International Journal of Gynecology and Obstetrics 104 (2009) 128–131

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

CLINICAL ARTICLE

Maternal mortality surveillance in an inland Chinese province

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ARTICLE INFO

Article history:
Received 27 August 2008
Received in revised form 16 September 2008
Accepted 3 October 2008

Keywords:
China
Confidentiality
Maternal mortality surveillance

ABSTRACT

Objectives: To evaluate the Chinese maternal mortality surveillance system in an inland province and identify how it can be improved. *Methods:* The review process and Chinese Maternal Deaths Reporting Form were compared with standards recommended by the UK Confidential Enquiry into Maternal and Child Health using interviews with key personnel, field observations, and reports and audits from 2003–2005. *Results:* The Chinese Maternal Deaths Reporting Form does not provide anonymity for the deceased woman, the health workers, or hospitals. The information collected is often insufficient to identify substandard care. The Review Committee was not multidisciplinary and the review was not confidential. The review findings were only available to the Review Committee. *Conclusion:* Confidentiality should be a requirement in the maternal mortality surveillance system. The anonymous findings should be available to health workers, and be used to improve the system and inform the community about performance.

1. Introduction

Maternal mortality is a continuing global priority. Reducing maternal deaths is a health and political goal for many countries, especially low-income countries where 99% of maternal deaths occur [1]. Identifying and recording maternal deaths in low-income countries is a major challenge, particularly when routine registration and medical certification of the cause of death are unreliable or unavailable [2]. Estimates of maternal mortality rates in these countries may be based on sisterhood methods (interviewing a representative sample of respondents about the survival of their adult sisters), reproductive age mortality surveys, verbal autopsy, disease surveillance and sample registration [1], or guess work. However, accurate knowledge of the number of women who die is not enough. It is also vital to identify what can be done to reduce mortality, given that many maternal deaths are avoidable, even where resources are limited [3]. The "gold standard" recommended by the UK Confidential Enquiry into Maternal and Child Health (CEMACH) is that the lessons learned from maternal deaths should be used to improve clinical practice and prevent pregnancy-related death [4]. The CEMACH process has been conducted successfully in many resource-restricted countries such as South Africa, Malaysia, Egypt, and Ghana [5].

China, a rapidly developing country with a population of 1.3 billion people, has not yet achieved complete registration and medical certification of maternal deaths [6]. To inform policymakers about maternal mortality rates, China has begun active surveillance of the deaths of reproductive-age women in sampled regions [7].

The Chinese National Maternal and Child Health Surveillance System (NMCHSS) was established in 1989 across the eastern, western, and central areas of China [8]. The monitoring sites across the country were increased from 116 in 1989 to 336 in 2006; 126 of these are in urban settings and 210 are in rural settings—covering 140 million people or nearly 8% of the population [9]. The system uses the WHO definition of maternal death: "the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes." [10]. Deaths are classified as direct or indirect.

It is the responsibility of township maternal and child health (MCH) workers to review hospital records, consult at police headquarters and funeral homes, and inquire with local residents to identify any maternal deaths [9]. Once a maternal death is identified, the county MCH workers (with the help of township MCH workers) are expected to conduct an investigation through interviews with the family and birth attendant; conduct an audit of any medical records; and complete the Maternal Death Reporting Form, and return it to the prefectural MCH hospital. Every 6 months, the county MCH workers are expected to attend a Maternal Death Review Meeting with obstetricians, pediatricians, and health policymakers (forming a Maternal Death Review Committee) to determine the causes of any deaths [9] and to classify these as avoidable or unavoidable. The prefectural and provincial MCH hospitals review the maternal deaths that are reported twice yearly by the Maternal Death Review Committee to correct any inaccuracies in the forms submitted and

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0020-7292/$ – see front matter
doi:10.1016/j.ijgo.2008.10.004

to provide suggestions about these deaths to the NMCHSS. The NMCHSS evaluates the accuracy of the data in the system by randomly sampling 4–6 provinces annually [9].

Few publications in English have described the Chinese surveillance system and little is known about its strengths and weaknesses. The aim of the present study was to investigate the review process and a Maternal Death Review Meeting in an inland province in China, and compare it with the UK CEMACH process to explore the gaps in reporting and reviewing to identify opportunities to improve the Chinese system.

2. Materials and methods

The setting for this study was an inland province in China, with a population of over 30 million spread over an area of more than 150 000 km^2. Administratively, there are over 10 prefecture districts in the province, and more than 100 counties. In 2008, 8 counties and 2 cities were sampled by the NMCHSS.

The present study was a component of a larger study conducted between 2004 and 2007 in two Chinese provinces. The methods for the larger study are described elsewhere [11]. The present study used audit data and field work conducted in 19 villages and 10 townships across 9 counties. This included interviews with 12 hospital leaders and 6 MCH workers, audits of 27 Maternal and Child Health Annual Reports (2003–2005) and 40 maternal death reporting forms (2003–2005), and observation of a Maternal Deaths Review Meeting, held in November 2006. The field work, including observation at the review meeting, was conducted by the first author, a Chinese obstetrician. Data were recorded in a field diary in Chinese and translated into English for descriptive analysis.

The study received ethical approval from the Human Research Ethics Committee at Charles Darwin University, Australia, and the relevant local health bureaus in China.

3. Results

A major weakness identified from the Chinese Maternal Death Reporting Form was lack of anonymity or codes for the deceased woman, the person who attended her birth, and the hospital where the woman received care.

In addition, the MCH workers interviewed reported difficulty in investigating a maternal death owing to a lack of support for the process from the deceased woman's family and birth attendants. The MCH workers reported that the family provided little useful information and home visits were dangerous. Private birth attendants (village doctor or traditional birth attendant) and hospitals were reluctant to share information or record it on the form. Exploration during interviews with MCH workers helped explain the reasons for the reluctance to share information, which were that it is common practice for the person or facility involved in a maternal death to make large compensation payments to the bereaved family, often after difficult negotiations. Therefore, hospital staff or the private birth attendants are extremely sensitive and resistant to any external investigation. They fear that a review of the maternal death would reveal to the family that the death was abnormal. This would increase tension between the family and the birth attendants and result in higher levels of compensation being paid. The MCH workers were also concerned that pregnant women would not trust them subsequently, which would prevent them from seeking care.

Another problem highlighted by the MCH workers was the absence of guidelines for completing the case summary of the maternal death. In many cases these workers were not professional obstetricians or midwives. The last section of the Maternal Death Reporting Form requires the MCH worker to describe in more detail all treatments the woman received and summarize the medical and nonmedical factors that may have led to the death. The pathway to death, including the history and any barriers the woman encountered when seeking care, should be documented in this section. However, most of the forms we audited did not have comprehensive information in this section, and the quality of information varied greatly. Not surprisingly, the majority of case summaries failed to critically analyze why the woman died, and only repeated basic quantitative information already presented in the first part of the form. For example: "[Woman's full name given], female, 33 years old, parity 3, died 2 hours after the birth. She died at 4:00 PM on February 3, 2004. There was little [vaginal] bleeding when delivered. Two hours later torrential [vaginal] hemorrhage suddenly occurred, her blood pressure dropped, [she was in a] coma, then respirations and heartbeat stopped." In this case, as in others, no details were described that could be used to assess the quality of care the woman had received, or learn lessons for future improvement.

While our data are limited to observation of only one Maternal Death Review Meeting, the Committee we observed failed to conduct a multidisciplinary assessment of the causes and circumstances surrounding the 6 maternal deaths it investigated. The Review Meeting included 1 MCH worker and 3 specialists in obstetrics from local county hospitals. Two of the obstetricians had been involved in the care of 2 of the 6 deceased women. The Committee did not invite any specialists from midwifery/nursing, anesthesiology, pathology, or public health despite one woman collapsing at initiation of anesthesia. Although the meeting was chaired by an official from the County Health Bureau, no officials from the regional or local government were present, nor was there a senior clinician present who could have helped those in attendance to learn from the cases. Table 1 summarizes the details of the maternal deaths reviewed at the meeting.

The review process was not confidential and the names of the women, healthcare workers, and hospitals involved were openly discussed in the review meeting. There was a high risk for conflict of interest or need to protect one's own practice when reviewing any death in which a Committee member had been involved. Indeed, this was evident at the observed meeting. The two obstetricians defended themselves and their actions on several occasions, and the Committee

Table 1
Summary data for the 6 maternal deaths reviewed at the Maternal Deaths Review Meeting observed in November 2006

Patient	Age, y	Gravidity, no.	Parity, no.	Place of birth	Place of death	Type of birth	Cause of death: researchers' judgement	Factors contributing to death: Committee's judgement
1	23	2	2	Hospital	Hospital	Vaginal	Anaphylactic shock	Desire for a son Poor quality of prenatal care
2	23	1	1	Hospital	Home	Cesarean delivery	Puerperal sepsis	Poverty
3	34	3	2	Undelivered	In transit	Undelivered	Severe pre-eclampsia	Desire for a son Lack of personal health awareness
4	38	2	2	Hospital	Hospital	Cesarean delivery	Cardiac failure	Desire for a son Poor quality of prenatal care
5	35	3	2	Undelivered	Hospital	Undelivered	Eclampsia	Desire for a son Poverty
6	23	1	1	Hospital	Home	Cesarean delivery	Multiple organ failure	Poverty

members chose their words carefully to avoid offending them. For example, a 38-year-old woman who had died of cardiac failure was blamed for her own death because she had not reported rheumatic heart disease to her doctor. Although the woman's obstetrician had not taken a history or assessed her heart function, this was not commented on at the meeting.

There was no review of the care that the deceased women had received. For example, despite 6 units of blood being transfused over 6 days, a 23-year-old woman's hemoglobin level progressively dropped from normal at the beginning of the operation to 8.7 g/dL after a cesarean delivery. At the same time her temperature rose to 39 °C. The Committee did not identify the reasons for her fever or drop in hemoglobin level, or how these could have been managed, but simply listed the cause of death as sepsis and anemic heart disease. They classified the contributing factors as "poverty" because the woman's mother-in-law had refused to purchase more blood because the woman had become pregnant before marriage. The review did not discuss the possibility of operative complications or antibiotic treatment for the fever. The Committee believed that a contributing factor to the deaths of 4 women was their desire to have a male child; these women were blamed for putting themselves at risk by becoming pregnant more than twice. However, the clinical summaries indicated that these women had eclampsia or cardiac failure, with or without multiple organ failure.

The completed Maternal Death Reporting Form was shared only with the Maternal Death Review Committee. In terms of distribution of the Committee's findings, "confidentiality" was applied by restricting "outsider" access to the forms. The report prepared by the NMCHSS for the Ministry of Health is not publicly accessible and is described as an "internal report" [12]. The results are released through 2–3 page publications via academic papers in Chinese medical journals. These journals are not readily available to clinicians and only gross aggregated findings are reported. By the end of the present study, 3 papers had been published on national maternal mortality data from 1989–1991 [13], 1989–1995 [14], and 1996–2000 [8]. Another 2 papers were published in 2007, but the data used were from the results obtained in 1996–2000 [15] and in 2003 [16].

Underreporting of maternal deaths was found in 2 counties that were investigated. These deaths occurred in 2004 (3 deaths) and 2005 (1 death) and were not reported to the Provincial Health Bureau. These 4 deaths had been investigated by the township MCH workers and reported to the county MCH hospital where further reporting stopped. The local MCH workers were aware that other information they collected, such as live births, was not accurate either. They were confident, however, in the accuracy of the number of maternal deaths, even though we had discovered 4 deaths that had been concealed.

Most of the reported maternal deaths were reviewed by holding a Maternal Death Review Meeting whenever there were enough deaths to review. For example, the meeting observed in November 2006 reviewed 6 deaths that had occurred between April and October that year. In another county, 2 maternal deaths in 2005 were reviewed with the help of prefectural professionals, but 6 deaths that occurred during 2003 and 2004 and had not been investigated.

4. Discussion

Confidentiality was not applied to either the Maternal Death Reporting Form or the Maternal Death Review Meeting. Collecting information on maternal deaths was difficult because there was poor cooperation from the health workers and hospitals due to lack of trust and fear of compensation claims. To prevent blame and litigation, all records should be anonymous before review and publication [4]. A prerequisite of the UK CEMACH process is the maintenance of confidentiality [17], which insures that health workers and hospitals provide an unbiased description of the actual situation without fear of punitive action [17], and provide the necessary information.

The purpose of a maternal death inquiry, and one of its strengths, is that this approach enables identification of substandard care and the avoidable factors associated with the death through critical analysis of the care received [17]. The Maternal Death Review Meeting observed in the present study failed to provide a confidential, nonthreatening environment where the Committee could discuss these issues freely. Moreover, the Committee included two assessors who had been involved in the care of two of the deceased women. As a result, the Committee did not attempt to critique the substandard care that these women had received.

Maternal mortality surveillance findings in China are not accessible at a local level for the concerned parties such as policymakers, health professionals, the community, and women of reproductive age. Lee et al. [18] stated that, "the demonstrable power of surveillance is in sharing findings with those who need to know and who can act on these findings to improve patient safety." Surveillance findings can serve a pivotal role in identifying the factors contributing to maternal deaths, learning lessons to save lives, and determining the actions necessary to reduce problems. Therefore, distribution of anonymous information should be implemented at all levels, from the health system to the community itself.

The people responsible for collecting surveillance data should be qualified professionals with training and experience [18]. We found that the MCH workers in the present study did not have sufficient knowledge or skills to collect data on maternal deaths and the Committee was not competent to identify substandard care and recommend remedial action. Training should be provided to both MCH workers and Committee members to improve the quality of maternal mortality surveillance.

The Chinese Maternal Deaths Reporting Form should be revised to ensure anonymity of the woman, health workers, and the hospital involved; it should ensure that relevant social factors and detailed treatment history are included. Good design can encourage self-reflection by asking how these situations can be avoided in the future. The process should occur in a non-punitive manner because blame may diminish further reporting of maternal deaths. Health workers need to be made aware that the goal of a maternal death review is not to apportion blame, but to improve clinical outcomes and reduce maternal deaths in the future.

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, the Second Hospital of Shanxi Medical University, and the Western China Second Hospital of Sichuan University.

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