

ORIGINAL RESEARCH ARTICLE

Quality of Care: A Review Of Maternal Deaths In A Regional Hospital In Ghana

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Abstract

The government of Ghana and key stakeholders have put into place several interventions aimed at reducing maternal deaths. At the institutional level, the conduct of maternal deaths audit has been instituted. This also contributes to reducing maternal deaths as shortcomings that may have contributed to such deaths could be identified to inform best practice and forestall such occurrences in the future. The objective of this study was to review the quality of maternal care in a regional hospital. A review of maternal deaths using Quality of Care Evaluation Form adapted from the Komfo Anokye Teaching Hospital (KATH) Maternal Death Audit Evaluation Committee was used. About fifty-five percent, 18 (55%) of cases were deemed to have received adequate documentation, senior clinicians were involved in 26(85%) of cases. Poor documentation, non-involvement of senior clinicians in the management of cases, laboratory related issues particularly in relation to blood and blood products as well as promptness of care and adequacy of intensive care facilities and specialists in the hospital were contributory factors to maternal deaths. These are common themes contributing to maternal deaths in developing countries which need to be urgently tackled. Maternal death review with emphasis on quality of care, coupled with facility gap assessment, is a useful tool to address the adequacy of emergency obstetric care services to prevent further maternal deaths. (*Afr J Reprod Health 2015; 19[3]: 68-76*).

Keywords: Maternal death, Review, Quality of care, Sub-saharan Africa, Ghana

Résumé

Le gouvernement du Ghana et les principaux intervenants ont mis en place plusieurs interventions visant à réduire la mortalité maternelle. Au niveau institutionnel, l'on a mis en place le processus de vérification des décès maternels. Ceci contribue également à réduire la mortalité maternelle puisque les lacunes qui peuvent avoir contribué à ces décès pourraient être identifiées pour influencer les meilleures pratiques et prévenir de telles occurrences dans l'avenir. L'objectif de cette étude était d'évaluer la qualité des soins de santé maternelle dans un hôpital régional. Un examen des décès maternels a été effectué à l'aide du Formulaire d'Evaluation de la Qualité des Soins adapté du Comité de vérification des décès maternels du Centre Hospitalier Universitaire de Komfo Anokye (CHUKA). Il est estimé qu'environ cinquante-cinq pour cent, 18 (55%) des cas ont reçu une documentation adéquate ; des cliniciens chevronnés ont été impliqués dans 26 (85%) des cas. La documentation insuffisante, la non-implication des cliniciens expérimentés dans la gestion des cas, les problèmes relatifs au laboratoire surtout en ce qui concerne le sang et les produits sanguins ainsi que la rapidité des soins et de l'adéquation des services du soin intensif et des spécialistes à l'hôpital, ont été des facteurs contributifs à la mortalité maternelle. Ce sont des thèmes communs qui contribuent à la mortalité maternelle dans les pays en développement qui doivent être abordés d'urgence. L'examen de décès maternel, tout en mettant l'accent sur la qualité des soins, ajouté à l'évaluation de l'écart de l'installation, est un outil utile pour faire face à la pertinence des services de soins obstétricaux d'urgence pour prévenir d'autres décès maternels. (*Afr J Reprod Health 2015; 19[3]: 68-76*).

Mots-clés: mortalité maternelle, critique, qualité des soins, Afrique subsaharienne, Ghana

Introduction

According to the World Health Organization (WHO), maternal mortality is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its

management but not from accidental or incidental causes¹. WHO estimates that worldwide, about 300,000 women die each year from complications of pregnancy and childbirth². More than 99% of these deaths occur in resource-poor countries³.

A total of 902 institutional maternal deaths were documented in 2012 in Ghana with a corresponding total number of institutional

deliveries for the same year as 571,095⁴. The Government of Ghana and other stakeholders have put into place several interventions aimed at reducing the incidence of maternal deaths. These include the provision of free maternal health care services including antenatal care (ANC) and delivery, intermittent preventive treatment (IPT) for malaria and comprehensive abortion care services and recently, the MDG's Acceleration Framework (MAF).

At the institutional level, activities such as the conduct of clinical audits for maternal deaths have also been instituted. Clinical audits can also contribute to reducing maternal deaths as shortcomings that may have contributed to such deaths could be identified to inform best practice and forestall such occurrences in the future through identifying systems, professional, and facility factors that can be ameliorated^{5,6,7}. Audits are tools that provide a logical framework for quality improvement by systematically assessing clinical practices against accepted standards⁸.

Avoidable maternal deaths are largely categorized into causes of death⁹. These categories provide an important orientation to the general causes of maternal - related deaths and as such are fundamental to establishing a basis for strengthening health systems. However, a limitation of these somewhat broad categorizations is insight into where exactly deficiencies in clinical care are occurring, information that is critical to the design and implementation of effective health system improvements. For example, a maternal death from hemorrhage can result from absent prophylactic oxytocin, undetected bleeding, and/or inaccessible blood transfusion, poor referral system either from the community or from one facility to the other. Hence different type of system failures that necessitate different intervention approaches to prevent failure recurrence. Targeted health system strengthening relies on a systematic analysis of the events that lead to deaths in order to determine if avoidable breakdowns in medical care are present. If such deficiencies exist, fully characterizing them and pinpointing precisely where in the clinical care continuum they occur provides clinicians, policy-makers, and other stakeholders with information

needed. Therein lies the rationale behind quality of clinical care in maternal death audit reviews. Review of quality of clinical care in maternal death audit leads to good practices as well as ensuring the continuous professional education of health practitioners. Mortality audits have demonstrated success in helping to reduce childbirth-related deaths in lower income countries⁹⁻¹².

The concept of quality in healthcare is one with diverse opinions and schools of thought¹³. The Institute of Medicine (IOM) of the United States of America defines quality in healthcare as 'the extent to which health services provided to individuals and patient populations improve desired health outcomes'. The IOM defines six parameters for assessing the quality of health services namely: safety, effectiveness, patient-centeredness, efficiency, timeliness and equity¹⁴.

The Ghana Health Service (GHS) defines quality of healthcare as 'the proper performance (according to standards) of interventions that are known to be safe, affordable to society and impact positively on morbidity, disability and mortality'¹⁵. The GHS prescribes two perspectives for looking at the topic of quality of healthcare services: the client's perspective and the technical perspective. The client's perspective considers issues as seen by users of health services such as attitude of health staff, affordability, respect for patients' rights, promptness of services, cleanliness of premises and availability of medications. The technical perspective on the other hand looks at the how well the services are rendered when compared with professional standards. Issues considered here include institutional mortality, infection prevention, and adherence to standard Operating Procedures (SOPs), availability and use of technology, adequate human resource, health outcomes and stewardship¹⁵.

At present, we have little indication of the amplitude of the quality of service problem. One of the reasons for this knowledge gap is the difficulty inherent to measuring the quality of care practice at the patient level. There are several methods for measuring quality medical practice: standardized patients, direct observation, vignettes, and chart abstraction. Standardized patients

require a trained actor to engage medical professionals in a clinical examination related to a topic of research interest. For obvious reasons, it is impossible for an actor to convincingly recreate the birth process and other gynaecological problems. It is also possible to measure quality of care through direct observation, but this method is subjective and risks the Hawthorne effect. Finally, there are vignettes and chart abstraction. Vignettes are written scenarios involving a fictitious patient¹⁶. Work in high-income countries show that vignettes have promising measurement properties¹⁷ but there are limitations: they measure individual provider knowledge versus team practice, no validation studies have been conducted in low-income countries, and current tools target physicians versus midwives or other lower-cadre staff.

Chart abstraction is a general term for when researchers retrieve predefined information from patient medical records and compare that information against agreed-upon standards of care. A criterion-based clinical audit (CBCA) is a specific type of chart abstraction that can be effectuated by non-medically qualified audit assistants. Assistants screen the medical records of patients and extract relevant data. Standardized criteria for evaluating good quality care are predetermined and then compared against extracted data to evaluate whether or not a minimal standard of care has been met^{17, 18}. CBCA are gaining attraction in the domain of obstetrical and gynaecological care in resource-limited settings, as they can dually serve to measure and improve care¹⁶.

In August 2012, the Ministry of Health (MOH), Ghana organized joint monitoring visits to three regions in Ghana - Ashanti, Greater Accra and Central regions. In each region, the team visited a teaching hospital, a regional and a district hospital. Ridge Hospital (a Regional hospital) in Greater Accra was among the audited hospitals¹⁹. The visit focused on maternal mortality audit. Findings in all the three regions indicated that although guidelines for conducting maternal death audits existed they were not widely disseminated nor used. The structures for implementing the maternal death audit were not operating

satisfactorily. Hospitals that performed (maternal) death audits did so in isolation without the participation of other parties that might have contributed.

A year after the MOH team report, a team from the Ghana College of Physicians and Surgeons visited the Ridge Hospital to review the maternal deaths by assessing quality of care. The selection of this period was also based on the fact that it had the highest proportion of audited maternal deaths in the hospital. Also, forms for maternal audit were revised by the Ministry of Health (MOH), Ghana and made available for use in 2012. Therefore the team wanted to review maternal deaths based on the revised forms.

The Ridge hospital in the Greater Accra Region of Ghana was built in the pre-independence era of Ghana and has maintained an initial bed capacity of one hundred and ninety-one (191) beds up to date. The hospital was built to cater for one thousand five hundred annual deliveries but has been conducting an average of eleven thousand deliveries over the past ten years. In the year 2012 - 2013, a total of 11,364 deliveries were conducted at the hospital²⁰. It has four (4) obstetrician-gynaecologists, and twenty-seven (27) midwives. It has two theatre spaces for surgical procedures²⁰.

Methodology

Study Design: This is a retrospective descriptive review of the quality of care of all maternal deaths for a period of one year using criterion-based clinical audit. The method comprised review of the patients' case notes, physical inspections as well as key informant and in-depth interviews with clinical staff.

Procedure: All available maternal deaths folders and audit forms were identified and selected from January to December, 2012. All maternal deaths were examined per the WHO definition on individual basis. Each patient's case notes were examined from the technical perspectives. This included case-notes to determine proper documentation, involvement of senior clinicians, clinical management, follow-up, drug administration, laboratory tests and results.

The overall management of the patient was classified as standard or substandard based on the scoring system from the Quality of Care Review Form adapted from the Komfo Anokye Teaching Hospital (KATH) Maternal Death Audit Evaluation Committee²¹. This is similar to the criterion-based clinical audit Form of Pirkle *et al.*²².

The Quality of Care Review Form adapted from the Komfo Anokye Teaching Hospital (KATH) Maternal Death Audit Evaluation Committee was suitable to the socio-cultural needs of Ghana. This measuring instrument had already been used in four different hospitals (Northern part of Ghana, Ashanti, Greater Accra as well as the Eastern and Central parts of Ghana). These have different geography and culture but reliable and valid results have been obtained. The review examined the quality of care in thematic areas (Table 1).

Table 1: Assessment of Quality of Care under Thematic Areas at the Ridge Hospital

Thematic areas
Documentation
Involvement of Senior Clinicians in the Management of cases
Laboratory related issues particularly in relation to blood and blood products
Promptness of Care
Adequacy of intensive care facilities and specialists in the hospital

Different weights were assigned to the various elements. A maximum score of two (2) and a minimum of zero (0) were assigned to the answer for each question. A score of two meant that the component of quality care for the question was fulfilled while a score of (1) meant that the quality of care was inadequate. A score of zero indicated poor quality of care. A panel of three members were involved in the scoring. To remove biases, each panel member gave his own score on the blind side of the other panel members and their justification of the score. Following this, panel members presented their scores and average score stricken for each question. All panel members were residents of the Ghana College of Physicians and Surgeons with a background in biostatistics.

Data was inputted by the same panel members. Promptness of care was within the context of delay in receiving appropriate care at the hospital and was defined as time taken by a senior clinician to review a case once he/she had been informed about it, the time taken for procedures and treatments to be administered to the patient. Promptness also included time taken for specialists from other clinical specialties other than Obstetricians to review after they had been alerted. We took into consideration, other equally pressing emergencies under the circumstances in the hospital.

Documentation involved ascertainment of recordings of all the key elements in the nurses and doctors' notes—history taking, physical findings, differential diagnosis, lab tests and results, as well as final diagnoses, and outcomes; nurses notes, drug administration etc. Inadequate description of events or missing data was classified as poor documentation. Where vital information was omitted such as drug administration, key informant interview was conducted to ascertain whether it was due to poor documentation or that the drug in question was not given. Scores were given separately for documentation and drugs administration as indicated in Table 2.

If more than 50% of the questions scored 2, the quality of care was deemed to have been fulfilled; if equal numbers of the questions scored 0, 1 and 2 then the quality was unsatisfactory. Each score was entered into an access database created using Epi info version 3.5.4, 2008. Data analysis was conducted using frequency distribution for all variables.

Ethical Approval

The study was approved by the Ghana College of Physicians and Surgeons Faculty of Public Health Board and the Ridge Hospital Administrative Board.

Results

Thirty – three maternal deaths were reviewed.

Table 2: Quality of Care Review Form adapted from the Komfo Anokye Teaching Hospital (KATH) Maternal Death Audit Evaluation Committee

Final criteria (n=35) for the obstetrical CBCA assessment		
Domain	Criteria	Score
History taking	Time of arrival of mother to the facility Condition of the mother at arrival Number of prenatal visits Age Gravidity Parity	
Clinical examination	Uterine height Cardiac frequency Blood pressure Temperature Fetal presentation Fetal heart beat Membranes/amniotic fluid Cervical dilatation	
Differential Diagnosis		
Time of arrival of Medical doctor		
Rank of Medical doctor		
Drug Administration	Treatment chart availability Completeness of treatment chart Signature of Health personal involved	
Follow up of case	Review of patient Dates of review	
Laboratory analyses	Blood type Availability of blood type in the hospital blood blank Rhesus factor HIV test Syphilis test	
Monitoring during childbirth	Name of birth attendants Qualification of birth attendants Time of placental expulsion Oxytocin given Time of birth given	
Postpartum monitoring	Follow-up examination Exit examination Date of discharge Vital status of the infant at birth	
Adequacy of intensive care facilities and specialists in the hospital	Attended to by a specialist Availability of theatre space	

*Source: KATH Management Information System, Kuamsi-Ghana, 2013.

Results of Thematic Analysis on Factors Leading to Substandard Care

Table 3 gives a summary of the scores for thematic areas that were quantified.

Table 3: Showing Quantitative scores of thematic areas of Quality of Care, CBCA Review of Maternal Deaths.

Quality of care criteria for N=33	Adequate: Freq(%)	Inadequate: Freq(%)	Poor: Freq(%)
Documentation	18(54.5)	2(6.1)	13(39.4)

Nurses' notes			10(30.3)
Doctors' notes			3(9.1)
Involvement of Senior clinicians	26(85)	3(2.9)	4(12.1)
Promptness of care	29(87.9)	0(0.0)	4(12.1)

Documentation

None or poor documentation of observations and subsequent actions taken was a significant factor in the review of the quality of care. Both doctors - 3 (9.1%) and nurses - 10 (30.3%) were found to poorly document actions in clinical and nursing notes (Table 3).

Non - Involvement of Senior Clinicians in the Management of cases

Even though 85% of these cases were seen by senior clinicians – specialists 25(75.8%) and senior medical officers, 3(9.1%) respectively; four, 4 (12.1%) of them were not seen by senior clinicians (Table 3).

Laboratory related issues particularly in relation to blood and blood products

The Laboratory services were found to have contributed to poor quality of care. Delays in receiving blood or blood products were identified as contributory factors. There was a case in which an urgently needed blood type was not available in the blood bank.

Promptness of Care

For 29 (87.9%) of the maternal deaths, there was promptness of care except in four (4) of the cases (12.1%).

Adequacy of intensive care facilities and specialist in the hospital

Although the hospital has intensive care facilities and specialists at the OB-GYN department, such facilities and services were not readily available because of the sheer number of patients involved.

Discussion

Some doctors failed to document the times that they saw patients in the case notes. Other issues of poor documentation noted included non-availability of laboratory results where it was requested; inadequate administration of drugs in the nursing notes even though drugs had been fully prescribed in the doctor's case-folder. For all the key elements in a medical record—history, physical findings, differential diagnosis, lab tests and results, as well as final diagnoses, and outcomes—healthcare providers differed in how they observed, measured, interpreted, and reported their findings but at the end, differential diagnoses were comparable. Lowenstein²³ and Badcok *et al*²⁴ also indicated similar findings that medical case notes typically were multi-authored, the quality of documentation within and across medical case notes varied. Therefore, the quality of the data extracted was dependent on the completeness and accuracy of what the healthcare providers actually documented in the record²⁵.

When there was no written entry in the medical case notes and that of the nurses the panel members interviewed key staff because this did not necessarily mean that care or treatment was not given²⁶. Other possible explanations for missing information could be that the healthcare providers failed to elicit important information, failed to record information they obtained or care they gave, or that patients could not recall their symptoms and illnesses or they deliberately withheld pertinent information²⁶.

Regardless of the reason, if the panel members could not find the relevant information in the case notes, they searched among the supporting documents or solicited the information during the interviews. Information might have been missed, particularly if the information of interest was presented as a single word, or only reported once in the entire text²⁷.

The issue of non-involvement of senior clinicians became evident when 4 (12.1%) were not seen by senior clinicians. Junior clinicians and midwives in the front line seeing women attending

as emergencies need proper support and back up and need to have clear guidelines about when to seek senior help. It is expected that they do not manage emergencies alone, and if they ask for help and review, they should be supported. Junior clinicians and nurses need to communicate the gravity and urgency of the situation clearly when discussing patients with their superiors, who should ensure that they have asked enough questions to enable themselves to assess the situation fully and whether they need to attend in person.

On the issue of laboratory services, even though there was a 24 hour service there were delays and lack of some blood-types despite the fact that caesarean sections and blood transfusions are key components of comprehensive emergency obstetric care²⁸. An estimated fifty percent of maternal mortalities recorded in Accra in 2011 were as a result of the non availability of blood for onward transfusion to the pregnant women who needed it²⁹. A policy that seeks to command political involvement at all levels starting from the grass roots involving local government officials, high level politicians right up the president of the Republic of Ghana should result in a sustainable campaign for blood donation.

Some reasons for promptness of care in this study were due to specialists attending to equally pressing emergencies. For example, the few anaesthetists were also engaged in other emergencies in this hospital of study. Other studies conducted elsewhere³⁰ indicated that lack of blood, lack of electricity, lack of theatre space were some of the reasons for the delay.

The large workload for staff at the obstetrics and gynaecology department occurred as a result of overcrowding in some of the wards, particularly, the female ward, where most deaths occurred. The fewer number of midwives on duty per shift and the large numbers of women in labour presented a challenge for effective monitoring of the progress of labour and delivery. As indicated above, this hospital was built in the colonial era with a bed capacity of 191. This hospital initially built for 1,500 to 2,000 births a year now handles over 10,000 births. In 2012

alone, there were over 11, 000 birth deliveries. This calls for political will for the immediate expansion and upgrading of the facilities at the department.

Limitations

There may have been biases with respect to the answers provided by the staff on the qualitative aspect of in-depth interview mainly because they did not want to put the hospital in disrepute.

Conclusions

This study attempted to throw light on some quality of care factors which were important in maternal deaths in a regional hospital. Poor documentation, non- involvement of senior clinicians, availability of blood as well as over-utilised hospital resources were brought to the fore. The maternal death review with emphasis on quality of care, coupled with facility gap assessment, is a useful tool to address the adequacy of emergency obstetric and gynaecological care services to prevent further maternal deaths.

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Contribution of Authors

All authors contributed to the conception and design of the study as well as data collection and analysis and the manuscript preparation. All authors mentioned in the article approved the manuscript.

References

1. World Health Organization Health statistics and health information systems. Maternal mortality ratio (per 100,000 live births) www.who.int/healthinfo/statistics/inmaternalmortality/en/. Accessed, 5th February, 2014.
2. World Health Organisation: Trends in Maternal

- mortality: 1990-2013: estimates developed by WHO, UNICEF, UNFPA and the World Bank. Geneva: WHO; 2013.
3. World Health Organisation: Media Centre: Maternal Mortality: Fact sheet no. 348; updated May 2014. Accessed at <http://www.who.int/mediacentre/factsheets/fs348/en/>.
 4. Ghana Health Service Institutional Records. Maternal Mortality Factsheet: 2012. Accra-Ghana.
 5. Kilpatrick SJ, Berg C, Bernstein P, Bingham D, Delgado A, Callaghan WM, Harris K, Lanni S, Mahoney J, Main E, Nacht A, Schellpfeffer M, Westover T, Harper M. Standardized severe maternal morbidity review: J Obstet Gynecol Neonatal Nurs. 2014 Aug;124(2Pt1):361-6.doi:10.1097/AOG. 0000000000000397.
 6. Centre for Maternal and Child Enquiries (CMACE). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. BJOG 2011;118 (Suppl. 1):1–203.
 7. Isabella D, Wendy JG, Ties B. Maternal death surveillance and response. Bulletin of the World Health Organization 2011; accessed at <http://www.who.int/bulletin/volumes/89/11/11-097220/en>.
 8. Mancey-Jones M, Brughra RF. Using perinatal audit to promote change: a review. Health Policy Plan 1997, 12(3):183–192.
 9. Lawn JE, Blencowe H, Pattinson R, Cousens S, Kumar R, Ibiebele I, Gardosi J..
 10. Day LT, Stanton C. Stillbirths: where? when? why? how to make the data count?.
 11. Lancet 2011, 377(9775):1448–1463.
 12. Pattinson R, Kerber K, Waiswa P, Day LT, Mussell F, Asiruddin SK, Blencowe H, Lawn JE: Perinatal mortality audit: counting, accountability, and overcoming challenges in scaling up in low- and middle-income countries. Int J Gynaecol Obstet 2009,107 (Suppl 1):S113 –S121. S121-112
 13. Dumont A, Fournier P, Abrahamowicz M, Traore M, Haddad S, Fraser WD: Quality of care, risk management, and technology in obstetrics to reduce hospital-based maternal mortality in Senegal and Mali (QUARITE):a cluster-randomised trial. Lancet 2013,382 (9887):146–157.
 14. Kidanto HL, Wangwe P, Kilewo CD, Nystrom L, Lindmark G. Improved quality of management of eclampsia patients through criteria based audit at Muhimbili National Hospital, Dar es Salaam, Tanzania. bridging the quality gap. BMC Pregnancy Childbirth 2012, 12:134
 15. Buttel P, Hendler R, Daley J. Quality in Healthcare: Concepts and Practice. The Business of HealthCare. Accessed at healthcarecollaboration.typepad.com/healthcare.../quality_buttell.pdf.
 16. Institute of Medicine (IOM) .2001.Crossing the quality chasm: A new health system for the 21st century. pp 23-38.
 17. Institutional Care Division of the Ghana Health Service. Quality assurance strategic plan for GHS 2007-2011. pp 19-20.
 18. Pirkle CM, Dumont A, Traore M, Zunzunegui M. Validity and reliability of criterion based clinical audit to assess obstetrical quality of care in West Africa. BMC Pregnancy and Childbirth 2012 12:118 doi:10.1186/1471-2393-12-118
 19. Peabody JW, Luck J, Glassman P, Jain S, Hansen J, Spell M, Lee M. Measuring the Quality of Physician Practice by Using Clinical Vignettes: A Prospective Validation Study. Ann Intern Med 2004, 141(10):771-780. PubMed Abstract Publisher Full Text
 20. Koblinsky M. Reducing Maternal Mortality: Learning from Bolivia, China, Egypt, Honduras, Indonesia, Jamaica, and Zimbabwe. The World Bank, Washington D.C; 2003.
 21. Ministry of Health, Ghana: Joint Monitoring!Report . Accessed at www.moh-ghana.org./Joint%20monitoring%20report%20-%20august.
 22. Ghana Health Service Institutional Records. Reproductive and Child Health Unit, Greater Accra Regional Health Administration Factsheet, 2012. Accra-Ghana
 23. Maternal Death Quality of Care Evaluation Form. Komfo Anokye Teaching Hospital Management Information System Department, 2012. Kumasi-Ghana.
 24. Catherine M, Pirkle CM, Dumont A, Traore M, Zunzunegui M. Validity and Reliability of Criterion Based clinical audit to assess obstetrical quality of care in West Africa. BMC Pregnancy and Childbirth 2012 12:118 doi:10.1186/1471-2393-12-118.
 25. Lowenstein S. Medical record reviews in emergency medicine: the blessing and the curse. Ann Emerg Med 2005, 45:452-455. PubMed Abstract Publisher Full Text
 26. Badcock D, Kelly A, Kerr D, Reade T. The quality of medical record review studies in the international emergency medicine literature. Ann Emerg Med 2005, 45:444-447.PubMed Abstract Publisher Full Text.
 27. Siegler E: The evolving medical record. Ann Intern Med 2010, 153:671-677. PubMed Abstract Publisher Full Text.
 28. De Marinis M, Piredda M, Pascarella M, Vincenzi B, Spiga F, Tartaglino D, Alvaro R, Matarese M. 'If it is not recorded, it has not been done!?' consistency between nursing records and observed nursing care in an Italian hospital. J Clin Nurs 2010, 19:1544-1552. PubMed Abstract Publisher Full Text.
 29. Engel L, Henderson C, Fergenbaum J, Colantonio A. Medical record review conduction model for

- improving interrater reliability of abstracting medical-related information. *Eval Health Prof* 2009, 32:281-298. PubMed Abstract.
30. Bates I, Chapotera G, McKew S, van den Broek N. Maternal mortality in sub-Saharan Africa: the contribution of ineffective blood, 2013. Available at: [www.mamaye.org.gh /sites/default/.../Ghana %20blood%20factsheet_1.pdf](http://www.mamaye.org.gh/sites/default/.../Ghana%20blood%20factsheet_1.pdf).
 31. Carboo T. Fifty percent (50%) of maternal mortality due to lack of blood for transfusion. Donor Services Records, 2011. Korle-Bu Teaching Hospital, Accra.
 32. Mamady C. Maternal Mortality in the Gambia: Contributing factors and what can be done to reduce them. A thesis submitted As partial fulfillment for the award of the Master of Philosophy Degree in International Community Health .Accessed at www.ncbi.nlm.nih.gov.Journal List>Reprod Health v.2; 2005.