**Title:** Availability and quality of emergency obstetric care in Shanxi Province, China

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**Key words** emergency obstetric care, rural health, China

**Synopsis** Basic EmOC facilities are not adequate and township hospitals should be updated to provide BEmOC. The quality of EmOC is poor and needs to be improved.
Abstract

Objectives: To investigate the availability and quality of EmOC women received in a Chinese rural province.

Methods: The study was conducted in seven rural counties and townships in Shanxi Province, China. Data included interviews with seven hospital leaders, five maternal and child health workers and seven obstetric clinicians; 118 audits were made of complicated birth records, 21 Maternal and Child Health Annual Reports analyzed, and observations conducted of facilities and advanced labor care.

Results: The number of CEmOC facilities was adequate in all counties. Three counties had fewer BEmOC facilities than recommended and only four counties reached the recommended level. Most of the existing township hospitals could not provide birthing services. All the county hospitals could perform caesarean sections with a rate ranging from 6.8% to 40.8%. The management of complications was not evidence based. For example, women with pre-eclampsia and eclampsia were given too little magnesium sulphate; women were not closely monitored after birth and the partograph was not used correctly with consequences shown in obstructed labor.

Conclusion: The BEmOC facilities are not adequate and township hospitals should be updated to provide birthing services. The quality of EmOC is poor and needs to be improved.
1. Introduction

Of the estimated annual 536,000 maternal deaths, 99% occur in the developing counties, making maternal mortality a major health and development challenge [1]. The majority of maternal deaths are due to complications: hemorrhage, infection, unsafe abortion, hypertensive disorders in pregnancy, obstructed labor and others [2]. Most of the primary causes of maternal deaths are difficult to predict in advance but are treatable in the context of a functioning health system. The United Nation Children’s Fund (UNICEF), World Health Organization (WHO) and United Nation Population Fund (UNFPA) have suggested one of the critical pathways to reducing maternal mortality is improving the accessibility, utilization and quality of emergency obstetric care (EmOC) during pregnancy and childbirth [3].

Monitoring the level of maternal mortality is very difficult and costly in most developing countries given there is no comprehensive vital registration available. The UNICEF, WHO and UNFPA has advocated an alternative approach to measure improvement over time and allow governments to track change towards the overall progress in reducing maternal mortality [3]. These UNICEF published guidelines divided health facilities into two groups: basic EmOC (BEmOC) and comprehensive EmOC (CEmOC). Facilities that provide “administration of parenteral antibiotics”, “oxytocics drugs and anticonvulsants”, “manual removal of placenta and retained products” and “operational vaginal delivery” are defined as BEmOC facilities. CEmOC facilities perform all the BEmOC functions as well as performing caesarean section (CS) and providing blood transfusion. The guide recommend for every 500,000 population at least four BEmOC facilities and one CEmOC facility [3].
The UNICEF recommends “case fatality rates” as indicators for the quality of EmOC and the proportion of women with obstetric complications admitted to a facility who died should be below 1% [3]. However the measurement of quality of care is complex and more indicators are needed as the “case fatality rates” may not necessarily reflect the response and professional performance of the providers [4]. A systematic literature review also shows that data for evaluating the technical quality of EmOC are scarce and varied [5]. In this study, we used consistency in managing common causes of maternal deaths, comparing this with the best evidence based practice in recommended management [6] as the indicators for the quality of EmOC.

In China there is a good maternal death registration system [7]. The maternal mortality ratio (MMR) in 2005 and 2006 was 47.7 and 41.1 per 100,000 live births respectively. This steadily declined to 34.2 in 2008 [8]. Despite the progress that the Chinese government has made in reducing maternal mortality, the gaps between rural and urban areas are critical. For example, the MMR in rural area was double the MMR in urban areas (69.6 vs 29.3 per 100,000 live births in 2000 and 53.8 vs 25.0 per 100,000 live births in 2005) [8]. Reducing mortality in rural areas is a challenge. The facility delivery rate is low, in some rural villages the rate is as low as 28% [9], and there are many barriers, such as financial cost, transport and traditional customs, for women to accessing health care [10]. In China township and county hospitals are the major frontline of reducing maternal deaths. In 2003, about 30% of maternal deaths occurred in these two levels of hospitals [11]. However, very few publications in English have reported the availability and quality of EmOC in these hospitals in rural China.
Between 2004 and 2007 we conducted an Australian Research Council (ARC) funded project looking at the impact of policy on delivery of regional maternity care in two Chinese provinces. We conducted a baseline assessment of the current level of maternity service women received in two provinces. In Sichuan province we collected data mostly in county/urban and minority settings and in Shanxi Province the focus was more rural. The study we report here was based on the results in Shanxi Province. As a component of the larger study, the goal of this study reported here was to determine the current availability and quality of rural EmOC in Shanxi Province of China.

2. Materials and Methods

The settings and methods of the larger ARC study was described elsewhere [7, 10]. The present study used mixed methods to document the availability and quality of EmOC services in seven rural counties (labeled DX, FX, NW, PD, XY, ZZ, HG), across three districts. Districts were selected with a high, medium and low MMR compared across the Province. In each county we purposively sampled one major hospital according to the number of live births in 2005. We randomly sampled between 20% and 100% of the total medical records complicated with hypertensive disorders in pregnancy, postpartum hemorrhage (PPH) and obstructed labor. Data collected also included interviews with seven hospital leaders, five MCH workers, seven doctors and midwives, analysis of 21 Maternal and Child Health Annual Reports (2003-2005) from our areas of study and observations of all the facilities and seven advanced labors. Research instruments for records audits, observations and most of the interviews were adapted from the WHO Safe Motherhood Assessment Tools [12]. The field work including interviews, medical record audits and
observations were conducted by the first author, a Chinese obstetrician. Qualitative data were recorded in a field diary in Chinese and translated into English and the numerical data were entered into SPSS 15.0 for descriptive analysis.

The study received ethical approval from the Human Research Ethics Committee at Charles Darwin University and gained agreement from relevant local health bureaus.

3. Results

Availability of EmOC services

The number of CEmOC facilities for the population was adequate in all the seven counties, and well above the minimum recommended of one per 500,000 population in six counties. Three counties were below the minimum number of BEmOC facility recommended (four per 500,000 population) and the other four counties had greater than four BEmOC facilities. The details of the availability of EmOC services by county are presented in Table 1.

Although there were a number of township hospitals in each county, most of them did not provide birthing services, let alone BEmOC. As Table 1 shows, in DX and HG County, almost all the township hospitals could not provide BEmOC. In NW, only half of them were able to provide the services. This means that many women who reside in villages must travel long distances to access a birth facility located in the county centre for an emergency. It appeared that not only were counties lacking the BEmOC facilities, but also the existing facilities were not functioning as they should.

Quality of EmOC Services
All but one of the seven hospitals had adequate oxytocin, magnesium sulphate (MgSO₄), antibiotics and syringes readily available in labor room. In one hospital they were kept elsewhere because the head nurse was concerned “the doctors were stealing medicines to provide birth service outside [of their hospital]”. All the hospitals could perform CS however the CS rates varied across the hospitals. Six hospitals had a relatively low rate of CS (6.8%-21.7%) and one hospital (PD) had a higher rate (41%). All the hospitals conducted vacuum extraction, but none conducted forceps delivery although the equipment was available. Interviews with the staff found that forceps delivery was not accepted by local women and staff were also de-skilled because of rare opportunity to practice.

Availability of safe blood for transfusion is essential for effective implementation of EmOC services. In our study five of the seven hospitals kept blood in their own facilities and the other two hospitals (HG, NW) asked nearby hospitals for blood when needed. Generally it took one to three hours to get blood from other hospitals. Interviews with hospital leaders found the blood bank in the city delivered blood once a week and it was hard for them to predict how many bags of blood they needed. The hospitals would have to bear the cost for expired blood if they asked more blood than they needed.

Five hospitals had sufficient newborn resuscitation equipment and two hospitals (DX, NW) did not. There were no stillbirths recorded in two hospitals (PD, XY) and three each in the DX, FS and NW hospitals, with nine and 11 in ZZ and HG hospital respectively. It was difficult to interpret the relationship between frequency of
stillbirths and the availability of resuscitation equipment due to small numbers. However, many staff reported that they did not know how to use the equipment.

In addition 118 women’s medical records were audited across the seven hospitals to assess the quality of care they received for their complicated birth. No maternal death was identified. The findings of the medical records audits are presented in Table 2.

*Hypertensive disorders in pregnancy*

The maternal age ranged from 19 to 44 years old with parity between 0 and 4. Six women had eclamptic seizures, five occurred before labor and one after labor.

The record auditing revealed MgSO₄ was not used correctly. All the hospitals gave women smaller doses than recommended for eclampsia and severe pre-eclampsia and did not maintain treatment for 24 hours after birth. Interviews with the local doctors identified that they thought a smaller dose was safe. They “heard that MgSO₄ is dangerous”, but they “don’t know why” and thought “it should be safer if giving a small dose”.

This study found that most women were administered antihypertensive medicines such as Nitedipine and hydralazine when their diastolic blood pressure was lower than 110 mmHg. Staff interviewed thought the antihypertensive medicines were safer and quicker to reduce blood pressure than MgSO₄. One doctor said: “magnesium sulphate needs to be monitored carefully and be maintained for a very long time. We don’t have enough nurses to monitor for its dangerous side effects. So we decided to reduce its dose but add anti-hypertensive medicines to reduce the blood pressure quicker.”
Postpartum hemorrhage

Two women were transferred to hospital with heavy bleeding after birthing at home and the rest gave birth in hospital. The recorded reasons for PPH were uterine atony (n=15, 68%), retained placenta (n=4, 18%), uterine rupture (n=1, 4.5%), laceration (n=1, 4.5%) and unknown (n=1, 4.5%).

According to the medical records, all but one hospital had actively managed the 3rd stage of labor. Labor observations however, showed that this was practiced poorly, for example the uterine massage after placenta delivered was much less frequent than recommended [6].

Despite two hospitals not storing blood, most women with PPH were transfused. Blood was even transfused to women whose hemoglobin was higher than 7g/dl, which is against the WHO recommendations [6].

Obstructed labor

Of the 48 women diagnosed with obstructed labor, 38 (79.2%) were multiparous and ten (20.1%) were primiparous. Six women were referred from home or other lower level hospitals when obstructed labor was identified, the other 42 obstructed labors occurred in the hospitals where birth was planned.

Forty four (92%) obstructed labors ended up with CS. Of the 44 CS, 11 (25%) were conducted while the cervix was fully dilated. Three births appeared possible by forceps as the fetal head was at +2 station.
A partograph was not recorded in many obstructed labors: three hospitals did not use it at all, three hospitals used it occasionally and one hospital used it for almost every case. For those cases which did record a paragraph, this was incomplete and the way it was used varied between hospitals. Interviews with the staff found that neither standardized partograph was provided to these county hospitals nor had training been provided in its use. The staff interviewed did not value the partograph. One midwife said: “We are busy every day, and I don’t have time to draw it. Who will look through the partograph? We always take action positively, even before the partograph tells us.”

4. Discussion

The paper describes the availability and quality of EmOC services in seven rural counties in Shanxi Province, China. The study revealed that the rural counties have an adequate number of CEmOC facilities, but functional BEmOC facilities were non-existent or inadequate. This is consistent with findings from a national needs assessments in 24 countries which included both developing and developed countries [13].

Most of the existing township hospitals in the rural counties studied were not able to provide BEmOC services. Women in these areas travelled a long distance to give birth in the county hospitals which were the CEmOC facilities. It is highly recommended that poorly functioning township hospitals be upgraded to provide basic, accessible and affordable EmOC services. The most important intervention is not building new hospitals supplied with sophisticated equipment, but upgrading existing facilities so they can provide BEmOC services [3]. By doing so, the workload
in county hospitals could be relieved and the clinicians could have more time to update their knowledge and provide a better quality of CEmOC services.

The CS rate in rural areas was much lower than that of the large cities (12.8% vs 39.5%) according to the 2003 Chinese National Health Service Survey [14, 15]. In our hospitals, the majority had a low CS rate, which is consistent with the national survey findings. The possible reasons for a low CS rate in these areas could be that it is still customary to have a natural birth, the financial difficulty of paying costs of CS and staff being geographically and academically isolated from “modern practice”. The hospital leader seems also had an impact on the popularity of CS. For example, the head of PD Hospital, which has the highest CS rate, is an obstetrician with five years of formal medical university training who has accessed and accepted contemporary Chinese obstetric standards. It is ironic that the leaders of those hospitals with low CS rates close to contemporary western recommendations were not obstetricians and two of them were even not qualified doctors.

Evidence based training on management of eclampsia, PPH and obstructed labor is urgently needed in rural hospitals. We found women received poor, harmful and dangerous EmOC services. For example despite MgSO$_4$ is recommended as the first line for severe pre-eclampsia and eclampsia and its schedule for use is well established [16], women in the study hospitals were administered smaller dose than recommended. Postpartum hemorrhage has been the most common cause for maternal deaths for many years although the provincial government has constantly provided training on its management [17]. The atonic uterus was the major cause recorded in audits for PPH in our study, which is consistent with the findings from other studies.
[18]. Research shows that persistent uterine massage effectively reduces the amount of blood loss [19], women in our study however were poorly monitored after birth. It suggests that the training programs are ineffective or need improvement and these programs needs to be evaluated carefully. Our study found the partograph was not used at all or used incorrectly in the hospitals investigated. Research has shown that by using a partograph the birth attendant can successfully identify the failure of labor to progress and take action to avert obstructed labor [20]. Effective training on how to use the partograph should be included in formal medical and midwifery education and provided to all current obstetric clinicians.

Acknowledgements

This work was supported by the project ‘Improving Birth Outcomes in China: Consequences and potentials of policy, state and professional interactions’ (LP0454943) jointly funded by the Australian Research Council, Second Hospital of Shanxi Medical University and Western China Second Hospital Sichuan University.
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