Discrepancy between the national protocol and healthcare providers’ knowledge, attitude, and practice regarding induction and augmentation of labor with oxytocin in Cambodia

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Abstract

Objectives
The aim of this study was to investigate the knowledge, attitude, and practice (KAP) of healthcare providers regarding the utilization of oxytocin for induction or augmentation of labor.

Methods
A qualitative study composed of direct observation and individual interview was conducted at a national tertiary maternity hospital in Phnom Penh, Cambodia in January and February 2013. The progress of labor in women who received oxytocin for induction or augmentation of labor was directly observed to confirm the healthcare providers’ management of oxytocin infusion. The attending doctors and midwives were individually interviewed after the women delivered.

Results
During the study period, 10 women were observed, and 12 healthcare providers (three doctors and nine midwives) were interviewed individually. Indications for labor induction or augmentation seemed to be appropriate for nine women. However, we found discrepancies between the national protocol and healthcare providers’ knowledge and actual practices. For example, 11 healthcare providers had never read the national protocol for the management of labor induction and augmentation, which implied limited access to the correct knowledge. A misconception was noted in that the sudden increase of oxytocin was not dangerous during the second stage of labor, despite the establishment of a good contraction pattern. Furthermore, a lack of unified initial dose and extremely high maximum dose above that recommended by the national protocol were observed. About half of observed women were not monitored for more than 2 hours from the beginning of oxytocin infusion.

Conclusion
In the present study, lack of knowledge, misconceptions regarding the management of oxytocin infusion, and a large gap between the national protocol and the actual clinical practices were confirmed. To maximize patient
safety and therapeutic benefit, dissemination of the national protocol through in-service training is required.

Keywords: oxytocin, induction of labor, augmentation of labor, Knowledge, Attitude, and Practice (KAP) survey, Cambodia

I. Introduction

The use of oxytocin for labor induction and augmentation is one of the most commonly utilized obstetric treatments. However, the utilization of oxytocin during the first and second stages of labor varies among hospitals and countries. In western countries, 20‒30% of women receive some type of labor induction, and another 20‒40% of women receive labor augmentation. Similarly, 20‒90% of women, including low-risk women, receive oxytocin for labor induction or augmentation routinely in developing countries. In this context, the World Health Organization (WHO) was unable to determine a justifiable reason for many cases of labor induction and augmentation and could not determine a clear benefit for the liberal use of oxytocin for labor augmentation to prevent prolonged labor. After the introduction of the active management of the third stage of labor (AMTSL) as a standard practice to prevent postpartum hemorrhage, the availability of oxytocin was dramatically increased in low-income countries, especially in rural areas where the health facilities often have limited medical equipment and health personnel with knowledge about labor induction and augmentation. This situation precludes the careful observation of women and fetuses that is needed to safely induce and augment labor. However, little has been reported about existing practices in low-income countries.

The health systems in Cambodia were heavily damaged during the Khmer Rouge period (1975–1979). The Ministry of Health (MoH) launched health sector reforms in 1995, and resumed its efforts to reconstruct the healthcare systems and strengthen human resources, including skilled birth attendants (SBAs) such as doctors, midwives, and nurses. The MoH has promoted SBAs to assist delivery at health facilities as a key strategy to improve maternal and neonatal health status. At least one primary midwife (1-year midwifery education) was assigned to 51% of health facilities. Consequently, the rate of facility-based delivery increased from 22% during 2000–2007 to 61% during 2009–2013. Similarly, the rate of delivery assisted by SBAs increased from 44% to 72% during the same period in Cambodia. Although several studies regarding reproductive health issues have been conducted in Cambodia, information regarding induction and augmentation of labor is limited.

The aim of this study was to understand the discrepancy between the national protocol and healthcare providers’ knowledge, attitude, and practice regarding the use of oxytocin for labor induction and augmentation in Cambodia.

II. Methods

1. Study design

The qualitative knowledge, attitude, and practice (KAP) survey was conducted through direct observation and individual interviews with doctors and midwives in January and February 2013.

2. Study site

This study was conducted at a national maternity hospital, located in Phnom Penh, the capital city of Cambodia. This hospital is a leading referral tertiary center that also functions as a national training center in the area of maternal and child health. The hospital deals with approximately 7,200 deliveries annually, with 25% via cesarean section. In this hospital, only doctors are allowed to prescribe oxytocin for either induction or augmentation of labor. However, autonomous care lead by midwives is prioritized even if women receive oxytocin. Only when further medical interventions are required, doctors need to attend the deliveries.

3. Study participants

Women who were hospitalized and whose labor was induced or augmented by oxytocin were eligible for this study. Women who were planned elective
cesarean section, were preterm, had multiple pregnancies, breech presentations, or severe complications were excluded.

4. Data collection

Both the direct observation and individual interviews were conducted by the first author, who had a midwifery license, and a female Cambodian interpreter with a medical license. Study participants were sequentially recruited in the delivery room and maternity ward whenever doctors made a decision to use oxytocin for labor induction or augmentation. Recruitment was performed between 8:00 and 16:00 of weekdays.

Direct observation was used to confirm the healthcare providers’ management of labor induction or augmentation in both the maternity ward and delivery room. A 55-item checklist, which included (1) indication for labor induction or augmentation and (2) management of oxytocin (i.e., initial dose, maximum dose, and intervals of incremental oxytocin infusion) was used to monitor and record the progress of labor. Soon after doctors prescribed oxytocin for induction or augmentation, the researcher asked them about the indication for use of oxytocin. Direct observation was continued until a sufficient number of women had been observed to achieve data saturation.

The doctors and midwives who were responsible for the observed women were individually interviewed for approximately 60 minutes to complement the information obtained from direct observations and to help understand their knowledge, prevailing attitudes, beliefs, and misconceptions regarding the management of oxytocin. Notes were taken during the interviews, and the interview sessions were recorded using a voice recorder device only after the interviewee’s permission. The notes and audio recordings were transcribed verbatim.

5. Data analysis

Tables were prepared using Microsoft Excel spreadsheets (Microsoft Corp., Redmond, WA, USA). The appropriateness of oxytocin management for labor induction and augmentation was assessed using the “National Reproductive Health Program, Safe Motherhood Clinical Management Protocol for Reference Hospital” (hereafter referred to as the national protocol) prepared by the Cambodian MoH, which was a translated document from English into Khmer language in 2011 based on the WHO International Guideline for Managing Complication in Pregnancy and Childbirth (IMPAC). Appropriateness of indication was assessed using “WHO recommendations for the induction of labor”. In addition, “Care in Normal Birth: A practical guide” was also utilized to assess the healthcare providers’ knowledge and attitude.

6. Ethical considerations

This study was approved by the Ethics Committee of the Graduate School of Medicine at the University of Tokyo, Japan, and the National Ethics Committee for Health Research at the MoH of Cambodia. Written informed consent was obtained from parturient women prior to their direct observation. All women were assured that they had the right to withdraw from the study at any point, and that their acceptance or refusal to participate in this study would not affect their treatment or midwifery care. Likewise, written informed consent was obtained from doctors and midwives prior to the individual interviews.

III. Results

1. Characteristics of study participants

During the four-week study period, researchers approached 10 women (seven primiparas and three multiparas) for recruitment to direct observation, and all women agreed to participate (Table 1). Women were aged 21–40 years, and their gestational periods ranged from 259 to 302 days (37 to 43 weeks). Labor induction and labor augmentation were performed for three and seven women, respectively. Labor induction for one woman was discontinued due to hyperstimulation and fetal tachycardia, and her contractions and fetal heart rate eventually normalized after the oxytocin infusion was stopped. Eight women (including the woman for whom labor induction was discontinued) delivered vaginally, and two had vacuum extractions. None of the women had emergency cesarean sections, and there were no maternal deaths. Birthweights of the neonates were between 2,600 and 3,800 g. Low Apgar scores (i.e., ≤ 6) at 5 min were observed for two babies, but there was no
serious neonatal asphyxia.

At the moment of childbirth of the observed 10 women, eight deliveries were attended by both doctors and midwives and two deliveries were attended by only midwives. Note that two doctors attended two deliveries each (one was responsible for case 2 and 3, and the other was responsible for case 5 and 8), and three doctors and one midwife refused to be interviewed. As a result, individual interviews were conducted with three doctors aged 44‒56 years who had 22‒26 years of work experience, and nine midwives aged 22‒59 years who had 1‒37 years of work experience.

2. Knowledge

During the direct observation, indications for oxytocin use were confirmed at site (Table 2), and indications for nine women were deemed appropriate. The reasons for appropriateness for labor induction were oxytocin infusion started within 24 hours after a prelabor rupture of membrane (PROM) (case 1) and post-term pregnancy (43 weeks) (case 6). The reasons for appropriate labor augmentation were prolonged labor crossing the partograph action line (cases 3, 4, and 8-10), prolonged second stage of labor (case 2), and the termination of severe pre-eclampsia of a multiparous woman whose cervical dilatation was 5 cm on admission (case 5). Labor induction was found unsuitable for a woman at term who had neither labor pain nor PROM (case 7).

Through the individual interviews with the three doctors and nine midwives, knowledge about the initial dose and intervals of incremental oxytocin infusion was assessed. Table 2 shows the healthcare

<table>
<thead>
<tr>
<th>Table 1 Characteristics of study participants</th>
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<tbody>
<tr>
<td><strong>Characteristics of women (n=10)</strong></td>
</tr>
<tr>
<td>Parity</td>
</tr>
<tr>
<td>Primiparous</td>
</tr>
<tr>
<td>Multiparous</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Gestational period (days)</td>
</tr>
<tr>
<td>Maternal weight (Kg)</td>
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<tr>
<td>Maternal height (cm)</td>
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<tr>
<td><strong>Progress of labor (n=10)</strong></td>
</tr>
<tr>
<td>Indication of oxytocin</td>
</tr>
<tr>
<td>Induction</td>
</tr>
<tr>
<td>Augmentation</td>
</tr>
<tr>
<td>Total time of oxytocin administration (min)</td>
</tr>
<tr>
<td>Episiotomy</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Mode of delivery</td>
</tr>
<tr>
<td>Vaginal</td>
</tr>
<tr>
<td>Instrumental</td>
</tr>
<tr>
<td>C/S</td>
</tr>
<tr>
<td><strong>Characteristics of neonates (n=10)</strong></td>
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<tr>
<td>Birthweight (g)</td>
</tr>
<tr>
<td>Apgar score at 5 min</td>
</tr>
<tr>
<td>≤5</td>
</tr>
<tr>
<td>≥7</td>
</tr>
<tr>
<td><strong>Characteristics of doctors (n=3: 1 male and 2 female)</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Working experience (years)</td>
</tr>
<tr>
<td><strong>Characteristics of midwives (n=9: all female)</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Working experience (years)</td>
</tr>
</tbody>
</table>

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providers’ responses to the question regarding oxytocin management. Most doctors and midwives reported that the initial dose ranged from 2.5‒4 mIU/min (recommended initial dose is 3‒4 mIU/min), but one midwife who had the longest working experience (37 years) was not aware of the initial dose (case 10). In fact, she started oxytocin infusion at a 10 times higher dose (29 mIU/min) than the initial dose recommended by the national protocol. 14 Only one doctor knew the correct maximum dose of 60 mIU/min as defined in the protocol. 14 The most frequent answer for the maximum dose was 30 mIU/min, and three midwives did not know the maximum dose. Regarding the intervals of incremental oxytocin infusion (recommended interval of increment is 30 min), three and nine healthcare providers believed that the infusion rate should be increased every 15 and 30 min, respectively.

3. Attitude

We assessed the attitude of the doctors and midwives concerning when they would refer to the protocol describing the management procedures for induction and augmentation, and when to increase the doses of oxytocin. Surprisingly, 11 healthcare providers (including all three doctors) had never read any portion of the protocol. One midwife said, “I have never seen the protocol.” Only one freshman midwife had seen the national protocol (case 3), which was distributed by the midwifery school. She explained the situation at this hospital by saying, “I learned about how to manage and monitor the induction of labor at school. In truth, the doctors’ orders here are different from the protocol, and each doctor prescribes a different practice.”

Of the nine midwives, seven believed that they could increase the rate of infusion based on their own assessment. However, a veteran midwife said, “Based on my experience, I decide on whether to increase or decrease the rate. I don’t count the number of drops.” In fact, she did not know the initial or maximum doses of oxytocin (case 10). By contrast, two midwives considered that the infusion rate should be increased only when it was ordered by doctors. A newly employed midwife said, “Actually, we just follow what doctors do and what they prescribe, such as the number of drops.” She also did not know the maximum dose of oxytocin (case 6). Furthermore, the doctor who had worked for 27 years said that “careful monitoring of infusion is required when cervical dilatation is 3–4 cm, but after full dilatation, there is no problem,” describing their perception of a pharmacological reaction towards a sudden increase of oxytocin during the second stage of labor (cases 2 and 3).

4. Practice

The rate of oxytocin infusion was managed by gravity-fed infusion rather than by an infusion pump. All oxytocin-containing ampules were stored at room temperature, although ampules should have been kept refrigerated to prevent reduction of the drug’s efficacy. In this hospital, two concentrations of oxytocin infusion (10 and 20 mIU/mL) were utilized depending on the doctors’ prescription. However, there were no clear standards for selection of oxytocin concentration, and the initial dosage as ordered by doctors was 7 drops/min for all women regardless of the used concentration. Table 2 summarizes the healthcare providers’ practice of oxytocin management confirmed by direct observation. In actual practice, the researcher found that the initial doses of oxytocin infusion varied from two to 29 mIU/min. None of the women received an oxytocin infusion at the recommended initial dose of 3–4 mIU/min. 14 We also found that the maximum dose administered varied among the patients (5–140 mIU/min). The protocol allows the dose to increase to 60 mIU/min (maximum dose), as long as a good contraction pattern has not been established. 14 As mentioned above, some doctors and midwives increased the infusion rate sharply when full cervical dilatation was confirmed. For example, at the beginning of the second stage of labor, the infusion rates of 4 women suddenly increased (i.e., from 2 to 12 mIU/min, from 4 to 30 mIU/min, from 20 to 90 mIU/min, and from 10 to 140 mIU/min) even though a good contraction pattern was already established. In addition, the healthcare providers did not periodically confirm the rate of infusion every 30 min, as suggested in the protocol. 14 There was variation in the duration between the beginning of infusion and the first incremental increase or adjustment of infusion (range, 30 min to 6 h 20 min). About half of the observed women were not monitored for
Table 2: Summary of healthcare providers’ knowledge and practice regarding induction and augmentation of labor with oxytocin

<table>
<thead>
<tr>
<th>Case</th>
<th>Parity</th>
<th>Purpose of oxytocin administration</th>
<th>Indication</th>
<th>Recommended practice by protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Doctor</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Induction</td>
<td>PROM No contractions</td>
<td>3-4</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>Augmentation</td>
<td>Weak labor pain</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>Augmentation</td>
<td>Weak labor pain</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>Augmentation</td>
<td>Weak labor pain</td>
<td>3.5</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Augmentation</td>
<td>Severe pre-eclampsia</td>
<td>2.5</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Induction</td>
<td>Post-term (43 weeks)</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Induction</td>
<td>Not clear at term, no labor pain, no PROM</td>
<td>2.5</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>Augmentation</td>
<td>PROM Weak labor pain</td>
<td>3.5</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>Augmentation</td>
<td>Weak labor pain</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>Augmentation</td>
<td>Weak labor pain</td>
<td>I don’t concern about initial and maximum dose</td>
</tr>
</tbody>
</table>

*At the moment of childbirth of 10 women, 8 deliveries were attended by both doctors and midwives and 2 deliveries were attended by only midwives. However, 2 doctors attended 2 deliveries each (one was responsible for case 2 and 3, and the other was responsible for case 5 and 8), and 3 doctors and 1 midwife refused to be interviewed. As a result, interviews were conducted with 3 doctors and 9 midwives.
more than 2 hours, including three women who were not monitored for 4 hours or more.

IV. Discussion

This study was conducted at the top referral hospital in Cambodia, and it identified the discrepancy between the national protocol and health providers’ knowledge, attitude, and practice regarding labor induction and augmentation.

Healthcare providers’ knowledge was assessed by the decision making process to use oxytocin for either induction or augmentation of labor. This study determined that the indications for labor induction or augmentation were appropriate for most cases based on their knowledge, and liberal use of oxytocin was rarely observed. This appropriate usage is supported by the lower rate of induction and augmentation at this hospital (11%)\(^7\), compared with the higher rates in Egypt (91%),\(^1\) South American countries (61%),\(^2\) and Jordan (42%),\(^2\) where elective inductions performed due to patient requests or for convenience are prevalent. A previous study also reported that the rates of labor induction and augmentation exceeded 40% in 5 of the 7 low-income countries investigated.\(^7\)

Inappropriate practices, such as lack of unified initial dose of oxytocin infusion and excessively high maximum dose, were confirmed. Administration of oxytocin is safe when used correctly; however, overdose of oxytocin infusion is occasionally related to hypertension of the uterus, uterine rupture, and fetal dysfunction.\(^19\) Furthermore, the bioactivity and reaction to oxytocin varies across individuals. Therefore, gradual increases in the rate of oxytocin infusion are required to determine the appropriate dose for each woman. Given the above, using two different concentrations of oxytocin infusion in this hospital was likely to cause confusion. To simplify oxytocin management, a single concentration of 10 mIU/mL is recommended, as suggested in the previous study.\(^20\) In addition, oxytocin-containing ampules should be refrigerated at the appropriate temperature.

Notably, the upper limit proposed by the WHO for maximal infusion rate is 60 mIU/min,\(^15\) and this level is approximately 12-fold higher than the normal physiological oxytocin level produced during spontaneous labor.\(^21\) Thus, healthcare providers should be aware that these upper limits are extremely high for women whose oxytocin receptors have high sensitivity. Sudden increases in the infusion rate (i.e., 90 or 140 mIU/min) during the second stage of labor for women already experiencing effective uterus contractions should be avoided.

We did note that doctors and midwives at this hospital could perform standardized protocols, such as AMTSL and skin-to-skin contact, correctly through in-service education. However, the present study suggested the need for strengthening healthcare providers’ capacity to assess maternal-fetal conditions and to adequately manage oxytocin infusion. A crucial problem was that the majority of doctors and midwives had never read the national protocol and did not even know about its existence. Hence, the MoH should promote the dissemination of the national protocol through seminars and in-service training to improve the management of labor induction and augmentation. Given the fact that some midwives simply followed the doctors’ decisions for increasing the rate of infusion, clear guidance for managing labor induction or augmentation is necessary. As the largest national training center within the country, it is important that the doctors and midwives there should be a good model, providing evidence-based medicine and midwifery care for medical and nursing students who work in the different provinces. According to a previous study conducted in a Cambodian province, hazardous practice to both mother and fetus were observed, including intramuscular oxytocin injections for labor induction or augmentation by midwives, regardless of their necessity, presumably to obtain additional fees from patients.\(^22\) Considering such situations in Cambodian provinces, enhancing management skills for induction and augmentation of labor, developing a sense of medical ethics, and promoting the patient safety culture are urgently required for the nation as a whole.

The major limitation of this study was the small sample size. According to the health information database in this hospital, two or three women received oxytocin infusion per day. In reality, however, induction and augmentation were sometimes not performed in daytime shifts, or were often performed simultaneously. Since direct observation and individual interviews were conducted by the sole researcher, this methodology could be directly associated with the limited
number of study participants, although this study could minimize the observer bias. Women who met the inclusion criteria were sequentially recruited, and all women approached by the researchers agreed to participate. We believe that the information obtained by observing the 10 women reached logistical saturation when new clinical phenomena and useful information in this setting were not expected, and when an understanding was reached regarding the health providers’ management of oxytocin infusion. Second, observational effects might have influenced the healthcare providers to practice and perform more carefully while observed. However, healthcare providers’ practices were observed in detail by using a 55-item checklist, allowing a systematic evaluation of their performance of oxytocin infusion management in each procedure. Third, the study design excluded women with severe complications, which implies that the sample of 10 parturient women was not likely representative of all women who gave birth in this setting. In addition, measuring the oxytocin infusion management for high-risk women was out of scope of this study. Nonetheless, this study was an important first step to understand the oxytocin infusion management and assess the knowledge, attitude, and practice of Cambodian healthcare providers.

Despite these limitations, we believe that this study will provide important insights for policymakers to develop effective interventions to increase the safety of women receiving oxytocin.

Conclusions
The present study identified the discrepancy between the national protocol and the healthcare providers’ knowledge, attitude, and practice. Management of oxytocin infusion was not always consistent with the established recommended practices, although indications for labor induction or augmentation with oxytocin were appropriate in most cases. Most healthcare providers did not utilize the national protocol. Therefore, comprehensive in-service education regarding the management of safe induction and augmentation may improve their skills.

Acknowledgement
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References


カンボジアの国家産科プロトコールに基づいたオキシトシンによる
陣痛誘発・促進方法と医療従事者のオキシトシン管理の
知識・態度・実践の相違に関する調査

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要 旨

目的
本研究は、カンボジアにおいて医師・助産師がオキシトシンをどのように捉え、利用しているかを、国家産科プロトコールのオキシトシン使用基準と比較し、knowledge（知識）、attitude（態度）、practice（実践）の観点から把握することを目的としている。

方法
カンボジアの首都プノンペンにある国立の産科病院において、直接観察と個別インタビューによる質的研究を2013年1月～2月に実施した。直接観察はオキシトシンを用いて陣痛誘発・促進された産婦を対象とし、オキシトシン使用開始から分娩終了までの観察を通じて、陣痛誘発・促進の適応や産婦の分娩経過、医師・助産師のオキシトシン使用管理方法を確認した。個別インタビューは、直接観察で得られた情報を補完し、医療従事者のオキシトシンの捉え方、意思決定プロセス、使用管理に関する知識を確認するため、分娩を担当した医師・助産師を対象に行った。

結果
調査期間中、産婦10名の分娩経過を直接観察し、医師3名、助産師9名に対して個別インタビューを行った。陣痛誘発・促進開始の判断根拠となった医療従事者の知識は、10名中9名の産婦に対して妥当性があると評価できた。しかし、陣痛誘発・促進のためのオキシトシン使用管理については、国家産科プロトコールと医療従事者の知識・態度・実践との間に相違が見られた。例えば、医療従事者12名のうち、11名が陣痛誘発・促進方法について記載されている国家産科プロトコールを見たことがなく、正しい知識へのアクセスが阻られていることが明らかとなった。また、分娩進行効果が認められる有効陣痛が発来している状態においても、「子宮口全開後には点滴を増量しても問題ない」という誤った認識が広がっていることも分かった。臨床においては、オキシトシン点滴静脈注射の初回投与量は統一されておらず、最大投与量（安全限界）を越えた過剰投与も確認された。また、6名の産婦に対し、オキシトシン点滴開始後2時間以上、モニタリングがなされていなかった。

結論
本調査を通じ、陣痛誘発・促進を目的としたオキシトシン点滴管理に関する国家産科プロトコールと、医療従事者の知識・態度・実際の使用方法との間に大きなギャップが確認された。出産の安全性を確保し、治療効果を最大限とるために、国家産科プロトコールの普及とオキシトシン管理に関する研修の充実の必要性が示唆された。

キーワード：オキシトシン、降雨誘発、陣痛促進、Knowledge・Attitude・Practice（KAP）調査、カンボジア