman S, Berwick DM. Quality improvement in the developing world. Int J Qual Health Care. 2002 Dec;14(4):439–40. doi: http://dx.doi.org/10.1057/palgrave.iijhc.1200131.PMID:12515329

5. The WHO health systems framework. [Internet]. Manila: World Health Organization Regional Office for the Western Pacific; Available from: http://www.wpro.who.int/health_services/health_systems_framework/en/ [cited 2014 Nov 14].

6. Kruk ME, Freedman LP. Assessing health system performance in developing countries: a review of the literature. Health Policy. 2008 Mar;85(3):263–76. doi: http://dx.doi.org/10.1016/j.healthpol.2007.09.003.PMID:17911756

7. Arah OA, Westert GP, Hurst J, Klazinga NS. A conceptual framework for the Organization performance assessment tool for quality improvement in developing hospitals. Int J Qual Health Care. 2008 Jun;20(3):155–61. doi: http://dx.doi.org/10.1093/intqhc/mzn059.PMID:18697993

8. Kazandjian VA, Matthes N, Wacker KG. Are performance indicators generic? The international experience of the quality indicator project. J Eval Clin Pract. 2003 May;9(2):265–76. doi: http://dx.doi.org/10.1046/j.1365-2753.2003.00374.x.PMID:12787190

9. Mantej J, Kuroiwa H, Bjørnshave B, Bartels P. Nationwide continuous quality improvement using clinical indicators: the Danish national indicator project. Int J Qual Health Care. 2004 Apr;16 Suppl 1:145–50. doi: http://dx.doi.org/10.1093/intqhc/mz027.PMID:16954516

10. Schoen C, Davis K, How SK, Schoenbaum SCUS. U.S. health system performance: a national scorecard. Health Aff (Millwood). 2006 Nov-Dec;25(6):w457–75. doi: http://dx.doi.org/10.1377/hlthaff.26.1.75.PMID:16987933

11. Groene O, Skau JK, Frelsch A. An international review of projects on hospital performance assessment. Int J Qual Health Care. 2008 Jun;20(3):162–71. doi: http://dx.doi.org/10.1093/intqhc/mzn008.PMID:18339665

12. Groene O, Kazandjian N, Kazandjian V, Lombrai P, Bartels P. The World Health Organization performance assessment tool for quality improvement in hospitals (PATH): an analysis of the pilot implementation in 37 hospitals. Int J Qual Health Care. 2008 Jun;20(3):155–61. doi: http://dx.doi.org/10.1093/intqhc/mzn010.PMID:18378511

13. Veillard J, Champagne F, Klazinga N, Kazandjian V, Arab OA, Guisset AL. A performance assessment framework for hospitals: the WHO regional office for Europe PATH project. Int J Qual Health Care. 2005 Dec;17(6):487–96. doi: http://dx.doi.org/10.1093/intqhc/mz012.PMID:16155049

14. Krumholz HM, Normand SL, Spasovska JB, Shahin DM. Performance improvement: a multifaceted intervention to implement guidelines and improve admission paediatric care in Kenyan district hospitals: a cluster randomised trial. PLoS Med. 2011 Apr;8(4):e1001018. doi: http://dx.doi.org/10.1371/journal.pmed.1001018.PMID:21483712

15. Kickbusch I, Gleicher D. Governance for health in the 21st century. Geneva: World Health Organization; 2013. Available from: http://www.euro.who.int/en/publications/abstracts/governance-for-health-in-the-21st-century [cited 2015 Apr 17].

16. Bradley E, Hartig K, Pashman J, Cherlin E, Davis M, Callaway M, Czaplinski C, et al. Hospital management in the context of health sector reform: a planning model in Ethiopia. Int J Health Plann Manage. 2008 Jul-Sep;23(3):203–18. doi: http://dx.doi.org/10.1002/hpm.1951.PMID:18159713

17. Kebede S, Abebe Y, Wolde M, Bekele B, Mantopoulos J, Bradley EH. Educating leaders in hospital management: a new model in Sub-Saharan Africa. Int J Qual Health Care. 2010 Feb;22(1):139–43. doi: http://dx.doi.org/10.1093/intqhc/mzp051.PMID:19951963

18. McNatt Z, Thompson JW, Mengistu A, Tatek D, Linnander E, Ageze L, et al. Application of balanced scorecard in the evaluation of a complex health system intervention: 12 months post intervention findings from the BDHMA intervention: a cluster randomised trial in Zambia. PLoS ONE. 2014(9)(e). doi: http://dx.doi.org/10.1371/journal.pone.0093977.PMID:24751780

19. Swampeo D, Ebrahim S, Joseph A, Friedland PL. Newborn hearing screening in a South African private health care hospital. Int J Pediatr Otorhinolaryngol. 2007 Jun;71(6):881–7. doi: http://dx.doi.org/10.1016/j.ijporl.2007.02.029.PMID:17391536

20. Wong R, Hathi S, Linnander EL, El Banna A, El Manarghi M, El Din RZ, et al. Building hospital management capacity to improve patient flow for cardiac catheterization at a cardiovascular hospital in Egypt. Jt Comm J Qual Patient Saf. 2012 Apr;38(4):147–53. PMID:22535126

21. Kickbush I, Gleicher D. Governance for health in the 21st century. Geneva: World Health Organization; 2013. Available from: http://www.euro.who.int/en/publications/abstracts/governance-for-health-in-the-21st-century [cited 2015 Apr 17].

22. Kebede S, Abebe Y, Wolde M, Bekele B, Mantopoulos J, Bradley EH. Educating leaders in hospital management: a new model in Sub-Saharan Africa. Int J Qual Health Care. 2010 Feb;22(1):139–43. doi: http://dx.doi.org/10.1093/intqhc/mzp051.PMID:19951963

23. McNatt Z, Thompson JW, Mengistu A, Tatek D, Linnander E, Ageze L, et al. Implementation of hospital governing boards: views from the field. BMC Health Serv Res. 2014;14(1):178. doi: http://dx.doi.org/10.1186/1472-6963-14-178.PMID:24742180

24. Ethiopian Hospital Reform Implementation Guidelines. 1. Addis Ababa: Federal Ministry of Health; 2010.

25. Ethiopian Hospital Reform Implementation Guidelines. 2. Addis Ababa: Federal Ministry of Health; 2010.

26. Kebede S, Mantopoulos J, Ramadhanad S, Cherlin E, Gebeheyu M, Lawson P, et al. Educating leaders in hospital management: a pre-post study in Ethiopian hospitals. Glob Public Health. 2012;7(2):164–74. doi: http://dx.doi.org/10.1080/17441692.2012.542171.PMID:21259143

27. PEPFAR Ethiopia in-country reporting system (IRs), FY 2011. New York: Clinton Health Access Initiative; 2011.

28. Webster TR, Mantopoulos J, Jackson E, Cole-Lewis H, Kidane L, Kebede S, et al. A brief questionnaire for monitoring patient healthcare experiences in low-income settings. Int J Qual Care. 2011 Jun;23(3):258–68. doi: http://dx.doi.org/10.1093/intqhc/mzq019.PMID:21531989

29. PEPFAR Ethiopia in-country reporting system (IRs), FY 2013. New York: Clinton Health Access Initiative; 2013.

30. PEPFAR Ethiopia in-country reporting system (IRs), FY 2014. New York: Clinton Health Access Initiative; 2014.

31. Kickbusch I, Gleicher D. Governance for health in the 21st century. Geneva: World Health Organization; 2012. Available from: http://www.euro.who.int/en/publications/abstracts/governance-for-health-in-the-21st-century [cited 2015 Apr 17].

32. Bradley E, Hartig K, Pashman J, Rowe LA, Cherlin EJ, Pashman J, Wong R, et al. Hospital quality improvement in Ethiopia: a partnership-mentoring model. Int J Qual Health Care. 2008 Dec;20(6):392–9. doi: http://dx.doi.org/10.1093/intqhc/mzn042.PMID:18784268
39. Chimwaza W, Chipeta E, Ngwira A, Kamwendo F, Taulo F, Bradley S, et al. What makes staff consider leaving the health service in Malawi? Hum Resour Health. 2014;12(1):17. doi: http://dx.doi.org/10.1186/1478-4491-12-17 PMID: 24641840

40. Conn CP, Jenkins P, Touray SO. Strengthening health management: experience of district teams in The Gambia. Health Policy Plan. 1996 Mar;11(1):64–71. doi: http://dx.doi.org/10.1093/heapol/11.1.64 PMID: 10155879

41. Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010 Dec 4;376(9756):1923–58. doi: http://dx.doi.org/10.1016/S0140-6736(10)61854-5 PMID: 21112623

42. Lewin S, Lavis JN, Oxman AD, Bastías G, Chopra M, Ciapponi A, et al. Supporting the delivery of cost-effective interventions in primary health-care systems in low-income and middle-income countries: an overview of systematic reviews. Lancet. 2008 Sep 13;372(9642):928–39. doi: http://dx.doi.org/10.1016/S0140-6736(08)61854-5 PMID: 18790316

43. Rowe LA, Brilliant SB, Cleveland E, Dahn BT, Ramanadhan S, Podesta M, et al. Building capacity in health facility management: guiding principles for skills transfer in Liberia. Hum Resour Health. 2010;8(1):5. doi: http://dx.doi.org/10.1186/1478-4491-8-5 PMID: 20298565

44. Seims LR, Alegre JC, Miure L, Bragar J, Thatte N, Kibunga P, et al. Strengthening management and leadership practices to increase health-service delivery in Kenya: an evidence-based approach. Hum Resour Health. 2012;10(1):25. doi: http://dx.doi.org/10.1186/1478-4491-10-25 PMID: 22931468

45. Sucaldito NL, Tayag EA, Roces MC, Malison MD, Robe BD, Howze EH. The Philippines field management training program (FMTP): strengthening management capacity in a decentralized public health system. Int J Public Health. 2014 Dec;59(6):897–903. doi: http://dx.doi.org/10.1007/s00038-014-0603-5 PMID: 25238870

46. Swanson RC, Atun R, Best A, Betgeri A, de Campos F, Chunharas S, et al. Strengthening health systems in low-income countries by enhancing organizational capacities and improving institutions. Global Health. 2015;11(1):5. doi: http://dx.doi.org/10.1186/s12992-015-0090-3 PMID: 25989069

47. Umble KE, Brooks J, Lowman A, Malison M, Huong NT, Jademaaro M, et al. Management training in Vietnams national tuberculosis program: an impact evaluation. Int J Tuberc Lung Dis. 2009 Feb;13(2):238–46. PMID: 19146754

48. Willis-Shattuck M, Bidwell P, Thomas S, Wyness L, Blaauw D, Ditiope P. Motivation and retention of health workers in developing countries: a systematic review. BMC Health Serv Res. 2008;8(1):247. doi: http://dx.doi.org/10.1186/1472-6963-8-247 PMID: 19053827