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CLINICAL ARTICLE

One-year evaluation of the impact of an emergency obstetric and neonatal care training program in Western Kenya

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ABSTRACT

Objective: To determine the impact of introducing an emergency obstetric and neonatal care training program on maternal and perinatal morbidity and mortality at Moi Teaching and Referral Hospital, Eldoret, Kenya. *Methods:* A prospective chart review was conducted of all deliveries during the 3-month period (November 2009 to January 2010) before the introduction of the Advances in Labor and Risk Management International Program (AIP), and in the 3-month period (August–November 2011) 1 year after the introduction of the AIP. All women who were admitted and delivered after 28 weeks of pregnancy were included. The primary outcome was the direct obstetric case fatality rate. *Results:* A total of 1741 deliveries occurred during the baseline period and 1812 in the post-intervention period. Only one mother died in each period. However, postpartum hemorrhage rates decreased, affecting 59 (3.5%) of 1669 patients before implementation and 40 (2.3%) of 1751 afterwards ($P = 0.029$). The number of patients who received oxytocin increased from 829 (47.6%) to 1669 (92.1%; $P < 0.001$). Additionally, the number of neonates with 5-minute Apgar scores of less than 5 reduced from 133 (7.7%) of 1717 to 95 (5.4%) of 1745 ($P = 0.006$). *Conclusion:* The introduction of the AIP improved maternal outcomes. There were significant differences related to use of oxytocin and postpartum hemorrhage.

1. Introduction

Maternal morbidity and mortality are of paramount concern in most resource-poor settings. The aim of the fifth Millennium Development Goal is to reduce maternal mortality [1]. Overall, 33.9% of maternal deaths in the African region are caused by hemorrhage [2].

The most recent estimate of the maternal mortality ratio in Kenya was 488 maternal deaths per 100 000 live births, which accounts for 15% of all deaths of women aged 15–49 years [3]. Although 92% of pregnant women in this country attend at least one prenatal clinic, only 43% deliver in a health facility [3]. Overall, only 44% of births are attended by a skilled attendant, most often a nurse or midwife. This lack of skilled care at delivery has been acknowledged as a key contributor to poor maternal health outcomes [4]. In addition, the adequacy of existing skills has at times been called into question, further underlining the need for consistent teaching and retraining of key provider skills [5,6].

Previous efforts to improve the safety of motherhood in resource-limited settings in the past few decades have focused on improving the skills of traditional birth attendants; however, to date, the efficacy of these efforts has not been clearly demonstrated [7]. Current initiatives are focused on improving the skills of healthcare professionals involved in obstetrics and care of the neonate (e.g. nurse-midwives and physicians) to improve the safety and outcomes of obstetric services as well as increasing the proportion of deliveries performed by a skilled attendant, which has been associated with improved outcomes [8]. To date, tests to evaluate knowledge before and after a training intervention have shown that performance improved after training [9], staff who received training reported improved comfort in dealing with acute scenarios [10], and there was some short-term improvement in the rates of postpartum hemorrhage [11], which is a major contributor to maternal mortality. Despite the availability of numerous training courses on emergency obstetric and neonatal care (EmONC), there is an overall lack of adequate evaluation of existing programs in terms of their clinical performance, and a paucity of evidence of any long-term benefit with regard to maternal and neonatal outcomes [6]. A recent cluster-randomized large-scale trial performed in West Africa [12] showed a significant reduction in maternal mortality ($P = 0.0299$) after the introduction of a

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multifaceted strategy of EmONC training, outreach visits, and maternal death review committees at district and capital hospitals; however, this effect was not seen at hospitals outside the capital.

The Advances in Labor and Risk Management International Program (AIP) is a product developed, owned, and implemented by the Society of Obstetricians and Gynecologists of Canada. The AIP is a capacity-building 5-day course for all health professionals (i.e. physicians, physicians in training, nurses, and midwives) responsible for the delivery of emergency obstetric and newborn care, addressing the five main causes of maternal mortality and morbidity (obstructed labor, hemorrhage, sepsis, hypertensive disorders, and complications owing to unsafe abortion). Newborn health outcomes are addressed in a component on newborn resuscitation and care. The AIP further sensitizes participants to the social, economic, cultural, and legal factors that may impede women from accessing reproductive health services and information, and it advocates for the improvement of women's reproductive and sexual health as a matter of social justice. Finally, it also exposes health professionals and administrators to the monitoring and evaluation methodologies necessary in all initiatives aimed at increasing access and quality of maternal and newborn health services. The AIP is taught within a framework of sexual and reproductive rights [13].

The AIP has become a well-studied measure of EmONC training: for example, Dumont et al. have previously reported the findings of a QUARITE (quality of care, risk management and technology in obstetrics) cluster-randomized trial conducted in Senegal and Mali that used the AIP [12,14]. To address the lack of existing evaluation of EmONC training courses, the aim of the present study was perform a before-and-after prospective chart review evaluation of the program to determine whether introducing the AIP improved the safety of obstetric and neonatal care provided at a low-resource tertiary care center in Kenya.

2. Materials and methods

A prospective study was undertaken involving chart review of all deliveries at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya, in the 3-month period (November 1, 2009, to January 31, 2010) prior to introducing the AIP, and in the 3-month period (August 1–November 30, 2011) 1 year after 80% of the maternity ward staff had completed AIP training. The threshold of 80% was agreed upon in the study design as representing most of the labor and delivery staff; staffing atrition and hiring meant that maintaining a level of 100% trained staff for the duration of the study was not possible. All women who were admitted and delivered at MTRH and all neonates who were born at MTRH during the study periods were included in the study. Pregnancies of less than 28 weeks and mothers or neonates transferred to MTRH after delivery elsewhere were excluded from the study. Ethics approval for the study was obtained from both the Research Ethics Board at the University of Toronto and the Institutional Research Ethics Board at Moi University School of Medicine (protocol numbers 24371 and 000435, respectively).

Moi University School of Medicine and MTRH have been partnered with the Department of Obstetrics and Gynecology at the University of Toronto, Canada, since 2007. MTRH is a 700-bed hospital serving over 11 million people in Western Kenya and is the clinical site of Kenya's second-largest medical school. Between 2009 and 2011, approximately 7000 deliveries per year were performed at MTRH. To consolidate the training and experience of the labor ward staff at MTRH, staff were not transferred to other wards or facilities to maintain the impact of training interventions and the team environment.

Research assistants were present on the labor ward 24 hours per day, 7 days per week during the study data collection periods. Delivery information was collected from charts immediately following the delivery on a data collection sheet and later entered into an electronic database. Although research assistants could approach staff for clarification of chart information there was no direct patient contact and therefore informed consent was not required. Data were collected for a month prior to the initiation of the study to pilot the use of the forms and to train the research assistants in data collection.

The primary outcome was the direct obstetric case fatality rate (direct obstetric deaths or women with direct obstetric complications). Secondary outcomes were maternal and neonatal morbidity, including rates of admission to intensive care units and neonatal intensive care units, hemorrhage, transfusions, neonatal mortality rate, and an Apgar score of less than five at 5 minutes.

All chart abstraction data were entered into Microsoft Access 2007 software (Microsoft Enterprise, Redmond, WA, USA) and checked for consistency using SPSS version 19 (IBM, Armonk, NY, USA). Any discrepancies in data were checked against hard-copy data collection forms to ensure accurate data entry. Data from the baseline period prior to the AIP training intervention were merged with the post-AIP training intervention period to allow for before-and-after cross-sectional comparison of the AIP.

Data were collected on the demographic characteristics of the participating mothers (i.e. age, marital status, occupation, and maternal education) and clinical parameters (i.e. height, weight, and gravidity). The mean was calculated for continuous variables. Clinical and delivery characteristics of participants were also dichotomized to reflect the number of women above or below a threshold clinical value. The gestational age of the neonate was characterized as preterm, at term, or post-term if gestation at delivery was less than 37 weeks, 37–41 weeks, or more than 41 weeks, respectively.

Data were collected on the labor characteristics of participants, including method of induction, labor augmentation, and type and duration of labor, for the baseline and post-AIP training intervention periods. Delivery and pregnancy complications, such as episiotomy, tearing, and lacerations, were measured by dichotomous variables with yes or no responses. Data were also collected on neonate characteristics at birth, sex, and Apgar score at 5 minutes.

All statistical analyses were conducted using SPSS version 19. Categorical variables were compared using a χ^2 test and continuous variables were compared using a Student t test to determine whether there were any significant differences between the baseline and post-AIP training intervention periods. When appropriate, the Fisher exact test was used to compare proportions for expected cell counts less than five. $P < 0.05$ was considered statistically significant.

3. Results

The demographic and obstetric characteristics of the study population are shown in Supplementary Material S1 and S2. A similar number of deliveries occurred during the two periods of data collection: 1741 in the baseline period and 1812 after the training intervention. The mean maternal age of the participants was similar for both data collection periods: 26.4 ± 5.8 years and 26.7 ± 5.9 years ($P = 0.137$). The only significant differences between the two study populations were for occupation, how many had completed secondary education, and weight. A higher proportion of students and businesswomen were admitted during the postintervention period ($P < 0.01$), perhaps reflecting the higher proportion with secondary education; however, significantly fewer participants were self-employed ($P = 0.015$). The weight of participants admitted during the postintervention period (68.4 ± 12.1 kg) was significantly greater than that of those admitted before the intervention (65.5 ± 11.9 kg; $P = 0.001$). In total, 748 (43.1%) of 1735 patients in the preintervention period and 725 (40.2%) of 1804 patients in the postintervention period were primigravidas ($P = 0.078$). The two groups of patients were not significantly different in terms of their previous obstetric history, including prior live births and prior preterm births.

Clinical characteristics of the patients are shown in Table 1 and labor characteristics are shown in Table 2. Mean length of pregnancy and proportion of twins delivered were similar before and after the intervention (Table 1). In total, 83 (5.0%) of 1676 and 113 (6.5%) of 1750 patients were HIV positive before and after the intervention period, respectively.