

What do we know about maternal and perinatal mortality and morbidity audits in sub-Saharan Africa? A scoping literature review

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Abstract

Purpose – *The purpose of this paper is to provide a situational overview of the facility-based maternal and perinatal morbidity and mortality audits (MPMMAs) in SSA, their current efficacy at reducing mortality and morbidity rates related to childbirth.*

Design/methodology/approach – *This is a scoping literature review based on the synthesis of secondary literature.*

Findings – *Not all countries in SSA conduct MPMMAs. Countries where MPMMAs are conducted have not instituted standard practice, MPMMAs are not done on a national scale, and there is no clear best practice for MPMMAs. In addition, auditing process of pediatrics and maternal deaths is flawed by human and organizational barriers. Thus, the aggregated data collected from MPMMAs are not adequate enough to identify and correct systemic flaws in SSA childbirth-related health care.*

Research limitations/implications – *There are a few published literature on the topic in sub-Saharan Africa.*

Practical implications – *This review exposes serious gaps in literature and practice. It provides a platform upon which practitioners and policy makers must begin to discuss ways of embedding mortality audits in SSA in their health systems as well as health strategies.*

Social implications – *The findings of this paper can inform policy in sub-Saharan Africa that could lead toward better outcomes in health and well-being.*

Originality/value – *The paper is original.*

Keywords *Mortality, Africa, Perinatal, Audits, Death reviews, Facility, Maternal, Sub-Saharan*

Paper type *Literature review*

Background

A maternal mortality audit is a process that looks at the number and causes of deaths among women who die between conception and six weeks after delivery, while perinatal mortality audit looks at the stillbirths and early neonatal deaths (WHO, 2015, 2016; WB, 2011). The overall aim is to identify correctible deficiencies (such as omission in care, delayed or missed diagnosis, inappropriate missed drug administration and miscommunication) in order to improve the quality of safe motherhood, as well as to prevent future occurrences (WB, 2011; WHO, 2016; Owolabi *et al.*, 2014). Morbidity audits look at the illness and problems which are not severe enough to cause death (Higginson *et al.*, 2011; WHO, 2016).

In HICs, hospitals and other health care facilities have long conducted morbidity and mortality audits to identify deficiencies in health care provision and ways to improve patient outcomes (Kurinczuk *et al.*, 2014; Luz *et al.*, 2014). Routine facility morbidity and mortality audits have been linked to improved quality of care and better health outcomes (WHO, 2004, 2016). Reviews of maternity-related deaths, which began in the 1950s (Short, 1961), have proved especially

effective at identifying potential contributing factors and reducing childbirth-associated mortality (Merali *et al.*, 2014; Pattinson *et al.*, 2009).

World Health Organization (WHO) (2001) published the first guidelines for conducting maternal death reviews (MDRs) in 1996 (revised in 2001). In 2004, WHO's "Beyond the numbers: reviewing maternal deaths and complications to make pregnancy safer" analyzed MDR data from audits and offered comprehensive suggestions on how to prevent deaths. In 2012, WHO and partners introduced maternal death surveillance and response (MDSR), which outlined a new, evidence-based approach to maternity-related health care that providers could use to improve their own practices (WHO, 2013). More recently, there has been an emphasis to explore causes of stillbirth and neonatal death, in order to identify avoidable contributing factors, as part of existing MDRs.

Not all countries in SSA have facilities for conducting death reviews. Countries that conduct death reviews have now modified the standard MDSR to include perinatal audits, or maternal and perinatal death surveillance and response (MPDSR). For example, Sierra Leone launched the National Maternal Death Surveillance and Response Technical Guidelines in 2015. The new guidelines moved beyond MDRs, to surveillance and response, taking actions to prevent future deaths. Burkina Faso Ministry of Health introduced the National MDSR system and guidelines to respond to the country's high maternal mortality rate in 2012, improving data collection and surveillance by incorporating use of mobile phones and routine reporting forms. By 2010, Kenya, South Africa (SA), Malawi, Botswana, Ghana, Tanzania, Uganda and Nigeria had instituted procedures for auditing maternal and neonatal mortality, based on WHO recommendations, on how health care facilities should conduct MPDSRs.

Overall, as literature attests, some SSA countries are conducting MPMM audits yet it is not clear whether the data collected are linked to improved quality of maternal and neonatal health considering the sobering numbers of deaths in facilities. Furthermore, very little is known about the processes and efficacy of the MMA data that are being collected. The aim of this review is to improve our understanding on this topic by providing a situational overview of the facility-based maternal and perinatal morbidity and mortality audits (MPMMAs) in SSA, their current efficacy at reducing mortality and morbidity rates related to childbirth.

Methods

Step 1

Inclusion criteria. The search was limited to SSA. Sub-Saharan Africa in this paper denotes countries geographically located south of the Sahara. SSA was chosen because it has the highest maternal and neonatal deaths worldwide. The research team (consisting of social scientists and a clinical epidemiologist) defined the search parameter. Both qualitative and quantitative studies in academic journals including MPMMAs published between 2008 and 2017; empirical papers containing sections on audit methods and processes; papers containing reflection on audits, quality of health and patient safety and articles written in English – both primary and secondary research works were included.

Exclusion criteria. Papers that did not meet the inclusion criteria above; book monographs; papers not in English language were excluded.

Step 2

Studies were selected by searching PubMed and HINARI databases for "maternal" or "perinatal" and "morbidity" or "mortality," "low-middle-income countries" (LMICs) or "developing countries."

Step 3

The search yielded 1,678 papers. Authors screened the papers for duplicates and omitted 1,533 papers. Additional screening was conducted by two authors (AL and JJ) to look at the relevance of the remaining papers – as to whether they met the inclusion criteria. The authors omitted

125 papers leaving 25 eligible papers. Non-peer-reviewed literature included reports, guidelines and policies obtained (largely through author contacts) from international health organizations and government ministries of health.

Step 4

All studies retrieved were read by the research team to understand the scale of audits in LMIC. Each team member read the materials and entered into a summary table (Tables AI and AII). Aspects of the information collected included: how mortality audit data were being conducted in SSA. In particular, the methods and processes that were in place; what challenges exist; the effectiveness of the data; what standards and tools were in place; and what research gaps exist.

The resulting analysis reflects frequent collective discussions on how to evaluate and interpret the data collected (Figure 1).

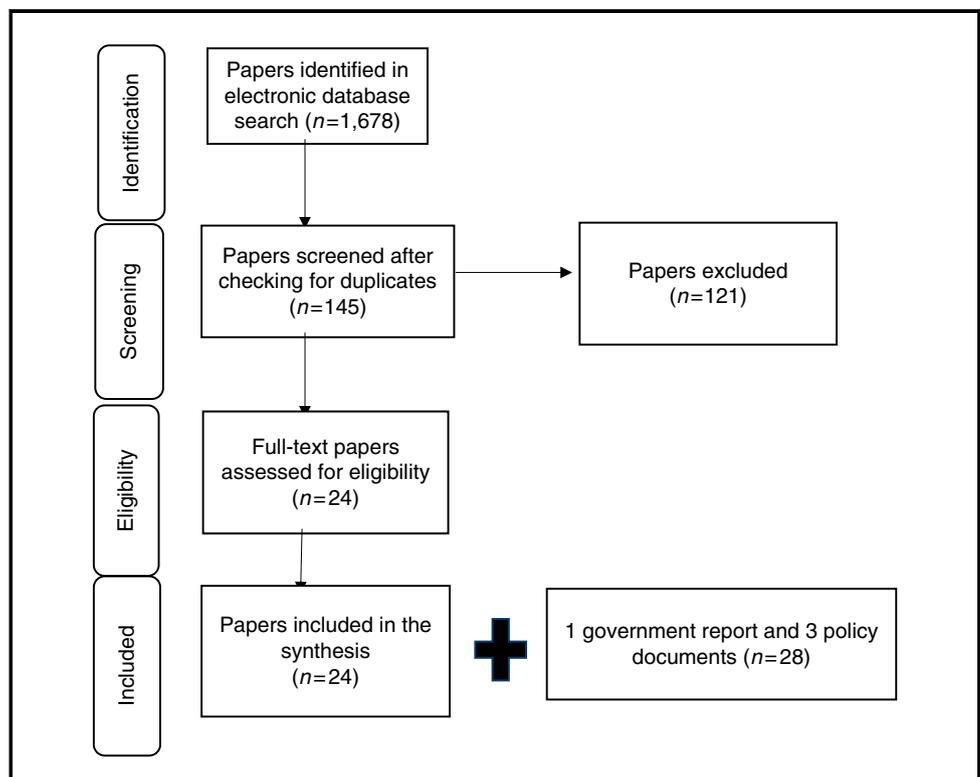
Findings

As detailed below, findings exhibit that MPMMA are not a standard operating procedures across SSA. The varied approaches that SSA countries have used over time in collecting MPMMA data make it difficult to evaluate the data collected; and systematic and human factors undermine the effectiveness of MPMMA.

Variability undermines the usefulness of MPMMA data

This review shows many different auditing approaches SSA countries have used over time and in different settings, so it is difficult to evaluate and interpret the MPMMA data collected. Some MPMMA, for instance, “near miss” cases, where potentially life-threatening incidents did not result in death, and some did.

Figure 1 PRISMA chart of the selection of papers in review



Other variable approaches included clinical audits – MDRs only, vs maternal and perinatal death reviews (MPDR) – and more in-depth confidential inquiries into maternal deaths (Agaro *et al.*, 2016; Combs Thorsen *et al.*, 2014, Madzimbamuto *et al.*, 2014). By 2010, many SSA countries – SA, Botswana, Malawi and Ghana – had all introduced nationally supported procedures for systematically auditing maternal and neonatal mortality and morbidity. To date, numerous SSA African countries (Chad, Zimbabwe, Mozambique, Congo and Somalia) have either made minimal progress or yet to initiate a national MPMMA process. Several other countries (Tanzania, Uganda, Malawi, Nigeria, Kenya, Burkina Faso and SA) are conducting facility-based death reviews and using MDSRs/MPDSR (Agaro *et al.*, 2016; Combs Thorsen *et al.*, 2014; Kongnyuy and Van Den Broek, 2008; Rhoda *et al.*, 2014; Richard *et al.*, 2009).

This review revealed the degree to which MPMMA are not yet standard operating procedure, promulgated by national governments in Sub-Saharan Africa. Where African MPMMA do take place, they are initiated by individual health care facilities, often at great distances from one another (Musafili *et al.*, 2017; Hofman and Mohammed, 2014). Rather than being conducted frequently according to a prescribed procedure, as in developed countries, African MPMMA are generally undertaken in an *ad hoc* manner, occur in facilities that are widely dispersed geographically and include little or no outside supervision (Agaro *et al.*, 2016; Van Hamersveld *et al.*, 2012; Hofman and Mohammed, 2014). These features go far to explain the variability in methodologies used, which undermines the usefulness of the data. The literature suggests that to standardize MPMMA, they need undertaken as part of a coordinated national effort (WB, 2011; WHO, 2016).

Systemic and human factors undermining MPMMA outcomes in SSA

While MPMMA have improved patient outcomes in HICs, in SSA, their implementation and success has been slow. This lack of progress in instituting standard mortality reviews has in part contributed to SSA's failure to achieve WHO's Millennium Development Goals (4 and 5) and Social Development Goal (3) to improve maternal health. Maternal and perinatal mortality rates remain significantly higher than in other countries; conditions in care facilities are frequently unsafe, medical errors are rife (WHO, 2013; Kinney *et al.*, 2010) and the vast majority of SSA countries register childbirth-related deaths as having "no attributable cause" (WHO, 2010).

A 2010 WHO report on Malawi's effort, however, revealed that even where nationally supported, partly supervised and conducted according to standard MMNA protocols, the usefulness of these MPMMA was undermined by a variety of issues, both cultural and systemic. The WHO report specifically cited: insufficient procedural knowledge, meager record keeping skills, insufficient data management skills and fear of being blamed for poor outcomes (see also Vink *et al.*, 2013; Kongnyuy and Van Den Broek, 2008).

Farther, lessons learned from this review indicate that, where audits are conducted, MPMMA meeting is not regular (Van Hamersveld *et al.*, 2012; Agaro *et al.*, 2016; Angelo *et al.*, 2010; Vink *et al.*, 2013). Yet, frequent mortality meetings are an effective way of learning how to prevent maternal and perinatal deaths as well, providing opportunities for acknowledging good care/practice and management. Similar findings were also reported in a study conducted in Burkina Faso (Richard *et al.*, 2009), Uganda (Agaro *et al.*, 2016), Nigeria (Hofman and Mohammed, 2014) and Malawi (Vink *et al.*, 2013; Bakker *et al.*, 2011). Research conducted in Malawi, Nigeria, Tanzania, Botswana and Uganda revealed a lack of knowledge and understanding about the importance of audits among hospital staff (Armstrong *et al.*, 2014; Kongnyuy and Van Den Broek, 2008; Musafili *et al.*, 2017; Van Hamersveld *et al.*, 2012). Van *et al.* and Armstrong *et al.* found a lack of commitment among staff to conduct audits in Tanzania. In part, these barriers may be amplified by limited organizational support as the key health decision makers did not attend audit meetings. Supervision of mortality reviews is also inadequate (oversight from Ministry of Health) (Hofman and Mohammed, 2014; Agaro *et al.*, 2016; Madzimbamuto *et al.*, 2014; Vink *et al.*, 2013).

This review also found that data reporting during the audit meeting were poor and incomplete (standards are not clearly set) with clinical records lacking in some audits – no discussion about the primary cause of death, final cause of death, avoidable factors, morbidity, missed opportunities and action plan.

Since 2011, the Government of Kenya changed MDSR to include MPDSR (WHO, 2011), thus making it mandatory for hospitals to report maternal deaths (WHO, 2011). Although reporting childbirth-related deaths is done routinely, evidence shows that, the majority of the hospital facilities where standard forms are provided, health care staff fail to fill them out accurately and completely; no effort is made to analyze the information collected to find out how to improve conditions, practices and outcomes; and audits are not followed by changes designed to improve health outcomes (KMOH, 2014a, b).

Tanzania instituted MPDR in 2006. In 2010, however, Angelo *et al.* found that although maternal and perinatal mortality audits in Tanzania were a standard health care policy, the audits were limited in scope, and when carried out, were not standardized. The few hospitals that conducted MPDR audits did so only irregularly, kept no records of meetings, discussions, decisions or remedial actions taken. In addition, audit committees did not include key hospital decision makers, and health care workers were not made aware of audits having taken place.

Four years later, a study by Armstrong *et al.* found that little had changed. The MPDR system was still of insufficient quality to serve as the basis for identifying problems associated with maternal and perinatal deaths (Armstrong *et al.*, 2014). Care facilities were given no guidelines on how to report facility-based maternal and perinatal deaths. The study also established that even where MPDR were conducted, those conducting reviews at the hospital were unable to identify challenges and solutions. In most cases, no remedial actions were taken. Where responses did take place, they were insufficient to remedy existing deficiencies that may have contributed to higher mortality rates.

Compared with other countries in SSA, SA seems to be the only country that has made progress toward this course. Created to help health care facilities conduct standardized mortality audits, SA's perinatal problem identification program (PPIP) is credited with reducing the rate of avoidable perinatal deaths and substantially improving the quality of health care (Rhoda *et al.*, 2014). A PPIP's mortality review uses a participatory team approach, with nurses and doctors working together to analyze causes of death. Mortality meetings are frequent – every death is reviewed and summarized within 24 h (Patrick and Stephen, 2008). All review team participants are asked to submit recommendations, and PPIP data are used to identify and rectify loopholes in the health care system that may lead to future deaths (Belizan *et al.*, 2011; Rhoda *et al.*, 2014; Patrick and Stephen, 2008). The PPIP process entails: data collection, “the preparatory meeting,” mortality review meeting, epidemiological and content analysis and recommendations.

The plethora of research from SSA points to health care staffs' fear of being blamed for poor outcomes as a contributing factor to poor reporting (Kongnyuy and Van Den Broek, 2008; Combs Thorsen *et al.*, 2014). Similarly, poor recording may be due to both insufficient resources to implement changes (Bakker *et al.*, 2011; Kongnyuy and Van Den Broek, 2008) and insufficient value placed on teamwork (Van Hamersveld *et al.*, 2012; Hofman and Mohammed, 2014; Lewis, 2014). These findings point toward the urgent need to train MPDR audit committees in SSAs and the need to institute incentives to motivate relevant health care staff to see the value of attending audit meetings.

Discussions

Based on WHO's guidelines for maternal and perinatal mortality audits, a successful death audit must: select a committee of diverse professionals (clinicians, hospital administrators and hospital representatives) and have a clearly defined leadership – including the chair, case/data presenter and a secretary; ensure that standards of good practice are available; certify that all deaths that occurred in the facility during a defined period of time are available; document the circumstances that led to each death; develop a clinical death summary file; and organize the MDR session in advance by arranging meeting venue, informing participants and providing a schedule of the review (WHO, 2004, 2005, 2006; see also De Brouwere *et al.*, 2013). Farther, during the death review audit meetings, the chair must encourage a non-discriminatory environment to encourage honest discussions. Results from the previous audit meetings must be re-evaluated, clinical summary of each case presented and a systematic case analysis conducted to allow an understanding to the chain of events that led to the death. Death audits meetings must conclude with recommendation and an action plan.

The current literature review shows limitations in the way, audits are being conducted in SSA. Recommended guidelines are not followed, which raises questions as to whether facilities that conduct audits have knowledge about these tools. This review also highlights potential areas of exploration that can be considered in strengthening audits as a quality improvement tool. Although MPMMA in SSA are taking place at the facility levels, findings showed that procedures used have not been standardized. Reporting is also spotty, leaving scant data about the process and its results, either locally or nationally. The findings also underscore the lack of aggregation of facility level data with the community data. In SSA, most of the births take place in the communities. There is therefore an unclear description or reporting of events that took place at the community level which might indirectly or directly have contributed to maternal or new-born deaths. While there are studies on community level verbal autopsies, these are not integrated with the data from facilities as well. This highlights a gap that needs to be addressed, to ensure death causing factors attributed to dynamics at the community and facility levels are addressed. These findings are consistent with findings from other LMICs outside SSA, for example, Bangladesh, Solomon Islands (Sandakabatu *et al.*, 2018); Brazil (Luz *et al.*, 2014) and India (Paily *et al.*, 2014).

Literature on MPMMA has put emphasis on how human and organizational factors have been a barrier to successful implementation of death reviews. While these factors are central, it is important to highlight that the ability of audit teams to review cases, draw lessons and inform service delivery frequently depends on team members' ability to share adverse information, disclose errors, and seek help and feedback from other team members and the administration, without fear of punitive measures (Lewis, 2014). Morbidity and mortality review can also be affected by the larger organizational and institutional context, and can be influenced by availability of resources and leadership support. Given the abundance of evidence that medical errors are largely attributable to systems rather than individuals; moreover, improving quality of care requires a more rigorous definition of the systems and methodology required to assess many different factors that may contribute to birth-related deaths (Lewis, 2014; Hofman and Mohammed, 2014; WHO, 2013).

The lack of understanding, inadequate supervision and a lack of skills among hospital teams as highlighted in the literature calls for the need for a cultural shift on how audits should be conducted. Literature suggests that, apart from SA where PPIP is used, audits are still fragmented and do not exist in many countries. Where audits have been successful like the developed countries, evidence shows that they are carried out by multi-disciplinary audit teams whose members meet regularly to review cases, identify challenges and solutions (Rhoda *et al.*, 2014; Patrick and Stephen, 2008). This success, in part, has been due to effective guidelines and standardized frameworks in which multi-professional teams use during audits, which is lacking in many countries of SSA.

Current literature identifies gaps with regard to how MPMMA are conducted in SSA countries. Rather than focusing on structural factors, there is need for research to explore issues around the audit processes as well as the context in which audits are conducted. For example, institutional and inter-professional contexts are useful in supporting health care professionals. Institutional support provides a favorable enabling environment for collaborative teamwork, ensures resources such as adequate staffing are available and supports best practice initiatives. Reduction of medical errors and improving quality of care require more system approach to address the multiple factors underlying medical errors that are beyond individuals (Collins *et al.*, 2009; Walton, 2004). A systems approach is important in part because it promotes a blame-free environment, in which hospital staff at all levels, and patients, are all stakeholders. A systems approach will also provide the organizational structure health professionals need to collect, review and report data on adverse events, errors and near misses to improve hospital.

Recognizing the need to support countries in maternal health care, however, literature highlights the need for clear implementation guidelines for execution of mortality reviews and an enabling environment with support from governments (Abebe *et al.*, 2017; Higginson *et al.*, 2011; Lewis, 2014). WHO recommends the need for legal and ethical frameworks in setting up and conducting death reviews (WHO, 2016). The absence or existence of legal protection influences the ability of audit team members to willingly take part in audits. The need for a legal framework

to ensure that deaths are reported and discussed while ensuring accountability and confidentiality of individuals involved and the information gathered is therefore important (see also Hodorozea and Friptu, 2014; Paily *et al.*, 2014).

Conclusions

There is need to strengthen the quality of facility level reviews in hospitals where they are being conducted, as well as encourage and provide frameworks that can guide those hospitals that are not undertaking this process to do so. Even where data are being collected like for the case of Tanzania (Armstrong *et al.*, 2014), there is need to identify challenges and solutions to increase accountability of professionals and to improve quality of care. We conclude that while the implementation of mortality audits in SSA is slowly progressing, however, there is need to consider the more intangible human aspects that may directly or indirectly influence the success of implementation of such interventions. More research is needed on the social cultural context in which MPMMSs are conducted including processes and procedures, ways community mortality data can be aggregated with the facility data as a way for strengthening health systems and strengthening audit guidelines, frameworks and policies in SSA to improve audits.

Limitations

This is a scoping paper. There are a few published studies on this topic in sub-Saharan Africa.

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Table A1 A summary of literature synthesis

| Author/year of publication | Title of the paper | Methodology | Aims of research | Summary |
|-----------------------------------|--|---|--|--|
| 1. Abebe <i>et al.</i> (2017) | "We identify, discuss, act and promise to prevent similar deaths": a qualitative study of Ethiopia's maternal death surveillance and response system | A qualitative case study using key informants | The study interviewed frontline MDSR implementers in four largest zones in Ethiopia to find out their experiences of the first 2 years of MDSR, including perceptions of its introduction and outcomes for health services | In Ethiopia, the strong political support of MDSR with the broader health strategies and health systems was a facilitator to its implementation. Staff turnover, fear of legal repercussions and a lack of understanding of the purpose of MDSR were some of the barriers experienced at its onset |
| 2. Agaro <i>et al.</i> (2016) | The conduct of maternal and perinatal death reviews in Oyam District, Uganda: a descriptive cross-sectional study | A cross-sectional mixed methods study | To examine the factors that influence the conduct of maternal and perinatal death reviews in Oyam District, Uganda | Findings showed a low participation of health workers in MPDR (34.8%). MPDR committees ($p < 0.001$), attendance of review meetings ($p < 0.001$), and lack of knowledge on the MPDR objectives ($p < 0.001$), implementation of MPDR recommendations ($p < 0.001$), observed improvement in maternal and new-born care ($p < 0.001$) and provision of feedback ($p < 0.001$) as enabling factors in enhancing audit meetings. Factors that hindered conducting MPDR included: lack of information among health workers about MPDR process, committee formation and training of MPDR committee, lack of supervision, and lack of financial motivation of MPDR committee members. Challenges to MPDR included: heavy workload to health workers, high number of perinatal deaths, and non-implementation of recommendations |
| 3. Allanson and Pattinson (2015) | Quality-of-care audits and perinatal mortality in South Africa | Analysis of secondary data from 29 community health facilities, 105 district hospitals, 4 national central hospitals, 22 regional hospitals and three provincial tertiary hospitals | To determine how perinatal mortality rates had changed in health care facilities participating in the perinatal problem identification program | After five years of continuous audits in 163 facilities, findings revealed that there were reductions in perinatal mortality in 48 facilities. Facilities with high perinatal mortality rates attributed that to patient delay in seeking health care when the baby was sick, lack of use of antenatal steroids, lack of nursing personnel and data distress |
| 4. Alexandre <i>et al.</i> (2009) | Improving obstetric care in low-resource settings: implementation of facility-based maternal death reviews in five pilot hospitals in Senegal | Qualitative approaches using multimethods | "[...] to explore and describe health workers' perceptions of facility-based maternal death reviews and to identify barriers to and facilitators of the implementation of this approach in pilot health facilities of Senegal" | Using focus group discussions, participant's observations of audit meetings, audit documents and interviews with staff, the study aimed to explore health professional's barriers to and facilitators to the implementation of facility-based maternal death reviews. The study was conducted in varied hospitals context in Senegal where MDRs had been implemented in 2004–2015. Barriers to implementation of facility-based mortality audits were poor quality of information in the patient's files, lack of feedback to non-attending staff, and senior managers lack of participation. Facilitators including manager to participate as well as moderate the meetings and staff in attendance willing to participate in the discussions |
| 5. Angelo <i>et al.</i> (2010) | Factors for change in maternal and perinatal audit systems in Dar as Salaam hospitals, Tanzania | Qualitative interviews | To assess the structure, process and impacts of maternal and perinatal death audit systems in clinical practice in order to provide insights on how they could be assessed | Maternal and perinatal audit systems existed only in 4 and 3 hospitals respectively, and key decision makers did not take part in audit committees. Sixty percent of care providers were not aware of even a single action which had ever been implemented in their hospitals because of audit recommendations. There were neither records of the key |

(continued)

Table A1

| <i>Author/year of publication</i> | <i>Title of the paper</i> | <i>Methodology</i> | <i>Aims of research</i> | <i>Summary</i> |
|---------------------------------------|---|---|--|--|
| 6. Armstrong <i>et al.</i> (2014) | Strengths and weaknesses in the implementation of maternal and perinatal death reviews in Tanzania: perceptions, processes and practice | Reviewed the national MPDR guidelines and conducted a qualitative study using semi-structured interviews | To review national policy documentation and explore stakeholders' involvement in, and perspectives of, the role and practices of MPDR in district and regional hospitals, and assessed current capacity for achieving MPDR | decision points, action plan, nor regular analysis of the audit reports in any of the facilities where such audit systems existed. There are gaps in the current MPDR system. Responses showed differential understanding of the purpose of MPDR. Thus, the current MPDR do not function adequately or perform quality reviews. Facility-based maternal and perinatal death data are not sufficiently captured and appropriate challenges and solutions at the facility level that could inform learning are not well documented. Staff are committed to the process of maternal death review, with routine documentation and reporting, yet action and response are insufficient. Deaths were rampant in babies below 37 weeks or shortly after birth. Better access to medical care hospitalization in the intrapartum and early neonatal period could improve maternal and neonatal outcomes. |
| 7. Belizan <i>et al.</i> (2011) | Neonatal death in low- to middle-income countries: a global network study | Observational study | To determine a population-based mortality rates in low and middle-income countries | Health workers were familiar with the concept of audit. Audit was deemed as a helpful tool to improve the quality of care. There is a need for audit to be performed in a manner that enhances motivation and on-the-job learning |
| 8. Bakker <i>et al.</i> (2011) | Health workers' perceptions of obstetric critical incident audit in Thyolo District, Malawi | Qualitative research entailing semi-structured interviews with 25 district health workers, a focus group discussion and observation of audit sessions in health facilities in Thyolo District, Malawi, between August 2009 and January 2010 | To examine local health workers' perceptions about obstetric audit and assess the impact of audit and feedback on their work satisfaction and motivation | Challenges experienced were: (1) identification of cases: conflicting maternal death numbers, and missing medical charts, (2) data collection: poor record keeping, poor quality of documentation, difficulties in identifying and locating appropriate health care workers for interviews, the potential introduction of bias through the use of an interpreter, and difficulties with locating family and community members and recall bias; and (3) data analysis: determining the causes of death and clinical diagnoses |
| 9. Combs Thorsen <i>et al.</i> (2014) | Easier said than done! Methodological challenges with conducting maternal death review research in Malawi | Critical reflection | The aim of this paper is to critically reflect upon the process used to carry out a facility-based maternal death review study, while highlighting challenges and providing recommendations on how best to overcome these challenges | Mortality death reviews were initiated in 75 emergency obstetric and new-born care facilities in northern Nigeria and were initially conducted in the 33 hospitals. Findings showed irregularity in conducting MDR in part due to transfer of key members of MDR committees. A lack of supervision and shortage of staff equally contributed to the poor MDR outcomes. Documentation was poor as only 93 (12.1%) of 768 identified MDs were recorded on MDR forms and 52 (6.7%) had been reviewed. Staff observed that MDRs resulted in improved quality of care |
| 10. Hofman and Mohammed (2014) | Experiences with facility-based maternal death reviews in northern Nigeria | Mixed methods, including a review of MDR forms, health management information system data on maternal deaths (MDs), as well as semi-structured interviews with members of 11 MDR committees | To evaluate the effectiveness of the maternal death review (MDR) system and process in improving quality of maternal and new-born health care in northern Nigeria | |

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Table A1

| Author/year of publication | Title of the paper | Methodology | Aims of research | Summary |
|---------------------------------------|---|--|---|---|
| 11. Kongnyuy and Van Den Broek (2008) | The difficulties of conducting maternal death reviews in Malawi | SWOT (strengths, weaknesses, opportunities and threats) analysis of the process of maternal death review during a workshop in Malawi | To explore the challenges encountered in the process of facility-based maternal death review in Malawi, and to suggest sustainable and logically sound solutions to these challenges | Findings showed that, the review was conducted by qualified staff, data were available from case notes, there was support from hospital management/DHMTs and hospitals had maternal death review forms. Barriers to conducting mortality reviews included: fear of blame, lack of knowledge and skills to properly conduct death reviews, inadequate resources and missing documentation. There were opportunities to improve the reviews through technical assistance from expatriates, support from the Ministry of Health and implementation of national protocols. Threats to improving audits included cultural practices, potential for lawsuit, demotivation due to the high maternal mortality and poor planning at the district level. There was need to improve documentation and the process of conducting maternal death review in a blame-free manner, encouraging good leadership, motivating staff, the need to use guidelines, proper stock inventory and community involvement Maternal audit has progressed globally and led to improved quality of care. The progress is slow in LMIC. Moving forward, good leadership and timely sharing of information is required |
| 12. Kerber <i>et al.</i> (2015) | Counting every stillbirth and neonatal death through mortality audit to improve quality of care for every pregnant woman and her baby | A review | To systematically review and capture the causes and avoidable factors linked to deaths, in order to affect change | Supportive cultural factors such as Individual responsibility and ownership; professionalism and "maternity conscience" provide an enabling environment for a successful review. A proactive institutional ethos, a supportive political and policy environment at both national and local levels are also central to the success of the conference |
| 13. Lewis (2014) | The cultural environment behind successful maternal death and morbidity reviews | A review | Aims to summarize many of the lessons learnt from the introduction of near-miss reviews in most areas of the world ranging from high-income countries to those in Africa, Asia and Central and Eastern Europe | The authors reviewed a total of 56 case notes from 82 deaths notified in 2010. The number of contributing factors were high, an indication of poor quality of care even where deaths were not avoidable. For example, "14/23 (61%) of direct deaths were considered avoidable compared to 12/32 (38%) indirect deaths." Failure to recognize seriousness of patients' condition (71% of cases); lack of knowledge (67%); failure to follow recommended practice (53%); lack of or failure to implement policies, protocols and guidelines (44%); and poor organizational arrangements (35%) were the highest-ranking categories contributing to deaths |
| 14. Madzimbamuto <i>et al.</i> (2014) | A root-cause analysis of maternal deaths in Botswana: toward developing a culture of patient safety and quality improvement | Maternal death case-notes analysis | To determine the underlying causes of maternal deaths using a root-cause analysis approach to guide interventions | Substandard care by health workers, patient delay and deficiencies in blood transfusion were the leading three factors that attributed to death |
| 15. Merali <i>et al.</i> (2014) | Audit-identified avoidable factors in maternal and perinatal deaths in low resource settings: a systematic review | Systematic review | To identify the most frequent avoidable factors in childbirth-related deaths globally through a systematic review of all published mortality audits in low and lower-middle-income countries | |

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Table A1

| Author/year of publication | Title of the paper | Methodology | Aims of research | Summary |
|------------------------------------|---|-----------------------------------|--|--|
| 16. Musaffii <i>et al.</i> (2017) | Case review of perinatal deaths at hospitals in Kigali, Rwanda: perinatal audit with application of a three-delays analysis | Case review | To assess factors that could contribute to perinatal mortality and potentially avoidable deaths at Rwandan hospitals | Findings showed a higher rate for perinatal death. For example, from 8,424 births, there were 269 perinatal deaths (106 macerated stillbirths, 63 fresh stillbirths, 100 early neonatal deaths) corresponding to a stillbirth rate of 20/1,000 births and a perinatal mortality rate of 32/1,000 births. A total of 250 perinatal deaths were audited. Factors contributing to mortality were ascertained for 79% of deaths. These included – delay in care-seeking (identified in 39% of deaths), delay in arriving at the health facility (identified in 10% of the deaths), and provision of suboptimal care at the health facility (identified in 37% of the deaths). Difficulties in reporting pregnancy-related danger signs and lack of money were a barrier in reaching the hospitals. Delay in referrals, diagnosis and management of emergency obstetric cases was the most prominent contributors affecting the provision of appropriate and timely care by health care providers |
| 17. Nakibuuka <i>et al.</i> (2012) | Perinatal death audits in a peri-urban hospital in Kampala, Uganda | A retrospective descriptive study | Perinatal death audits were integrated in routine care, and its effect on perinatal mortality rate at Nsambya Hospital were described | Poor neonatal resuscitation skills, incorrect use of the partographs and delay in performing caesarean sections were the leading avoidable factors contributing to deaths. Three skills sessions of neonatal resuscitation, introduction of continuous positive airway pressure (CPAP) for babies with respiratory distress, updates on use of partographs were implemented. Perinatal mortality reduced after the introduction of audits (from 52.8 per 1,000 total births in 2007 to 47.9 deaths per 1,000 total births in 2008 following the introduction of mortality audits) |
| 18. Owolabi <i>et al.</i> (2014) | Establishing cause of maternal death in Malawi via facility-based review and application of the ICD-MM classification | Qualitative interviews | To explore if international classification of Diseases Maternal Mortality (ICD-MM) classification is used during facility-based audit review in Malawi | To a certain degree, the MDR process and practice are well established in Malawi. Challenges faced entail completing the forms, analyzing the available data and using the information collected to improve practice. Practitioners, more often, do not understand the differences between primary and secondary causes of death. For instance, causes of death were sometimes reported as non-obstetric complications when it was not. Obstetric hemorrhage was the leading assigned cause of death. There is need for accurate classification of cause of death |
| 19. Pattinson <i>et al.</i> (2009) | Perinatal mortality audit: counting, accountability and overcoming challenges in scaling up in low- and middle-income countries | Systematic review | Present the results of a systematic review of perinatal mortality audit in low- and middle-income settings to facilitate health system strengthening, particularly at the time of birth and examine the effect on perinatal outcomes, particularly intrapartum-related | Audit has the potential to decrease perinatal mortality rates and improve quality of care if solutions identified during the audit can be implemented. There is need for facilities to track intrapartum stillbirth and pre-discharge intrapartum-related neonatal mortality rates |
| 20. Patrick and Stephen (2008) | Child PIP: making mortality meaningful by using a structured mortality review | A descriptive paper | To describe the origins, growth and development of Child PIPP over the last 5 years, and provides an overview | By allowing recommendations to arise out of the Child PIP information, Child PIP in South Africa generates information that can lead to improved quality of care |

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Table A1

| <i>Author/year of publication</i> | <i>Title of the paper</i> | <i>Methodology</i> | <i>Aims of research</i> | <i>Summary</i> |
|--|--|--|---|---|
| 21. Rhoda <i>et al.</i> (2014) | process to improve the quality of care that children receive in the South African health system Experiences with perinatal death reviews in South Africa – the perinatal problem identification program: scaling up from program to province to country | A review | of the findings and recommendations to date To understand strengths and challenges of PIPP | PIPP is user friendly and has the potential to be used in many facilities with minimum requirements for installation. It has the potential to facilitate the rapid expansion of data collection, analysis and review ultimately leading to quality of care |
| 22. Smith <i>et al.</i> (2017) | Implementing maternal death surveillance and response: a review of lessons from country case studies | A secondary analysis of ten case studies from countries at different stages of MDSR implementation, using a policy analysis framework to draw out lessons learnt and opportunities for improvement | A review | Review revealed that MDR is accepted and ongoing at subnational level in many countries. However, it is not institutionalized, there is need for a shift from facility-based MDR to continuous MDSR to inform wider health system. There is need for team processes at facility level. No shame culture must be adapted. There governments must allocate resources toward this course |
| 23. Van Hammersveld <i>et al.</i> (2012) | Barriers to conducting effective obstetric audit in Ifakara: a qualitative assessment in an under-resourced setting in Tanzania | Qualitative study – participant observation and interviews | To explore barriers to and solutions for effective implementation of obstetric audit at Saint Francis Designated District Hospital in Ifakara, Tanzania | Audit sessions were inconsistent, often, happened only when the head of department of obstetrics and gynecology were available. Cases with evident standard care factors were audited. Participants regarded obstetric audit as useful in improving quality, yet they lacked adequate knowledge of the purpose of audit. Staff were not committed, there was a lack of managerial support, low staffing ratios and lack of financing. Audit meetings were not recommended by action plans. Conclusively, there is need to encourage staff and managers to attend the meetings |
| 24. Vink <i>et al.</i> (2013) | Maternal death reviews at a rural hospital in Malawi | Retrospective study | To analyze maternal deaths at Nkhoma Church of Central Africa Presbyterian (CCAP) Hospital and identify factors causing delays in care | Findings showed that most deaths were indirect (<i>n</i> = 34 (58.6%)). Non-pregnancy-related infections were the leading cause of indirect death (<i>n</i> = 22), with meningitis the most common (<i>n</i> = 13). Most of the patients experienced a delay in seeking care (<i>n</i> = 37 (63.8%)); a transport delay (<i>n</i> = 43 (74.1%)) or a delay in receiving adequate care (<i>n</i> = 34 (58.6%)) |

Appendix 2

Table All Non-peer-reviewed policy and government reports

| <i>Publishing organization</i> | <i>Summary</i> |
|--------------------------------|---|
| 1. WHO (2016) | This was a Global survey of national MDSR systems conducted in 2015 by WHO and UNFPA to find out the global implementation of maternal death surveillance and response (MDSR). The findings revealed that although there was a widespread adoption of important elements of the MDSR system, many of the countries had not started using MDSR. Where national policies existed, they did not automatically guarantee the application of MDSR principles and processes at subnational level. Still, the findings showed that the existence of national and subnational maternal death review committees in some countries does not guarantee that these committees were functioning. Of concern, is the disparity between the percentage of countries with a national policy for notification of maternal deaths (86%) and the application of the policy on the ground |
| 2. World Bank (2011) | This report discusses the importance of maternal death audits and the need of accurate systems of national MM rates, why MMA are important, approaches for reviewing maternal deaths and ill health as well as guidelines for establishing facility-based maternal audits |
| 3. KMOH (2014a, b) | This report details the first confidential inquiry into maternal deaths in Kenya to evaluate the circumstances surrounding mother's death. In total, 484 deaths occurring in the referral hospitals in Kenya were reviewed. Causes of death were accrued to deficiency in the care of mothers, blood loss, hypertensive disorders, pre-existing conditions such as HIV and anaemia. Following this report, a National Maternal and Perinatal Death Surveillance and Response (MPDSR) Committee and a National MPDSR secretariat were established |
| 4. WHO (2013) | This is a policy document that explains the critical concepts of Maternal Death Surveillance and Response (MDSR), and specific instructions for implementing each aspect of MDSR |

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