The use of routine case record data to evaluate quality of inpatient hospital care for newborns and children in Kenya

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Chapter 1

General Introduction and Objectives
Introduction

Background

In the last two decades there has been a growing demand for health care in the midst of rising costs and constrained resources which have resulted in an increased interest in measuring and improving the quality of health care in many countries. Further, there is an increased global interest in universal coverage with the debate changing from a focus just on coverage to increased coverage with quality, affordable services [1][2]. This has prompted efforts to move from assessing costs and activity to assessing quality. In the United Kingdom (UK) there is an emphasis on both performance measurement and quality improvement for the National Health Service (NHS) and the development of a national performance framework. There are many approaches to improve quality. They include (but are not limited to): i) training, although evidence suggests it may have limited effects[3][4], ii) local audit and feedback for which there is some evidence of effectiveness or wider scale performance assessment focusing on whole health care systems, iii) accreditation systems that incentivise hospitals to achieve standards - examples of these in low income countries include SafeCare in Kenya, Tanzania and Nigeria[5] and the Council for Health Service Accreditation of Southern Africa (COHSASA)[6], and iv) pay for performance initiatives that use financial incentives and penalties to reward ‘correct’ practice.

Pressures to improve performance and quality measurement have resulted in an increasing demand for information on quality of care, and thus quality measurement, in high income countries. These same pressures are now beginning to be felt in low income countries (LICs). Thus international attention is being paid to changes in global burden of disease estimates as metrics of global health system performance while the more specific Countdown 2015 approach has focused on achievement of the millennium development goals (MDGs) for child and maternal health, tracking progress at country level. In high income countries much more detailed quality of care assessments are now embedded in many health systems and often derive their data from routine health information systems. In low income countries, however, there is as yet limited data to evaluate routine care. Therefore we need to develop measurement tools and information systems that allow for routine quality of care assessment in LICs. However, these approaches need to be ‘fit for purpose in context’.

Quality of care assessment

One simple paradigm for classifying quality of care was popularized by Donabedian who proposed considering the structure, or resources available to provide care, the process, or how people act and use
these resources, and the outcomes of care as measurement domains[7]. This thesis will touch briefly on
some elements of structure, focus predominantly on process measures and explore mortality as one
obviously important outcome in two papers. The process of care examined in this thesis might best be
considered as the technical content of medical care rather than broader, valid attributes such as the
quality of patient-provider interaction. Here the technical approach to care is contrasted with standards
derived from national evidence-based clinical guidelines.

Why do we need quality of care measurement?

Health care reforms in the last decade have placed great value on measuring clinical performance to
inform patient choices and promote equity of provision, safety, accountability, efficiency and
effectiveness[8]. These may be linked to major efforts like pay-4-performance[9, 10] and the
development of national schemes such as the Quality and Outcomes Framework (QOF)[11], among
others. The World Health Organization’s (WHO) 2007 Framework for Action for strengthening health
systems in developing countries identified quality as one of the key drivers of improved health outcomes
and greater efficiency in health service delivery[12]. In the developed world this has resulted in, for
example, routine monitoring of drug and prescription errors, guideline adherence and the emergence of
clinical decision support systems[13–15] that have led to improved quality. The adoption of these
approaches remain sporadic in LICs. However reports from LICs suggest that the quality of care (QoC)
provided in many facilities, both primary and referral is generally poor[16–18].

Based on the Donabedian framework quality of care assessment aims at detecting challenges in the
 provision of care either in structure, process or outcomes, identifying gaps in care and opportunities for
 quality improvement initiatives. The value of quality of care assessment in identifying failures in health
care provision can be illustrated using examples from the UK. In the ‘Bristol’ case analyses of patient
outcome data resulted in three paediatric cardiac surgeons being found guilty of malpractices[19] while
in the ‘Shipman case’ a general practitioner was found guilty of murdering 15 patients[20]. At an
organisational scale examples include the inquiry into the Mid Staffordshire NHS foundation Trust in
England after analyses of routine data suggested persistently high mortality[21]. Although the above
examples are extreme they highlight the need for quality assessment in identifying deviations from
expected standards of care.
Why is it useful to work on hospital quality of care

Efforts in LICs to provide better health care have often concentrated on the provision of primary care services of public health importance like immunization, access to bed nets and skilled birth attendants amongst other interventions. Efforts examining the quality of primary care provided to children include IMCI evaluations[22–25] and quality of outpatient management of malaria[26]. Some quality indicators at this level are now included in the routine health information system – district health information system 2 (DHIS2). For example malaria testing rates amongst children with fever or HIV testing rates. Other quality indicators are part of programmatic evaluations like the malaria and HIV indicator surveys. These are disease specific[27][28] and undertaken periodically (every 3-5 years) but are limited in scope. Much less is however known about quality of care in hospitals which are the referral centers receiving the severely ill patients from peripheral/primary health facilities.

Hospitals are often linked to a network of primary care and community based health services and it is estimated that about 10 -20% of sick children presenting at primary care will require referral to a district hospital based on current guidelines[29]. Hospitals are used as training centres for health care providers and practices learnt in these settings are likely to influence practice throughout the health system. However, reports from Kenya, Angola and Zambia indicate that practitioners hardly follow guidelines leading to inappropriate treatment and incorrect treatment dosages for common childhood illnesses such as pneumonia, diarrhoea and malaria [17, 18, 30, 31][32]. Further, essential resources for provision of care have been reported as inadequate despite about two thirds of the health care budget being allocated to these facilities.

Although there is a considerable need to improve primary care, it is estimated that lowering case fatality rates and thus inpatient mortality generally, or improving referral, or both at the district hospital level might also reduce child mortality by 3–30%[33]. In addition, care in hospitals may be improved with limited additional resources a key factor in LICs where resources are scarce[34]. For instance, Duke and colleagues highlight that case management in hospitals for severe malnutrition[35], pneumonia[36] and neonatal care[37] can be improved with better ward organisation, use of clinical guidelines and staff participation in improvement efforts[38]. Therefore evaluating health care provision in these settings is essential to improving quality of hospital care and to ensure the majority of severely ill newborn babies and children get appropriate, effective and timely treatment in support of primary care facilities.

Approaches to measuring quality of care
Quality of care has been defined as ‘the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge’[8]. Quality of care measurement has been described through a framework developed by Donabedian with three attributes namely structure, process and outcome[7]. Although these attributes are intertwined their usefulness depends on context. To allow for quality of care measurement, indicators which could be defined as the quantitative measures that assess a particular health care process or outcome are required. Indicators are based on standards of care and allow documentation of the quality of care; benchmarking for comparisons between places and time; accreditation; monitoring by regulatory bodies and support quality improvement initiatives.

Structural measures provide indirect quality of care measures related to the physical setting, human resources, organization of care and the availability and amount of resources used by the health system to deliver programs and services. For example staff availability and the availability of space, beds, buildings, supplies and equipment used to deliver medical care. Processes are the actual activities involved in the provision of care that the provider undertakes and how well they are done and for clinicians may include history taking, examination, investigations and treatment administration - they are a series of inter-related activities undertaken to achieve an objective. Outcomes are defined as the outputs of process and structure and are states of health or events that follow care. They are commonly described as ‘the five Ds’: death, disease, discomfort, disability and dis-satisfaction.

Process measures

Process of care indicators are useful for quality improvement strategies since they breakdown the health care pathway and may allow for an exploration of how different aspects of care affect the outcome. Although mortality is easy to measure, it is unlikely to display big changes and so is not often a measure that is sensitive to still important changes in the way care is provided. Meanwhile, process measures track the desired practice directly and can vary over the entire scale of performance from 0% to 100% so one can see whether efforts to make changes are working.

The process of providing care can be assessed against agreed standards. For example, how clinicians examine patients, make diagnoses and decide on treatments can be examined if there are appropriate standards of care that define such processes. There are a number of ways of examining these technical processes used by researchers. Clinicians may be tested for their responses when presented with standard scenarios or vignettes and asked to talk through or act out their approach while this is assessed.
Another method is to employ people to act as a standard patient and record the actions of a health worker who sees them[42, 43]. In the former method clinicians are clearly aware they are being tested, in the latter they may be unaware. While both methods have some advantages, particularly an ability to standardize the set of processes one is trying to test people on, these methods are very hard to use at large scale. In high income settings, large routine patient level datasets are therefore increasingly used to assess technical aspects of health service delivery[44][45]. These clearly, however, have the limitation that one can only make assessments of what processes are recorded.

Although process indicators have been used as a proxy to outcome data in quality of care assessments, these are only useful if there is an established link to outcomes. For example, randomised trials may have demonstrated superiority for one treatment over another and therefore an indicator of quality might track the use of the most effective treatment. However, while process measures are more sensitive in measuring quality, in LICs they are much harder to use due to poor record keeping and documentation.

**Outcome measures**

Outcomes are the consequences of care. They reflect all aspects of care including those that cannot be measured like technical expertise that are likely to determine outcome. Outcome measures such as hospital mortality are in theory easy to measure and should be readily available in most routine health information systems. Although outcomes such as mortality are the end result of care, structure and process are not additive, in that, availability of the required resources and good process-of-care does not necessarily lead to a good outcome since outcome is influenced by environmental and patient intrinsic factors like genetics[46]. For example the outcome of a neonate with severe sepsis requiring intravenous fluids may be influenced by the ability of the clinician to establish appropriate intravenous access, the selection of antibiotics and the adequacy of fluid therapy. While it might be possible to measure the antibiotics chosen and amounts of fluid prescribed the adequacy of intravenous access and the sensitivity of the pathogen to the treatment may be harder to establish. For these reasons many have criticised the use of hospital mortality as an aggregate indicator of quality of care[46–48].

**Quality of care assessment in high income countries**

HICs have made considerable progress in the adoption of technology in health leading to routine use of electronic medical records (EMRS). Although EMRs in HICs have shown utility in quality of care assessment, clinical decision support systems, scheduling patients for various appointments and
prescription order forms[13–15] they are still undergoing development. A recent review of EMRs in HIC settings illustrated challenges in the structural formats in which data were stored, missing data, and differences in disease coding[49]. However, with huge investments and in a highly centralised and dominant system, advances in health information systems may soon allow developed countries to routinely measure aspects of care such as adherence to guidelines, equity, patient experience and the cost-effectiveness of interventions. Such aims underlie the development of the Quality and Outcomes Framework (QOF) in the UK that has helped consolidate evidence based methods for improving care by increasing the use of computers, decision support, clinician prompts, patient reminders and better recording of care. This has improved intermediate outcomes for some conditions, notably diabetes[10, 50, 51].

The availability of functional health information systems in HICs at the hospital level that collect patient level data has also allowed formation of research/learning networks enabling wide scale quality of care assessment as a routine exercise and data re-use for clinical research. An example of such a network is the Vermont Oxford Network[52] that comprises of over 800 institutions and maintains large databases that include information on interventions and outcomes of infants cared for at member institutions. The primary goal of this database is to assist member hospitals understand their performance for purposes of quality improvement. A similar example is the national paediatric learning health system (PEDSnet) that comprises a multi-institutional clinical data research network of 8 paediatric hospital systems[53]. At a department and hospital level these platforms allow assessment of quality and track progress of guideline adoption while more broadly they provide an opportunity to undertake observational and outcome research that have been used to inform care, change guidelines and study disease trends. HICs are therefore providing examples on the approaches to and value of routine data which LICs should now start to adopt but using lessons learnt in HICs to create robust systems.

**Previous reports on quality of care in low income countries**

Quality of hospital care in LICs has often been found to be poor. Most LICs have concentrated on the provision of quantity and not quality care with a focus on improving access to fundamental public health interventions, including sanitation, immunization and basic primary care. However as these countries undergo economic development, calls for improved quality of care within both primary and secondary care settings have emerged[12, 54].
For example in a study by English and colleagues less than 10% of children were assessed for level of consciousness and acidotic breathing which are key prognostic signs and predictors of severe malaria [30]. In some other settings inadequate triage, over hospitalization, over-diagnosis and over-treatment have had adverse consequences for health outcomes and wasted health expenditure[55]. Some of the issues highlighted as an explanation to poor quality of care in LICs are: i) inadequate structure including poor physical environments, poor organisation of services, poor availability of human resources and equipment[56, 57], ii) poor supervision and management to ensure guidelines are followed[58] and iii) poor motivation among other factors. Although resources have previously been highlighted as a reason for poor quality of care, limited data available from LICs indicate that high quality basic care can be provided even with limited resources. Literature on quality improvement with limited resources is summarised in table 1. However, the lack of data or data available only in an aggregated/summarised format leads to an inability to evaluate quality routinely[30, 59, 60]. Because the gap between the care that is currently delivered and the best possible care is often larger in resource-poor countries than in developed nations, quality improvement strategies may have even greater potential to improve health outcomes in resource poor settings. Further, while quality improvement initiatives in LICs need to be scaled up these quality improvement strategies need to be integrated into the existing health systems[61].
<table>
<thead>
<tr>
<th>Author; year; setting</th>
<th>Study design</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutta et.al; 2014[34]</td>
<td>Review</td>
<td>There are high impact low cost interventions for newborn but coverage is low. Some of the interventions include: delayed cord clamping and cleaning, immediate initiation and exclusive breastfeeding, administration of vitamin K and appropriate thermal care practices among others</td>
</tr>
<tr>
<td>Mbwele et.al; 2012; Tanzania[62]</td>
<td>Cross-sectional survey</td>
<td>Newborn care was reported to be sub-optimal despite availability of resources</td>
</tr>
<tr>
<td>Ayieko P et.al; 2012; Kenya[63]</td>
<td>Cluster randomized trial</td>
<td>A multi-faceted intervention that included feedback, training on guidelines, provision of guidelines and job aides improve uptake of guidelines, a local facilitator to help in onsite problem solving and external supervision resulted in a 21% improvement in process of care measures overall.</td>
</tr>
<tr>
<td>Reyburn et.al; 2008; Tanzania[17]</td>
<td>Cross-sectional survey</td>
<td>Although hospital supplies were available, care provided to children was poor with inadequate clinical assessment, missed diagnoses and prescription of inappropriate treatment being reported as the main challenges in provisions of care</td>
</tr>
<tr>
<td>Duke et.al; 2006: Kazakhstan, Russian Federation, Moldova[55]</td>
<td>Systematic observational assessment.</td>
<td>Poor care was associated with excesses in treatment, over diagnosis and over-hospitalization linked to outdated protocols and absence of evidence-based approaches to clinical decision making.</td>
</tr>
<tr>
<td>Boonstra et.al; 2005; Botswana[64]</td>
<td>Cross-sectional survey</td>
<td>Poor care for diarrhoea and acute respiratory illnesses was attributed to non-adherence to guidelines</td>
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**Ministry of Health efforts in quality of care assessment in Kenya**

Although quality of care assessment in LICs is still in its infancy, the government of Kenya has put in efforts to evaluate care through a range of activities such as Service Provision Assessments (5 yearly) and Hospital Reforms Surveys (yearly). The Ministry of Health has to date expressed greatest interest in the financial operations, the infrastructural capacity of the hospital and the availability of essential commodities [65]. In limited scope process and outcome data linked to individual patients has also been collected in such surveys through a handful of case reviews per department. Outcome data is mainly provided by routine systems which have unfortunately been shown to be inconsistent and sometimes erroneous in the way they aggregate data. While these government linked assessments have been used to inform equipping hospitals they provide only a superficial snapshot of quality of the process of care, useful mainly for supervision. There have to date been few efforts to link data collected routinely to measurement of the process of quality of care provided to patients or to explore individual patient outcomes.

**Prior quality of care work in Kenya**

Several efforts to improve approaches to quality assessments have been attempted in the context of research studies. The first early reports on QoC for children in hospitals in Kenya were in 2002 using tools adopted from WHO[66] that aimed to evaluate both process and structure in 14 district hospitals across Kenya. Findings from this survey work indicated that paediatric care was inconsistent with clinical guidelines[30] and hospitals were ill prepared to provide in-patient paediatric care. The number of health workers were reported as few while essential resources were reported to be sub-optimal. In addition there was inadequate data and patient documentation to evaluate some aspects of care. At the time most health workers in district hospitals did not have access to the WHO guidelines or any local or modern practice guidelines, a factor that may have contributed to the poor quality of care reported. Stemming from these findings was the need for local guidelines to standardise care and support health workers with limited paediatric training in hospital management of children for the major causes of mortality. In 2005, local guidelines and a training to disseminate these guidelines were developed with involvement of pertinent stakeholders[67]. With the implementation of guidelines, there was a subsequent need to evaluate if the dissemination and implementation of guidelines resulted in improvement of care. However, it was unclear what quality indicators would be most useful to assess and be relevant to stakeholders in QoC assessment. As a consequence work to explore appropriate quality indicators was initiated through a Delphi process. Although there was a consensus on the
measures of quality of hospital care, there were concerns of inadequacy of data to measure most of the process-based indicators[68].

A second spin-off from early work was the need for improved documentation to allow better quality of care assessment. A standardised admission record form aiming to cover common childhood illnesses and based on the guidance of the IMCI referral care strategy was developed and included signs and symptoms recommended by both local and international guidelines. An evaluation of the implementation of this form illustrated that it guided clinicians in examining for key signs and symptoms and also greatly improved documentation[69]. Subsequent use of this form was recommended by the Ministry of Health in internship training centre hospitals in Kenya.

The use of routine Health Information Systems for quality of care assessment

Globally health information systems have begun to receive a lot of attention evidenced by the setting up of the Health Metrics Network and the unveiling of President Obama’s Global Health Initiative which calls for “strengthening existing public health surveillance and other data collection systems for monitoring diseases, conditions, health service provision, and health outcomes” as part of an integrated approach to strengthen health systems [U.S. Government, 2011][70]. In addition the need for greater accountability and transparency from governments and international agencies is increasing the demand for better and sound health statistics to benchmark progress and performance of public health and medicine[71]. Further, WHO lists a well-functioning health information system as one of the key building blocks for health systems[12].

The use of information computer technologies has been identified as one of the ways of improving health information systems (HIS). Although the use of IT in health care has been adopted in HICs and allows for routine assessment of care adoption of IT in health care is only beginning in developing countries. As a result, despite the increased focus on evidence-based decision making, inaccuracies of data lead policy makers, health officials and program managers to make decisions based on extrapolation, anecdote or intuition rather than sound data. Policies are therefore more likely to be influenced by other considerations such as current crises and public and political opinions. Work undertaken by Braa and colleagues in Tanzania demonstrated that data quality and data use are inter-related in that poor quality data will not be used, and because they are not used, the data will remain of poor quality; conversely, greater use of data will help to improve their quality, which will in turn lead to
more data use[72]. Therefore improved information use requires improved quality of data and of information products, which in turn requires improved health information systems (HIS).

In low-resource settings routine health or hospital information system data are very limited, often of poor quality [73], and are typically summarized (e.g. total cases per ward) before being entered into the national health information system database. Work undertaken in Kenya to evaluate the usefulness of routine health records in quality of care assessment demonstrated discrepancies between data available on DHIS2 and the raw data in hospitals[74]. Such routine data very rarely include any information on a patient’s clinical findings or treatment. Thus at present routine data that are collected in HIS do not provide for individual patient level analyses of the process of care. Despite significant investments in health we therefore largely remain ignorant of whether patients receive the correct care. The availability of patient level data would provide the ability to track changes in epidemiological trends and evaluate the impact of changes in national guideline recommendations from routine settings as well as undertake assessments on the quality of the process of in-patient care, data that will assist in health service evaluation.

While a more long term solution for generating routine data is the use of EMRs, their development is costly and time consuming and may suffer from poor adoption resulting from barriers in their utilization. Therefore it might take longer than expected to have EMRs deployed in LICs. In addition in developed countries where EMRs are routinely used, challenges with interoperability, structural formatting of the data and inconsistency with paper records have been reported[75, 76]. Therefore, to side-step these challenges in the midst of limited resources an intermediary data collection system that routinely collects data from improved physical records, perhaps in a limited number of sites, would still provide data for quality of care assessment and be a learning platform for developing a ‘fit for purpose’ EMR system in LIC.

Summary

In conclusion, QoC has been highlighted as a key attribute of a health system but improvements can only be realized if we are able to measure it. Care can only be measured at scale through data, however in LICs data are very limited and where available have been of poor quality especially in routine settings. Further, most of the health information systems collect aggregate patient data that do not allow patient level quality of care assessment. Therefore to reliably report on quality of in-patient hospital care we need to collect patient level data that can allow us to report on both process and outcome. However
outcome data will be hard to interpret and large datasets of high quality data will be required to make any reliable comparisons between places. Integrating clinical data into evaluation approaches for routine systems in low resource settings, even for a subset of the hospitals, would be a considerable advance. The ability to assess what care is being provided, whether it is adherent to evidence-based guidance and to track adoption of new policies or technologies aimed at improving outcomes are important aspects of evaluating health system performance. Ultimately the inclusion of such data in EMRs or intermediate technology systems that collect routine patient level data would support routine quality of care assessment. If such data become more available suitable methods of analysing them to understand variation in performance and its impact will be needed. In this PhD work, I therefore hope to demonstrate how case record data may be used to evaluate quality of care in routine hospital settings in Kenya and in doing this promote the availability of quality data and its effective use as one means to promote improvement in services provided in Kenyan hospitals.
Objectives

The work is presented in three broad chapters and seven sub-chapters as outlined below.

1. To evaluate quality of care using case record review in routine Kenyan hospital settings and explore the potential of this approach for identifying key quality gaps and changes over time.
   a. An examination of the quality of care for newborns and severely malnourished children admitted in Kenyan district hospitals.
   c. Adoption of recommended practices and basic technologies in a low-income setting

2. To use case record review data as a means to examine associations with mortality in children admitted to Kenyan hospitals.
   b. An exploration of variation in and risk factors for paediatric inpatient all-cause mortality in a low income setting: Data from an emerging clinical information network

3. To explore the value of case record review data as a means to examine variability in quality of hospital care in Kenyan hospitals and to explore associations with such variability:
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