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ABOUT AJRH

African Journal of Reproductive Health (AJRH) is published by the Women’s Health and Action Research Centre (WHARC). It is a multidisciplinary and international journal that publishes original research, comprehensive review articles, short reports and commentaries on reproductive health in Africa. The journal strives to provide a forum for African authors, as well as others working in Africa, to share findings on all aspects of reproductive health, and to disseminate innovative, relevant and useful information on reproductive health throughout the continent.

AJRH is indexed and included in Index Medicus/MEDLINE. The abstracts and tables of contents are published online by INASP at http://www.ajol.info/ajol/ while full text is published at http://www.ajrh.info and by Bioline International at http://www.bioline.org.br/. It is also abstracted in Ulrich’s Periodicals, Feminist Periodicals African Books Publishing Records.

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The Women’s Health and Action Research Centre (WHARC) is a registered non-profit organization, committed to the promotion of women’s reproductive health in sub-Saharan Africa. Founded in 1995, the centre’s primary mission is to conduct multidisciplinary and collaborative research, advocacy and training on issues relating to the reproductive health of women. The centre pursues its work principally through multidisciplinary groups of national and international medical and social science researchers and advocates in reproductive health.

WHARC receives core funding and support from the Ford Foundation and technical cooperation and mentorship from International Perspectives on Sexual and Reproductive Health and Studies in Family Planning. Principal funding for the journal comes from the Consortium on Unsafe Abortion in Africa. The goal of the centre is to improve the knowledge of women’s reproductive health in Nigeria and other parts of Africa through collaborative research, advocacy, workshops and seminars and through its series of publications – the African journal of Reproductive Health, the Women’s Health Forum and occasional working papers.

ISSN: 1118-4841

Women’s Health and Action Research Centre @2013
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La Revue Africaine de santé de la Reproduction (RASR) est publié par le Women’s Health and Action Research Centre (WHARC). C’est une revue à la fois pluridisciplinaire et internationale qui publie des articles de recherche originaux, des articles de revue détaillés, de brefs rapports et des commentaires sur la santé de la reproduction en Afrique. La Revue s’efforce de fournir un forum aussi bien à des auteurs africains qu’a des professionnels qui travaillent en Afrique, afin qu’ils puissent partager leurs découvertes dans tous les aspects de la santé de reproduction et diffuser à travers le continent, des informations innovatrices, pertinentes et utiles dans ce domaine de santé de la reproduction.


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Le WHARC est une organisation non gouvernementale à but non-lucratif s’engage dans la promotion de santé de la reproduction chez la femme en Afrique sub-saharienne. Fondé en 1995, le Centre a pour objectif principal de mener des recherches pluridisciplinaires et en collaboration, de promouvoir et de former des cadres en matières relatives à la santé de la reproduction chez la femme. Le Centre travaille surtout à travers des groupes multidisciplinaires de chercheurs aussi bien nationaux qu’internationaux en sciences médicales et en sciences économiques dans le domaine de santé de la reproduction.

Le WHARC reçoit une aide financière principale de la Fondation Ford et bénéficié de la coopération technique de l’International Perspectives on Sexual and Reproductive Health et de Studies in Family Planning. Le financement principal pour la revue vient de la part du Consortium on Unsafe Abortion in Africa. L’objectif du Centre est d’améliorer la connaissance en matière de santé de la reproduction chez la femme au Nigeria et dans d’autres régions d’Afrique à travers la recherche en collaboration, le paydoyer, des ateliers et des séminaires à travers des séries de publication - La Revue africaine de santé de la reproduction, Le Women’s Health Forum et des rapports des recherches de circonstance.
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Nigerian Centenary Award Beneficiary: Professor Kelsey Atangamuerimo Harrison

Professor Kelsey Harrison, an internationally renowned professor of Obstetrics and Gynaecology, former Vice-Chancellor of the University of Port Harcourt, and a long-time reviewer, adviser and mentor of the African Journal of Reproductive Health, who wrote the first editorial on the debut of the journal in 1997, was one of the 100 recipients of the special Centenary Awards bestowed on distinguished Nigerians during the country’s recent Centenary Celebrations. The award was bestowed on him under the category of “Distinguished academic icons – for his distinguished work over many years in the field of childbearing under adverse socioeconomic circumstances with special reference to sub-Saharan Africa, maternal mortality reduction and prevention of vesico-vaginal fistulae” by President Goodluck Jonathan at an impressive ceremony at the Centenary Hall in Abuja on February 28, 2014.

Professor Kelsey Atangamuerimo Harrison was born in Abonnema, Rivers State, on January 9, 1933. He received his primary school education locally at Bishop Crowther Memorial School. After an outstanding secondary school career at Government College Umuahia, he trained at University College Ibadan and at University College Hospital London, graduating MB BS with honours and distinction in Obstetrics and Gynaecology in 1958.

Kelsey Harrison specialised in obstetrics and gynaecology becoming a member in 1964, and a fellow in 1973, of the Royal College of Obstetricians and Gynaecologists in London. Already a foundation member of the Society of Gynaecology and Obstetrics of Nigeria in 1965, he was professor of obstetrics and gynaecology, first in Ibadan (1972), then in Zaria (1972-1981), and lastly in Port Harcourt (1981-1998) where he became that university’s Vice Chancellor (1989-1992), having earlier been the Dean of the Faculty of Medicine of Ahmadu Bello University Zaria. He retired from the Nigerian university system in 1998, and was appointed in July 1999, an emeritus professor of obstetrics and gynaecology at the University of Port Harcourt.

He is a recognised authority on anaemia, sickle cell disease and malaria in pregnancy. His researches on anaemia at Ibadan University led to the development of the solution to the serious life-threatening problem of extreme anaemia in late pregnancy. Also, he was part of a group that discovered the dangerous threat posed by sickle cell disease to maternal and fetal lives, and how best to deal with them. Later studies on malaria in pregnancy by a group in Zaria in which he was an active participant, found out that protecting early teenage pregnant girls against malaria and anaemia conferred a hitherto unknown benefit: the protected girls grew taller, they produced bigger babies, yet they had less need for operative deliveries.

However, it is the ground breaking Zaria Maternity Survey by a team he led, that has proved to be his most fruitful effort. Between 1976 and 1979, Harrison and his colleagues collected data on over 20,000 births that when analysed, threw open the problems of traditional forms of interference, of adolescent marriage and pregnancy, of women’s inferior status, and of their neglect in pregnancy, labour and afterwards, and of the consequences of this neglect especially high levels of maternal mortality and obstetric fistula (VVF). Also revealed was the importance of formal education and good general health in making childbearing safer for mother and baby. Harrison concluded that although the real priority in the area is reducing maternal deaths, the real problem to be faced is not so much medical but sociological. These results and conclusions were published by British Journal of Obstetrics and Gynaecology in October 1985 and titled “Childbearing, Health and Social Priorities – a survey of 22774 consecutive hospital births in Zaria, Northern Nigeria” The change in thinking expounded by this work made a huge impact. What followed was first the launching of the worldwide Safe Motherhood Initiative in 1987 by WHO, UNICEF, World Bank and other agencies. Next, various UN agencies launched the worldwide campaign “Education for All” at Jonitien in Thailand in 1990, then the international conference on Population and Development in 1994 in Cairo, next the World Conference on Women in 1995 in Beijing, China, and finally the United Nations Millennium Declaration of 2000 in New York.
Still in Zaria, Harrison seemed to be unstoppable. The activities of the team Kelsey Harrison led, (fellow specialists, medical doctors, sociologists, nurses and midwives, top government functionaries in Kano and Kaduna State, and concerned individuals in the Zaria-Kaduna areas) succeeded in eradicating VVF in the Zaria area in the 1970s. The same determination resulted in the formation of a Nigerian Non-Governmental Agency - National Foundation of VVF - in 1990, and whose efforts placed the surgical treatment of VVF in Nigeria’s national agenda. The current on-going worldwide assault on VVF followed.

Ever since he became a College Scholar of University College Ibadan (1952-55) Kelsey Harrison’s career was marked by various honours and awards. He earned the Doctor of Medicine degree of University of London in 1969 with a thesis on Blood Volume in Severe Anaemia in Pregnancy. In 1987, he received the triennial George Macdonald Medal awarded jointly by the Royal Society of Tropical Medicine and Hygiene and the London School of Hygiene and Tropical Medicine. The degree of Doctor of Science (Medicine) London came in 1988, followed by the Nigerian National Order of Merit in 1989. The George Macdonald Medal is awarded “for outstanding research leading to improvement of health in tropical countries.” The citation on the occasion of the conferment of this award added “He (Kelsey Harrison) has made an enormously important contribution to public health in Nigeria, and Africa generally, for which future generations of women will be grateful”. He is a Fellow of the Academy of Science of Nigeria since 1988. For ten years, 1991 – 2001, he was a Foundation Member of the International Advisory Board of The Lancet medical journal. He delivered in 1996, the prestigious William Meredith Fletcher Shaw Memorial Lecture for the year 1995 at the Royal College of Obstetricians and Gynaecologists in London and titled “Poverty, deprivation and maternal health”. In 2009, the Government of Rivers State of Nigeria named its newest hospital in Port Harcourt, after him. He received in December 2011, the Nigerian Universities Distinguished Professors award. His latest public lecture is the 7th Professor Olikoye Ransome Kuti Memorial Lecture delivered on 1 June 2012 in Lagos and titled “Reducing Maternal Mortality in Nigeria: Looking Back and Looking Forward”.

He was involved in many rehabilitation processes in Nigeria at various levels after the civil war of 1967-70. In Rivers State, it was the rehabilitation of the maternity services destroyed through military operations, and the planning of a new specialist hospital for the state. In Ibadan, it was the reabsorption of students of Eastern Nigeria origin, whose studies were interrupted during the civil war.

On retirement from the Nigerian university system in 1998, he moved to Finland where he lives with his wife, Irma, herself a retired public health chief matron. His son, his daughter, and two teenage granddaughters, live in United Kingdom.

Kelsey Harrison’s contribution to scientific literature is well known. Besides the report on the Zaria Maternity Survey, a textbook, he co-edited and titled “Maternity Care in Developing Countries” was published in 2001. His autobiography published in 2006 is titled “An Arduous Climb: from the Creeks of the Niger Delta to a Leading Obstetrician and University Vice Chancellor”. His experiences in the rehabilitation of the maternity services of Rivers State during the Nigerian Civil War of 1967 to 1970 are graphically told in it. His latest work titled “Sowing the seeds of safe motherhood in Sub Saharan Africa” and published in 2010, is a compilation of some of his published scientific papers from 1966 to 2010.

Kelsey Harrison loves classical music, gardening, and sports ranging from football to ice hockey. Good at games, he played cricket for Nigeria in the 1950s and 60s, as opening batsman and wicket keeper.

The African Journal wishes him and his family well on this occasion, and more fruitful years of patriotic services to his fatherland.
The World Health Organization defines a traditional birth attendant (TBA) as: “a person (usually a woman) who assists a pregnant woman at childbirth, and who initially acquired her skills delivering babies by herself or working with other TBAs”. Estimates indicate that between 60-90% of births in some parts of sub-Saharan Africa are assisted by TBAs, with countries such as Chad, Niger and Nigeria reaching extremely high proportion of TBA-attended deliveries. A report from the Cameroon suggests that less than 50% of births are attended by skilled birth attendants (i.e. nurses, midwives and doctors), whereas about 26.8% are attended by family members, 22.2% by TBAs and 5.9% by women themselves.

While the prevalence of TBA-births is high in many parts of Africa, the question remains unanswered as to whether this situation is healthy for the promotion of maternal health in the continent. Increasing women’s access to skilled birth attendants is one of the proven interventions for reducing maternal mortality around the world. Countries such as Sweden, Finland and the Netherlands with lower rates of maternal mortality have nearly 100 percent skilled birth utilization rate, while there is increasing propensity by governments in high-income countries to promote and sustain women’s access to quality, evidence-based maternity care. In the few areas in the United States, for example where maternal mortality has been known to rise, this was largely due to women using traditional, and non-evidence based forms of care due to personal or religious convictions.

Interestingly, the attainment of optimal rates of skilled birth attendants in countries with high prevalence of maternal mortality is one of the sub-goals of the Millennium Development Goals. Furthermore, the result of a systematic review has failed to show any association between the training of TBAs and declines in rates of maternal mortality. Consequently, the WHO recommends that countries seeking accelerated reduction in maternal mortality should concentrate on increasing the access of pregnant women to skilled birth attendance. Yet, recent reviews and documentations continue to recommend TBA re-training and use by African countries, mainly based on arguments relating to the scarcity of skilled birth attendants, the lower cost of services by TBAs and community/traditional acceptance of the services they provide.

This edition of the African Journal of Reproductive Health features two articles that explore the use of TBAs versus skilled birth attendants for maternity care in two African countries. The paper by Lerberg and Sundby and their colleagues from the Gambia indicate that rural women are aware of the benefits of delivering in orthodox health care institutions with skilled providers. Among rural women interviewed, only about 27% had planned to deliver at home, but nearly 70% later were eventually delivered at home by TBAs. This tendency to deliver with TBAs despite women’s initial plan to deliver in hospital was due to personal constraints in reaching their preferred places of delivery. Up to 75% reported not having enough time to go to hospitals, while 30% indicated that this was due to lack of transportation. Thus, interventions based on provision of social safety nets in terms of cost reduction, transport provision and conditional cash transfers for women who seek hospital delivery would likely be effective in increasing the proportion of women delivered by skilled birth attendants in this population of women.

The second paper by Gloria Hamela and her colleagues from Malawi, demonstrate that although TBAs may not be effective in reducing
Okonofua & Ogu

maternal mortality, they can be engaged in the provision of various components of maternal health care. The team showed that training TBAs on prevention of mother to child transmission of HIV was effective in improving women’s access to HIV counselling, testing and treatment in the Kawale District of Malawi. Malawi, a country with the most comprehensive option B+ policy on prevention of mother to child transmission of HIV in Africa, is evidently aware that without engaging traditional forms of care that women use for maternity care, it would be unable to scale up this policy to reach all categories of vulnerable women. Thus, deploying TBAs to counsel women and referring them to the formal health care system for orthodox evidence-based care is a novel approach that requires replication throughout the African continent.

The point being made in this edition of the journal is to propose that African countries would need to pursue policies on integrating TBAs to formal systems of health care, not necessarily for the purpose of achieving immediate maternal mortality reductions, but to achieve scale and improved intermediate outcomes for maternal health. Such interventions should best focus on re-directing women from traditional forms to modern maternity care, providing simple and correct information on maternal health care to women, and linking rural women to primary prevention methods, including modern family planning methods. Examples of such novel use of TBAs are beginning to emerge in many parts of Africa. In Sierra Leone, the World Bank is funding a scheme whereby it pays £1 for every woman that a TBA brings to the hospital. Also in Cameroon, a maternal and child e-health project is underway called “call a midwife” in which TBAs will be provided with modern communication methods to enable them link up to formal service providers for the purpose of averting deaths in the hands of TBAs due to complications. The Abiye maternal health project in Ondo State of Nigeria includes registration of all pregnant women in the state, their linkage to formal health providers with mobile phones and the provision of completely free tertiary level maternity care. Such innovative safety nets provided to poor vulnerable women will help increase the use of evidence-based maternity care and improve both intermediate and immediate indicators of maternal health.

We conclude that the high rate of maternal mortality in parts of Africa can be better tackled if a proactive approach is developed for increasing women’s access to modern maternity care. Knowing that women die from complicated deliveries for which TBAs are ill-prepared to handle, but accepting that it would be difficult to completely do away with TBAs in the short term, we recommend a policy shift that engages TBAs to deal with intermediate components of maternal health care. As the determinants of TBA use in sub-Saharan Africa are driven by ignorance, illiteracy and poverty, a long term approach will be to focus on women’s education and socio-economic empowerment, and the re-organization of the health care system to target and implement appropriate safety nets for the protection of the reproductive health and rights of women.

Conflict of Interest

None

References

Le Traditionnel contre les accoucheuses dans la dispensation de soins de maternité: Appel à un changement de paradigme

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L'Organisation mondiale de la santé1 définit une accoucheuse traditionnelle (AT) comme: "une personne (généralement une femme) qui assiste une femme enceinte à l'accouchement, et qui a initialement acquis ses compétences en faisant accoucher par elle-même ou en travaillant avec d'autres accoucheuses traditionnelles". Les estimations indiquent que, entre 60-90% des naissances dans certaines régions de l'Afrique subsaharienne sont assistées par des accoucheuses traditionnelles, avec des pays comme le Tchad, le Niger et le Nigeria atteignant une proportion extrêmement élevée des accouchements assistés par des ATs. Un rapport du Cameroon2 suggère que moins de 50% des accouchements sont assistés par des accoucheuses qualifiées (c.-à-d infirmières, sages-femmes et médecins), alors qu’environ 26,8% sont en présence des membres de la famille, 22,2% par des accoucheuses traditionnelles et 5,9% par les femmes elles-mêmes.

Bien que la prévalence des naissances assistées par le AT soit élevée dans de nombreuses régions d'Afrique, la question reste sans réponse quant à savoir si cette situation est idéale pour la promotion de la santé maternelle dans le continent. L'augmentation de l'accès des femmes à des accoucheuses qualifiées est l'une des interventions confirmées pour réduire la mortalité maternelle dans le monde. Des pays comme la Suède, la Finlande et les Pays-Bas qui ont des taux les plus bas de mortalité maternelle ont près de 100 pour cent de taux d'utilisation des accoucheuses qualifiées, alors qu'il y a de plus en plus tendance par les gouvernements dans les pays à revenu élevé à promouvoir et à soutenir l'accès des femmes aux soins de maternité de bonne qualité. En conséquence, l'OMS recommande que les pays recherchant la réduction accélérée de la mortalité maternelle doivent se concentrer sur l'accroissement de l'accès des femmes enceintes aux accoucheuses qualifiées. Pourtant, les récentes critiques et documentations3,4 continuent de recommander qu'on donne la priorité à des ATs et à l'utilisation des ATs par les pays africains, principalement fondées sur des arguments relatifs à la rareté des accoucheuses qualifiées, la baisse du coût des services par les accoucheuses traditionnelles et l’acceptation par la communauté / la traditionnelle des services qu'elles dispensent.

Cette édition de la Revue africaine de santé de la reproduction comprend deux articles qui exploitent l'utilisation des ATs pour les soins de maternité dans deux pays africains. L'article de Lerberg et Sundby5 et leurs collègues de la Gambie indique que les femmes rurales sont conscientes des avantages d'accoucher dans des établissements de soins qui disposent des dispensateurs qualifiés. Parmi les femmes rurales qui ont été interrogées, seulement 27% avaient l'intention d'accoucher à domicile, mais presque 70% avaient accouché plus tard à domicile sous l'assistance des ATs. Cette tendance à accoucher
à l’aide des ATs malgré les décisions initiales des femmes d’accoucher dans un hôpital était dû aux contraintes personnellement rencontrées pour atteindre les lieux d’accouchement préférés. Jusqu’à 75% ont déclaré qu’elles n’avaient pas assez de temps pour y arriver alors que 30% ont indiqué qu’elles n’avaient pas pu trouver de moyens de transport. Ainsi, les interventions qui sont basées sur la dispensation des filets de sécurité en termes de la réduction du coût, la disponibilité de transport et les transferts conditionnels de l’argent pour les femmes qui recherchent l’accouchement dans l’hôpital seront peut être efficaces dans l’augmentation de la proportion des femmes qui bénéficient de l’assistance des accoucheuses qualifiées dans cette population des femmes.

Le deuxième article de Gloria Hamela et ses collègues de Malawi, démontrent que, bien que les accoucheuses traditionnelles puissent ne pas être efficaces dans la réduction de la mortalité maternelle, elles peuvent être engagées dans la dispensation de divers éléments des soins de santé maternelle. L'équipe a montré que la formation des ATs sur la prévention de la transmission du VIH de la mère à l’enfant a été efficace dans l'amélioration de l'accès des femmes aux services de conseil, de dépistage et de traitement dans le district du Kawale au Malawi. Le Malawi, un pays qui a la politique de l'option B+ la plus complète sur la prévention de la transmission du VIH de la mère à l’enfant en Afrique, est évidemment conscient que sans engager les formes traditionnelles de soins que les femmes utilisent pour les soins de maternité, il serait incapable d'intensifier cette politique pour atteindre toutes les catégories de femmes vulnérables. Ainsi, le déploiement des accoucheuses traditionnelles à conseiller les femmes et de les soumettre au système de soins de santé officiel pour les soins orthodoxes fondés sur des preuves est une nouvelle approche qui nécessite la réplication à travers le continent africain.

Le point qu’on fait dans cette édition de la revue est de proposer que les pays africains devraient poursuivre des politiques sur l'intégration des accoucheuses traditionnelles dans les systèmes formels de soins de santé, pas nécessairement dans le but de parvenir à des réductions immédiates de la mortalité maternelle, mais d’améliorer les résultats intermédiaires pour la santé maternelle. Ces interventions devraient mieux se concentrer sur les femmes et à les réorienter de formes traditionnelles à de soins de maternité moderne, tout en fournissant des informations simples et correctes sur les soins de santé maternelle pour les femmes, et reliant les femmes rurales aux méthodes de prévention primaire, y compris les méthodes modernes de la planification familiale. Des exemples de tel nouvel emploi des accoucheuses traditionnelles commencent à émerger dans de nombreuses régions de l’Afrique. En Sierra Leone, la Banque mondiale finance un projet dans lequel il paie £1 pour chaque femme qui est amenée à l’hôpital par une ATs. Aussi au Cameroun, un projet e-santé maternelle et infantile est en cours appelé "appeler une sage-femme" dans lequel dans les ATs seront intégrés avec les méthodes modernes de communication et liée à des prestataires de services officiels aux fins de la prévention des décès dans les mains des accoucheuses traditionnelles en raison de complications. Le projet de santé maternelle Abiye dans l’Etat d’Ondo du Nigeria comprend l’inscription de toutes les femmes enceintes dans l'état, leur lien avec les prestataires de soins formels avec les téléphones mobiles et la fourniture des soins de maternité de niveau tertiaire complètement libre. Ces filets de protection offerts aux femmes pauvres et vulnérables contribueront à accroître l'utilisation des soins de maternité fondée sur des preuves et d'améliorer les indicateurs intermédiaires et immédiats de la santé maternelle.

Nous concluons que le taux élevé de mortalité maternelle dans certaines régions de l'Afrique peut être mieux résolu si une approche proactive est développée pour améliorer l'accès des femmes aux soins de maternité moderne. Sachant que les femmes meurent d’accouchements compliqués pour lesquels les accoucheuses traditionnelles sont mal préparées à gérer, mais en acceptant qu’il serait difficile de faire complètement disparaître les accoucheuses traditionnelles dans le court terme, nous recommandons un changement de politique qui engage les accoucheuses traditionnelles à s’occuper des composants intermédiaires de soins de santé maternel. Comme
les déterminants de l'emploi des ATs en Afrique sub-saharienne sont entraînés par l'ignorance, de l'analphabétisme et de la pauvreté, une approche à long terme sera de mettre l'accent sur l'éducation des femmes et l'autonomisation socio-économique, et la réorganisation du système de soins de santé pour cibler et mettre en œuvre des filets de sécurité pour la protection de la santé et les droits des femmes.

**Conflit d'intérêts**

Aucun

**Références**


Components of Maternal Healthcare Delivery System Contributing to Maternal Deaths in Malawi: A Descriptive Cross-Sectional Study

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Abstract

In Malawi, it has been observed that some women are dying even when they reach a comprehensive emergency obstetric care facility where the quality is expected to be high and the maternal mortality low. The objective of this study was to describe shortcomings within the maternal healthcare delivery system that might have contributed to maternal deaths in the district of Lilongwe. Retrospectively, 14 maternal deaths that occurred between January 1, 2011 and June 30, 2011 were reviewed. Interviews were conducted with healthcare workers who provided care to the deceased women. Triangulated data from the respective medical charts and interview transcripts were analyzed using a directed approach to content analysis. Excerpts were categorized according to three main components of the maternal healthcare delivery system: skill birth attendant (SBA), enabling environment (EE) and referral system (RS). Most of the shortcomings identified were grouped under SBA. They included inadequate clinical workups and monitoring, missed and incorrect diagnoses, delayed or incorrect treatment, delayed referrals and transfers, patients not being stabilized before being referred and outright negligence. The SBA component should be investigated further. Interventions based on evidence from these investigations may have a positive impact on maternal mortality. (Afr J Reprod Health 2014; 18[1]: 16-26).

Keywords: maternal mortality; maternal death review; healthcare delivery system; skilled birth attendant; Malawi

Résumé

Au Malawi, il a été remarqué que certaines femmes meurent encore, même quand elles arrivent à un établissement de soins obstétricaux d'urgence complets où l'on s'attend à une qualité élevée et à une faible mortalité maternelle. L'objectif de cette étude était de décrire les lacunes dans le système de prestation de soins de santé maternelle qui aurait pu contribuer à la mortalité maternelle dans le district de Lilongwe. Retrospectivement, 14 décès maternels survenus entre le 1er Janvier 2011 et le 30 Juin 2011 ont été examinés. Les entrevues ont été menées auprès de travailleurs de la santé qui dispensent des soins aux femmes décédées. Des données triangulées des dossiers médicaux respectifs et des transcriptions des entrevues ont été analysées à l'aide d'une approche dirigée à l'analyse de contenu. Des extraits ont été classés en fonction de trois principaux composants du système de prestation de soins de santé maternelle: des accoucheuses compétentes (AC), un environnement favorables (EF) et le système de référence (SR). La plupart des lacunes identifiées ont été regroupées sous les CA. Ils comprenaient une croisière d'endurance et la surveillance clinique insuffisante, des diagnostics ratés ou mauvaise qualité, un traitement incorrect ou retardé, les orientations vers les spécialistes et les transferts différés, les patients n'étant pas stabilisés avant d'être orienté vers les spécialistes et la négligence pure et simple. La composante de CA devrait être examinée davantage. Les Interventions fondées sur des données de ces enquêtes peuvent avoir un impact positif sur la mortalité maternelle. (Afr J Reprod Health 2014; 18[1]: 16-26).

Mots-clés: mortalité maternelle, examen de la mortalité maternelle; système de prestation de soins de santé; accoucheuse qualifiée, Malawi

Introduction

Maternal mortality is a major health problem in Malawi, as the maternal mortality ratio is one of the highest in the world at 675 per 100,000 live births¹. Since the late 1990s to date, the government of Malawi has ratified policies and strategies, and implemented several initiatives in response to the maternal mortality crisis. The 2009 National Sexual and Reproductive Rights Policy
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states that all women shall have ready access to essential obstetric care, skilled attendance at childbirth, emergency obstetric care, postpartum care and effective referral and transport. The National Road Map outlines nine strategies for accelerating the reduction of maternal and neonatal mortality and morbidity, and serves as a guide for stakeholders to align with the government’s efforts. Supporting initiatives include the expansion of the Safe Motherhood Project with emphasis on increasing trainings in obstetric life-saving skills and maternal death audit sessions; human resources; infection prevention; providing information, education and communication materials; updating the nurse/midwife technicians’ curricula to include basic emergency obstetric care signal functions; and upgrading hospitals, health centers and maternity units. Two new state of the art maternity facilities opened within a year of each other (the district referral hospital and the central region referral hospital in October 2009 and August 2010, respectively) in the capital city of Lilongwe. Despite these and other efforts, the maternal mortality ratio (MMR) has remained high.

Maternal deaths have been problematized as maternal healthcare delivery system failures, or as malfunctions, that warrant urgent remedial action. These malfunctions may be identified by juxtaposing the maternal deaths along the continuum of obstetric care. The juxtaposition serves as a critical first step to help unearth the underlying problems. It makes breakdowns and blockages within the maternal healthcare delivery system even more glaring and palpable, and helps direct efforts to areas needing further investigation.

Generally speaking, a health care system consists of organizations, people and actions whose primary intent is to promote, restore or maintain health. Though it has several functions, the chief function of a health care system is service delivery, which can be termed health care delivery system.

Throughout safe motherhood literature, three key components of a maternal healthcare delivery system have been emphasized repeatedly as being essential to saving lives and reducing maternal mortality: skilled birth attendants (SBA), an enabling environment (EE) and a functioning referral system (RS). SBA refers to a qualified and competent healthcare provider who provides care to a woman and her newborn during pregnancy, childbirth and immediately after birth. EE describes a context that provides a skilled birth attendant with the necessary backup support to perform routine deliveries to ensure that women with complications receive prompt emergency obstetric care. It includes but is not limited to equipment, supplies, infrastructure, protocols, guidelines and supervision, RS indicates the desired movement from delivery care for normal labor at the primary level to basic and comprehensive emergency obstetric care for obstetric complications at the secondary and tertiary levels of care.

In Malawi, including the district of Lilongwe, maternal healthcare is informally provided by traditional birth attendants. Formally it is provided by midwives, nurse-midwives, clinical officers, general medical doctors and gynecologists/obstetricians. The provision of healthcare occurs at three different levels (primary, secondary, and tertiary) linked by a referral system. Maternal healthcare is offered free of charge in government facilities. At the primary level, maternal healthcare is provided by nurse midwives. They typically manage normal deliveries, with the exception of a few facilities that conduct vacuum extraction. Most Christian Health Association of Malawi (CHAM) hospitals and district hospitals in the public sector provide emergency obstetric care (EmOC), which includes the administration of parenteral antibiotics, oxytocic drugs and anticonvulsants, as well as manual removal of the placenta, the removal of retained products, assisted vaginal delivery, surgery (cesarean sections) and blood transfusions. Facilities that provide the first six are called basic EmOC facilities, while others performing all eight signal functions are called comprehensive EmOC facilities. In the district of Lilongwe, there are five fully functioning basic EmOC facilities, compared to the recommended 19, and five fully functioning comprehensive EmOC facilities. In a functioning district maternal healthcare delivery system, the quality of EmOC is expected to be high and maternal mortality is expected to be low.
However, that is not always the case. This paper aims to describe some of the malfunctions related to the three key components of the maternal healthcare delivery system that might have potentially contributed to some of the maternal deaths in the district of Lilongwe, Malawi.

![Diagram of Maternal Healthcare Delivery System in Malawi]

**Figure 1. Maternal Healthcare Delivery System in Malawi**

**Methods**

**Study Design**

A retrospective, cross-sectional, descriptive study design was used. Qualitative methods of content analysis and structured interviews were selected to conduct an in-depth investigation of the circumstances and events surrounding individual maternal death cases.

**Study Setting**

The district of Lilongwe is one of 28 districts in Malawi. It is situated in the central region of Malawi and shares its boarders with Dedza, Salima, Dowa and Mchinji (Figure 2). It is divided into three localities: urban, semi urban and rural areas. Approximately 67% of the population lives in the rural and semi-urban areas and are subsistent farmers producing tobacco, maize, ground nuts and rearing livestock. According to the 2008 population census, approximately 1.9 million persons resided in the district\(^1\). The predominant tribe is Chews, with the matrilineal marriage system being more common. The main religions in the district are Christianity, Islam and the traditional religion known as Gulewankulu. The district of Lilongwe has one central region referral hospital, one district referral hospital, two community hospitals formally known as rural hospitals and 63 health centers. Thirty-six of the 63 health centers are government operated. The community hospitals and the health centers are under the responsibility of the Lilongwe district health officer (DHO) whilst the central region referral hospital has a different administration.

Knowing that many women with complications eventually reach a hospital, the study was based at the comprehensive EmOC district referral hospital in Lilongwe, Malawi, which serves non-paying patients and has an urban catchment area of

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approximately 600,000 – 700,000 inhabitants (Table 1). In addition to providing maternal health care to its own case load, it receives referrals from 36 other health centers within the district. Complications that cannot be managed are referred to the central region referral hospital (tertiary level, Table 1). The maternity unit of the central region referral hospital primarily serves paying patients, but also receives referrals from the aforementioned district referral hospital, five CHAM hospitals within the district of Lilongwe and eight other district hospitals within the central region of Malawi. The district and central referral hospitals in Lilongwe share clinicians. On average, 15,000 babies are delivered annually, and the maternal death numbers are estimated to be one every other week, with a range between two to six per month.

Figure 2. Map of Malawi

Study Sample
Maternal death cases that occurred between January 1, 2011 and June 30, 2011, and for whom we had access to medical charts, were included in the study. Some cases were referred to the central region referral hospital where they subsequently died. They were included in the sample to determine whether there were any deficiencies during the referral process. Maternal deaths cases that occurred prior to reaching the district referral hospital were not included. A total of 14 maternal deaths were reviewed. Healthcare workers who provided care to the deceased patients were also included in the study (n=14). The district health officer, district nursing officer and the district safe motherhood coordinator were included as key informants. The sites were purposively selected because they were high-volume, urban comprehensive EmOC facilities; centrally located/easily accessible, and reported to have had a high institutional maternal mortality ratio (Table 1).
Table 1: Comparative characteristics of district referral and central region referral maternity units

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>District</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment population</td>
<td>600,000 – 700,000</td>
<td>&gt;5.5 million</td>
</tr>
<tr>
<td>Catchment area</td>
<td>Lilongwe District</td>
<td>Central Region (9 districts)</td>
</tr>
<tr>
<td>Type of hospital</td>
<td>Secondary</td>
<td>Tertiary</td>
</tr>
<tr>
<td>Bed Capacity</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>Ave. no. of maternal deaths per month</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ave. no. of admissions per month</td>
<td>1420</td>
<td>270</td>
</tr>
<tr>
<td>Ave. no. of deliveries per month</td>
<td>1117</td>
<td>250</td>
</tr>
<tr>
<td>Ave. no. of deliveries per day (24 hrs.)</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>Total no. of nurses in LW</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Ave. no. of nurses per day shift</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Max. no. of nurses per day shift</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Max. no. of nurses per night shift</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Max. no. of nurses per day shift (wkend)</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Max. no. of nurses per night shift (wkend)</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Sources: NSO 2011, Malawi; District Health Office, Lilongwe

Data and Data Collection Tools

A medical record extraction form and a structured facility-based questionnaire, were adapted from the WHO guidelines. Beyond the numbers: Reviewing maternal deaths and complications to make pregnancy safer. A medical record extraction form was used to extract information on parity, gravidity, medical history, and antenatal visits were extracted from the medical charts of the deceased women in the study. The Facility Staff Interview Questionnaire was used to interview the healthcare workers. It included open-ended questions to document individual healthcare worker’s accounts of the death in question, his/her views on the condition of the patient, the medical diagnosis, treatment, and support and barriers to providing treatment.

Data Analysis

An obstetrician/gynecologist who has worked at the study sites since 2005 reviewed all the maternal death case notes and respective facility-based transcripts. The purpose of his review was to triangulate the data, confirm the documented causes of death or to provide alternative causes where appropriate. Each case was discussed with the first author to determine what failures occurred and what could have been done differently.

To also aid in the analysis a directed approach to content analysis was used. This approach was used because the three main components of the maternal healthcare delivery system and existing maternal death research helped determine the initial coding scheme and relationships between the codes which Mayring referred to as deductive category application. The transcripts were read carefully to form a general impression of what healthcare staff said about the respective maternal death cases. The transcripts were then re-read to understand the context in which the maternal deaths occurred. Based on the definitions of the three components, all text that appeared to describe any aspect of the maternal healthcare delivery system were highlighted. Through the deductive category application all highlighted text were compared and sorted according to the predetermined categories that reflected the three components of the maternal healthcare delivery system, which were SBA, EE, and RS.

The first and third author who is an obstetrician/gynecologist reviewed and discussed each case for a second time to come to a final agreement on the faulty maternal healthcare delivery system component.

Ethical Considerations

This study was carried out in compliance with the Helsinki Declaration. Ethical approval was granted by The College of Medicine Research Ethics Committee in Malawi (Proposal No. 10/08/703) and The Regional Committee for Medical and
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Health Research Ethics in South-Eastern Norway (2008/16105). Furthermore, permission to conduct the study was obtained from the relevant authorities, e.g. senior management at the two maternity units.

Findings

Table 2. Summary of Maternal Deaths and Maternal Healthcare Delivery System Malfunctions

<table>
<thead>
<tr>
<th>GP</th>
<th>Age</th>
<th>Yrs of School</th>
<th>No. ANC visits</th>
<th>HIV Status</th>
<th>Cause of Death</th>
<th>Place of Death</th>
<th>Maternal Healthcare Delivery System Component</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1PO</td>
<td>27</td>
<td>12</td>
<td>UNK</td>
<td>-</td>
<td>Puerperal sepsis</td>
<td>Intensive care unit (ICU)</td>
<td>X</td>
<td>C/S performed, large fibroid discovered but wasn’t removed, and no specialist consulted. She stayed at the hospital for 6 days and was referred 5 days post op. The patient should have been referred soon after observing the complications i.e. the same day of operation.</td>
</tr>
<tr>
<td>G2P2</td>
<td>24</td>
<td>12</td>
<td>5</td>
<td>+</td>
<td>Peritonitis postpartum</td>
<td>High dependency unit (HDU)</td>
<td>X</td>
<td>Home delivery, during next day postnatal examination placental lobes were missed, returned 4 days later in severe abdominal pain. Reported to have been severely anemic, with pneumonia and hypertension, but none of these problems addressed prior to being referred. Patient arrived at 7, not seen until 9:50, died at 10pm.</td>
</tr>
<tr>
<td>G1P2</td>
<td>33</td>
<td>12</td>
<td>UNK</td>
<td>-</td>
<td>Pre-eclampsia</td>
<td>HDU</td>
<td>X</td>
<td>Patient arrived at 7, not seen until 9:50, died at 10pm. Previous scar discounted, clinician not available, poorly monitored, operating theater full, referral refused at tertiary level.</td>
</tr>
<tr>
<td>G1P1</td>
<td>18</td>
<td>9</td>
<td>4</td>
<td>-</td>
<td>Heart failure pulmonary embolism</td>
<td>High-risk postnatal ward</td>
<td>X</td>
<td>Patient not preppe/stabilized prior to referring/operation. Hb 2.2, yet not transfused. Referral documentation inadequate, but not a main contributor in the death. No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G2P1</td>
<td>28</td>
<td>10</td>
<td>4</td>
<td>-</td>
<td>Septicemia post delivery</td>
<td>Labor ward</td>
<td>X X X</td>
<td>Previous scar discounted, clinician not available, poorly monitored, operating theater full, referral refused at tertiary level.</td>
</tr>
<tr>
<td>G4P2</td>
<td>35</td>
<td>UNK</td>
<td>3</td>
<td>+</td>
<td>PPH</td>
<td>ICU</td>
<td>X</td>
<td>Patient not preppe/stabilized prior to referring/operation. Hb 2.2, yet not transfused. Referral documentation inadequate, but not a main contributor in the death. No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G5P5</td>
<td>35</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>Anemia</td>
<td>Postnatal ward</td>
<td>X</td>
<td>No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G10P9</td>
<td>39</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>Peritonitis postpartum</td>
<td>ICU</td>
<td>X</td>
<td>No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G3P1+1</td>
<td>33</td>
<td>UNK</td>
<td>UNK</td>
<td>+</td>
<td>Anemia</td>
<td>ICU</td>
<td>X</td>
<td>No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G6P5+1</td>
<td>37</td>
<td>8</td>
<td>6</td>
<td>-</td>
<td>PPH</td>
<td>Labor ward</td>
<td>X</td>
<td>Wrong drug administered, sepsis overlooked, stayed 4 days extra when condition observed wasn’t improving. No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G2P1</td>
<td>25</td>
<td>UNK</td>
<td>2</td>
<td>+</td>
<td>Septicemia post delivery</td>
<td>Postnatal ward</td>
<td>X</td>
<td>No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G4P2+1</td>
<td>32</td>
<td>UNK</td>
<td>2</td>
<td>+</td>
<td>Lactic acidosis (HIV-related)</td>
<td>ICU</td>
<td>X</td>
<td>1st admission only seen in outpatient department: Thorough history not taken, examination not done, not referred, given antimalarial drugs and sent home. No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
<tr>
<td>G3P2</td>
<td>23</td>
<td>UNK</td>
<td>UNK</td>
<td>+</td>
<td>Sepsis &amp; induced abortion</td>
<td>Outside the gates of the referring hospital (after being</td>
<td>X</td>
<td>1st admission only seen in outpatient department: Thorough history not taken, examination not done, not referred, given antimalarial drugs and sent home. No problems on the district hospital’s side. Ultrasound scanning performed and intrauterine death discovered, but didn’t induce. Patient was sent home and returned 3 days later then referred. Quality of the evacuation was questioned; clinician being implicated in causing death.</td>
</tr>
</tbody>
</table>

Medical charts of 14 maternal deaths were reviewed and data extracted. Thirteen nursing staff members and one clinical officer were interviewed. Each death is summarized in Table 2. Two cases had initially been referred from the primary health center. Three deaths occurred at the district referral hospital while the remaining 11 were referred to the central region referral hospital and subsequently died. For most of the maternal deaths reviewed (11 out of 14 cases) a large number of the shortcomings were categorized with the SBA component. Specifically, inadequate clinical work-ups (history taking and documentation), inadequate monitoring, missed and incorrect diagnoses, delayed or incorrect treatment, delayed referrals and transfers, patients not being stabilized before referring and outright negligence were all reported. There was only one maternal death in which shortcomings were reported for all three components. In this particular case, it was noted in the chart that the woman died from a ruptured uterus. According to the accounts given by the healthcare workers who were involved in this case, they did not know what was causing a foul smell so they wanted the clinician to review her, but he was unavailable because of other cases pending in the operating theater (SBA, EE). They called another clinician on call who advised them to refer the patient to the central hospital. Healthcare workers at the central region maternity unit refused to take the patient because they assumed the presenting complaint was not critical (RS). From the partogram sheet it was noted that there was no descent of the head after four hours and that cervix dilation was checked only once on admission (SBA). One of the healthcare workers disclosed that he decided to take a nap, even though he acknowledged that the ward was busy and that his colleagues had a full caseload (SBA, EE). Additionally, the operating theater was full, with several cesarean sections being performed that evening (EE). During her time in the labor ward, the patient made repeated requests for assistance, but the healthcare workers delayed in attending to her. Aside from this one case, shortcomings in either EE or RS were not identified. Similarly, there were two maternal death cases in which no shortcomings were identified.

**Discussion**

The aim of the paper was to describe some of the breakdowns within the maternal healthcare delivery system that might have potentially contributed to the maternal deaths reviewed. This section is organized according to the three components of the maternal healthcare delivery system that were investigated.

**Skilled Birth Attendant**

Through our investigation what was made apparent was that the skilled birth attendants’ provision of care was suboptimal. Treatment was inappropriate, delayed or not provided at all. These findings run contrary to several studies that circumstantiate the correlation between the presence of skilled birth attendants and the reduction of maternal mortality. At the same time, however, these findings are similar to those observed in other studies. What was surprising, or alarming, was that such skilled birth attendant malfunctions occurred at a newly erected district referral hospital (2.5 years old), which is a comprehensive emergency obstetric care facility that prides itself on being state of the art. The previous maternity was riddled with deficiencies, malfunctions and suboptimal quality of care, which helped to explain though not excuse the
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high maternal mortality ratio. It was envisioned that the newly constructed maternity unit would resolve some of these problems, including staff morale, and that it would gradually mitigate maternal mortality. It was also assumed that the healthcare workers performing the eight signal functions in concert would have the knowledge and skills to stabilize and refer women to the next level of care when necessary.

Delays in deciding to seek care or in reaching the district referral hospital might have contributed to the maternal deaths by further delaying the timely provision of care needed. However, Thaddeus and Maine assert that “…blaming the patient for seeking care late obscures the fact that the health care system often fails the patient”.

Something among (or within) the participating skilled birth attendants prevented them from providing care effectively. One explanation might be a sense of helplessness. Mbaruku and Bergström’s study in Kigoma, Tanzania revealed that prior to their intervention, most of the staff were convinced that the maternal deaths were due to circumstances beyond their control, which tended to justify passivity. They noted that the staff tended to forget their potential capacity to solve obvious problems. Other alternative explanations could be a lack of knowledge and technical competence, negative attitudes, burnout and human resource shortages. These factors were not assessed in the current study, hence calling for further investigation.

In our study, a shortage of staff was only reported for one case. This might be explained by the fact that besides staff being disproportionately located within district and regional hospitals, the Ministry of Health introduced the locum scheme in 2005 to address the acute human resources crisis. The strategy allows off-duty health workers or those on holiday to be compensated between 600 and 900 Malawi kwacha a day (equivalent to $3.61 and $5.42, respectively) for covering shortages. Therefore, the human resources are in place, but perhaps the required vigilance, technical competence, critical decision making skills and commitment are not.

In 2008, Lungu and Nkosi concluded that the locum scheme had initially shown some promising effects for mitigating the problems created by staff shortages, but that a number of problems had also been identified. For example, there were no guidelines or policies on how to systematically implement the scheme in a standardized, consistent manner. The remuneration for the locum work was an incentive, but it was not attractive enough to make health workers opt for it when other alternative incentives were available. Respondents stated that while health workers used the opportunity to earn additional money as a locum, they were not necessarily providing appropriate care during the assignments. They also reported observing colleagues sleeping while on assignment or at their regular post due to locum duties. In the case where the participating nurse-midwife technician admitted to taking a nap while the death occurred, he was not on his regular post, but in fact was on locum duty. Assessing the locum status of all the participating healthcare workers and its effect on care provided was not conducted for this study. Future studies that investigate this phenomenon are warranted.

Enabling Environment

Based on the maternal death cases investigated, there were no reports of lacking equipment, drugs or supplies. However, what might have been masked is limited supervision which influences the work environment and maternal outcomes. We asked participating healthcare workers whether there were barriers to executing action plans or providing care to the deceased woman in question, but we did not explicitly ask or prompt them about the nature of the supervision they receive. Management and supervision within the Malawian health care system has been described as being ad hoc, extremely limited and almost exclusively negative or corrective in nature. Also, senior management has been accused of being unaware of what staff are doing. In Malawi, human resources for health care are centrally managed at the Ministry of Health, meaning that department leadership has no real authority to attract or remove staff. This makes it difficult, or nearly impossible, to ensure adherence to protocols and guidelines. A lack of consistent technical and supportive supervision may have demotivated or reduced staff confidence in performing up to standard.
Another factor that may have adversely affected the work environment, and consequently influenced the quality of care provided, is the staff’s caseload\textsuperscript{38,43,44}. Approximately 40 deliveries occur each day at the district referral hospital, but information on how many deliveries each staff assists is not systematically recorded, nor did we ask.

\textit{Referral System}

Aside from the case in which the referral request was denied, there were no glitches in the existing referral system itself. The district referral hospital has five functioning ambulances and is approximately three kilometers away from the central region referral hospital. Specialists are still shared between the two hospitals, so communication is constant. With that said, there were still delays in referring and problems with patients not being stabilized before transfer, which points back to the skilled birth attendants and their knowledge, skills and attitudes. A complementary explanation is that existing policies are not fully understood or procedures are not executed in a standardized way and not monitored. In this study, most of the participating nursing staff was unclear about whether they had the authority to refer patients. This has major implications on the timing of care, particularly when a clinician is unavailable.

\textit{Limitations}

Limitations inherent to the study merit discussion. First, the sample size was small. Had the time period been extended, e.g. from January 1, 2010 – January 1, 2012, more cases would have presumably been included and perhaps a different pattern might have been observed. Second, the study was conducted at referral level hospitals which inherently introduces selection bias. A larger proportion of referral level hospitals’ caseload involves more complicated cases and tend to have a higher chance of dying. Therefore, a certain group of women could be over represented in the sample. However, this does not negate the fact that the cases investigated were sub optimally managed. Similarly, women who died at home or en route were not included. The characteristics and circumstances surrounding their deaths might be significantly different from the ones reviewed. This leads to under representation of maternal deaths of a certain profile.

Third, through interviewing staff it was assumed that they would report any barriers to providing care such as a shortage of staff, drugs or blood. If the study was complemented by surveying the availability of blood and blood products, antibiotics and other essential pharmaceutical commodities, then the interpretations of findings could be based on a more accurate picture of the conditions under which the staff provides care, as well as possibly adding more depth to the findings. Comparing the type of healthcare worker involved in providing care during the obstetric emergencies e.g. enrolled nurse, registered nurse, or obstetrician might have added more depth to the findings and provided alternative assessments of patient management and outcomes. Fourth, due to the fact that autopsies are generally not performed in low-income countries\textsuperscript{45, 46}, the cause of death was elucidated through the review of the information extracted from medical charts, and details gleaned from the interviews conducted with healthcare workers.

The obstetricians/ gynecologists who analyzed the data are susceptible to error, and their conclusions were based on their respective clinical judgments in the absence of reliable clinical and/or laboratory data to supplement the diagnostic procedure. Lastly, the data were cross-sectional in nature and therefore do not allow for causal conclusions.

\textit{Conclusion}

Though circumscribed in scope and limited by a number of methodological issues, this study contributes to the research on maternal mortality in low-income countries. It documents various breakdowns within targeted components of the maternal healthcare delivery system.

This study provides a catalytic step and glaring evidence which suggests that further investigations in the skilled birth attendant component should be considered. Devising interventions based on these future investigations is likely to have an impact on maternal mortality.
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Contribution of Authors

Viva Combs Thorsen conceived, designed and conducted the study; analyzed the data and wrote the initial drafts of the manuscript. Tarek Meguid co-wrote the initial drafts and analyzed the data. Johanne Sundby and Address Malata revised subsequent drafts of the paper. All authors read and approved the final manuscript.

Acknowledgments

We would like to thank the health workers for sharing what transpired during the course of care to death of the patients. Thank you, Mrs. Leah Phiri and Mr. Duncan Kwaitana for assisting with data collection. Dr. Patji Alnæs-Katjavivi, thank you for reviewing all the cases and your insights into the avoidable factors and their implications on management. Lastly, special thanks go to Mrs. Jacqueline Nkhoma for overseeing the study; and to Matron Hlalapi Kunkeyani, Mrs. Stabilly Miska, and Ms. Rachel MacLeod for tracking down and following up cases. This research was funded by the Norwegian Research Council.

Reference