Evaluation of midwife's vaginal examination by virtual reality model

Ogahara, Miyuki

博　士　論　文

Evaluation of midwife's vaginal examination by virtual reality model

（バーチャルリアリティモデルによる助産師の内診技術の検証）

平成 28 年 7 月 13 日

神戸大学大学院保健学研究科保健学専攻

小河原　みゆき

Evaluation of midwife's vaginal examination by virtual reality model

バーチャルリアリティモデルによる助産師の内診技術の検証

Miyuki　OGAHARA　　　　Izumi　SAITO

小河原　みゆき　　　　　　齋藤　いずみ

Graduate School of health Sciences, Kobe University

神戸大学大学院保健学研究科

Contents

Abstract

The objectives of this study were to determine the vaginal examination techniques used by midwives through measurements with objective indicators; to determine the relation between midwives' vaginal examination techniques, number of years of work experience, and number of years of providing birth assistance; and to provide basic data for the development of an educational model of noninvasive vaginal examination. The study was conducted on 103 midwives working in hospitals. An actual measurement of five items

(Cervical dilatation, position of the cervix, cervical consistency , cervical effacement, and station of the presenting fetal head) involved in vaginal examination was performed by using the first virtual-reality model of vaginal examination developed in Japan.

The accuracy rate of the vaginal examination based on the total score was 57.8%. Of the five evaluation items, the "station of the presenting fetal head" had the lowest accuracy rate. No relationship was found between the total scores of vaginal examination techniques, the midwives' clinical experience, and the number of births they had assisted.

This study will serve as basis for constructing basic data for practical use in an educational system for the learning and mastery of diagnostic skills.

Introduction

Vaginal examination is one of the basic evaluation procedures performed in the field of obstetrics and gynecology, and has an important role in medicine and health care. However, it is a physically and mentally invasive procedure as it involves direct contact with female genitalia. Vaginal examination is conducted during medical consultations and should be performed only by fully trained and nationally certified midwives and physicians with a high level of knowledge and skills (Notification from the Head of the Health Policy Bureau, Ministry of Health, Labour and Welfare, 2004). Meanwhile, it is commonly agreed that in perinatal care, vaginal examination is an essential procedure for the assessment of progression of labor. Vaginal examination of parturient women allows for the observation of the (1) degree of dilatation of the cervical canal,

(2) position of the cervical canal, (3) hardness of the cervical canal, (4) cervical effacement, (5) height and station of the fetal head, (6) presenting part of the fetus, and (7) degree of rotation of the fetus. For items [1] to [5], the Bishop pelvic score is used for the scoring of cervical ripening. The Bishop pelvic score is a universal and important parameter in the clinical setting, used as a standard criterion for judging a ripened cervix; in other words, it is used as a reference for assessing the progression of labor. In actual monitoring and follow-up of a delivery, it is important that vaginal examination will be repeated a number of times and that the changes will be monitored in a time-course manner through comparison of findings, in order to ensure a safe delivery. However, because of the particularities of the procedure as described above,

2

avoiding unnecessary vaginal examinations has become common sense in modern perinatal care.

Furthermore, with future progress in midwife-and-obstetrician-led shared examinations and midwife-managed delivery units, midwives will be more proactively involved in assisting deliveries, and proficient skills in vaginal examination techniques will be essential for an accurate diagnosis of the progression of delivery and for minimizing physical and psychological pain in parturient women. Moreover, there will be a need for biological models compensating for the decrease in opportunities to acquire skills in conducting diagnosis through vaginal examination. In studies conducted in other countries on the accuracy of vaginal examination techniques in the assessment of progression of delivery, the rates of misjudgments among obstetricians and midwives were analyzed using a cervical dilation model simulator, and the results showed that the rate of erroneous judgments by both obstetricians and midwives was approximately 51.4%, and that no significant differences in vaginal examination techniques were found between the two professions [1)2)3)4)].

In addition, a study conducted on obstetricians, which compared the findings of vaginal examination with transabdominal ultrasonographic examination-based diagnosis, provided evidence that the rate of erroneous judgments was 40%−60%, and that transabdominal ultrasonographic examination-based diagnosis was associated with a lower rate of erroneous judgments than vaginal examination [5)6)]. However, transabdominal ultrasonographic examination-based diagnosis has also been reported to have its own limitations at some stages in the progression of delivery [7)]. In Japan, a

3

comparative study of diagnoses made by midwives on the basis of vaginal

examination and those based on transabdominal ultrasonographic examination

was reported in 2010 [8]. With vaginal examinations, the rate of erroneous

judgments was 59.7%, showing virtually the same performance as that reported

in previous studies. However, previous reports have shown that cases where in

the fetus weighs $\geq$ 2500 g, and in which the cervical dilation is $\geq$ 7 cm,

transabdominal ultrasonographic examination-based measurements may not be

accurate, and along with the progression of delivery, there may be limitations to

the transabdominal ultrasonographic examination-based assessment of the

cervix. In addition, it is mentioned that there is no significant difference in the

accuracy of vaginal examination techniques according to the midwives' clinical

experience and number of assisted births. In other words, no alternative to

vaginal examination exists anywhere in the world, and therefore, it would not be

an exaggeration to say that vaginal examination techniques are of higher

importance in the diagnosis of the progression of delivery. On the basis of such a

background, studies on vaginal examinations, as well as on the education,

clinical training, and field learning of vaginal examination techniques, are faced

with considerable restrictions, including challenges to the accuracy of diagnosis,

to the rate of erroneous judgments among obstetricians and midwives while

performing vaginal examination, and to the comparison of findings from vaginal

examination with those from other diagnostic procedures.

This is a considerable issue in ensuring a safe delivery in accordance with

the expectations of parturient women, fetuses, neonates and family members, as

well as the entire nation. In addition, from the perspective of educational

background, the existing education of physicians and midwives on vaginal

examination has been entrusted to educational institutions, and there is a lack

of quality educational materials. For this reason, it is believed that clinical

training supervisors teach students about vaginal examination based on what they have learned through experience. Because the vaginal examination technique cannot be visualized while being performed, it is impossible for a third party to check or confirm a person's skill in conducting the procedure.

This is believed to lead to the continuation of a chain of vague traditional skills that have poor accuracy and are impossible to evaluate through objective indicators. Therefore, the outcomes shown by the findings of our study seem to be virtually the same as those of related reports published during the past 20 years. With a focus on the rarity of scientific basis for the fact that the status of the progression of delivery is reflected in the diagnosis based on vaginal examination, in this study we attempted to conduct a quantitative evaluation of the "quality" of diagnostic skill based on vaginal examination, as a means to evaluate the quality of midwifery care, for the purpose of providing a safe and secure environment for delivery.

Objectives of this study

The objectives of this study are as follows: to quantify the status of midwives' acquisition of vaginal examination techniques; to elucidate the correlation between vaginal examination techniques and the midwives' clinical experience; and to acquire basic data that are likely to lead to the development of an optimized, noninvasive, and educational biological model.

It is believed that there is a need for the construction of objective basic data that can be used effectively by midwives and obstetricians.

Definition of terms

The rate of erroneous judgments in vaginal examination refers to the percentage of cases in which the findings from the virtual-reality model of

vaginal examination are not consistent with the findings from the vaginal examination of the tested subjects.

Research Methods

1. Study design: Experimental design.

2. Study participants: Midwives working in hospitals and who had previous experience in performing midwifery procedures including vaginal examinations. A total of 103 midwives who provided their consent participated in this study.

3. Surveyed hospitals: 7 facilities in A Prefecture, Japan.

4. Study period: From November 1, 2011, to January 31, 2012.

5. Survey method:

After informal consent was received from the director of the nursing department or the head of each facility, the researchers explained the purposes, contents, and ethics of this study to the director of the nursing department or the head of the institution. When an agreement to cooperate in this study was reached, a schedule was adjusted to a later date and a call for collaborators was made. The researchers visited the facilities that agreed to take part in the study in order to collect data. Consent to participate in the study was again received. After completion of the experiments and the questionnaire survey, and after completion of the participation in the study, the participants were requested to use a visual model that allowed them, with the use of three-dimensional images displayed on a computer screen, to check

6

the position of their own fingers at the time of the vaginal examinations and
to conduct visual confirmation while performing a vaginal examination on
"Station 0."

Data collection method

1) Measuring instruments: A virtual-reality model of vaginal examination
(December 2010, LM-95) was used as an objective scale for measurements in
vaginal examination-based diagnosis.

2) The participants were requested to use the four types of cervical dilation
models in the virtual model of vaginal examination, to use the four settings
listed below, and to fill out a form with their vaginal examination-based
diagnosis. (Figure 1)

(a) 1 Experiment setting model

Cervical dilation (1–2 cm), position of the cervix (anterior), Consistency of
the cervix (medium), cervical effacement (0%), and degree of engagement of
the fetal head (-1 cm)

(b) 2 Experiment setting model

Cervical dilation (3–4 cm), position of the cervix (anterior), hardness of the
cervix (medium), cervical effacement (50%), and degree of engagement of
the fetal head (0)

(c) 3 Experiment setting model

Cervical dilation (8–9 cm), position of the cervix (anterior), hardness of the cervix(medium), cervical effacement (100%), and degree of engagement of the fetal head (+1 cm)

(d) 4 Experiment setting model

Cervical dilation (10 cm), position of the cervix (anterior), and degree of engagement of the fetal head (+2 cm)

Then, the rotation of the fetal head was determined based on the position of the posterior fontanel and sagittal suture on the fetal head model.

3) Participants examined 4 kinds of models in a random manner.

4) If the cervical dilatation was consistent with the vaginal examination model settings, 1 point was given for 1 item, and 5 points per 1 pelvic examination, with a total of 20 points for carrying out the examination four times.

5) The time needed for the determination of the vaginal examination-based diagnosis was measured in each experiment; however, since the purpose of the study does not require evaluating performance based on time, the participants were requested to continue until they were able to determine the diagnosis.

6) The participants wrote the results of their vaginal examination by filling out an answer sheet. The time required per person was predicted to be approximately 15 min.

7) Attribute survey (the midwives' clinical experience, the number of births assisted)

The number of the one-year live births was 1030000 on 2011, The number of the employees of the all midwife was 29137 on 2011. These statistical resources ware collected from Ministry of Health Labor and Welfare. The number of people that one midwife was delivered and assists is calculated with 29 people a year. (A caesarean section rates is 19.2%.) According to Clinical Ladder of Competencies for Midwifery Practice, In Japan Nursing Association, as for the senior nurse midwife, the years of experience were almost prescribed more than seven years. Thus, I classified it 7 years or more and less than 7years.

I calculated it with the number of 203 births assistance in approximately 7years. Thus, I classified it 200 births or more and less than 200 births.

Statistical analyses

The statistical package software SPSS version 20.0 for Windows was used for statistical analysis. The Student t-test was used to examine significant differences between the two groups in terms of the total score of each factor, independently[10]. In each case, 5% or lower was considered as the significance level.

I classify it in five indexes and can evaluate it, and Not the model that merely supplier developed, it is a crystal of the wisdom in the time when a Japanese obstetrical study researcher developed it for Health and Labour science research grant.

Ethical considerations

In the field survey of vaginal examination techniques using a biological

model, as well as in the collection of survey questionnaires, the data may contain personal information identifying individuals, such as the names of health-care workers. Concerning this issue, we complied with the law on the protection of personal information of Kobe University, and we followed the university's policy and guidelines pertaining to the management of personal information, as well as the regulations on the management of personal information at Kobe University. In addition, all required predetermined documents concerning these issues have been created and submitted.

An application was submitted to the ethics committee of Kobe University Graduate School of Health Sciences, in order to verify that there were no ethical or safety issues.   This study was approved by the ethics committee of Kobe University Graduate School of Health Sciences, and the ethics committee of each of the seven participating hospitals.

Results

　　With the target attribute, there were the most years of experience 0-3years of the midwives with 40 participated. In addition, with the number of births assistance numbers, there were the most 1-99 births with 44 participated. (Table 1)

　　By the midwives' basic education, as for the acquisition of the vaginal examination techniques, the student by the learning only for textbooks occupied 48 and the about half, the student by the model of dilatation of cervix occupied 53 and about half. By the midwives' postgraduate education, as for the acquisition of the vaginal examination techniques, 4 midwives participated in

workshops and 4 midwives participated in the study session which they planned in a ward. （Table 2）

The total score of vaginal examinations repeated four times was, 11.6 ± 2.6 points, the accuracy rate based on the total score was 57.8%; and the inaccuracy rate was 42.2%. The average score of the cervical dilatation was 2.3 ± 1.1 points, the accuracy rate was 58.0%, and the inaccuracy rate was 42.0%. The average score of the position of the cervix was 2.3 ± 1.0 points, the accuracy rate was 57.3%, and the inaccuracy rate was 42.7%. （Figure 2）

The average score of the cervical Dilatation was2.3±1.1points, the accuracy rate was 58.0%, inaccuracy rate was42.0%, The average score of the cervical Position was 2.3 ±1.0 points, the accuracy rate was 57.3%, inaccuracy rate was42.7%, The average score of the cervical Consistency was 2.7±1.0 points, the accuracy rate was 67.2%, and the inaccuracy rate was 32.8%. The average score of the cervical effacement was 3.0 ± 1.1 points, the accuracy rate was 73.8%, and the inaccuracy rate was 26.2%, which represent the highest values. The average score of the height of the presenting part (the fetal head) was 1.3 ± 1.0 points, the accuracy rate was 32.6%, and the inaccuracy rate was 67.4%, which represent the lowest values. （Figure 3）

We examined whether there are any differences in the relation between the five factors in vaginal examination and the midwives' clinical experience. Clinical Ladder of Competencies for Midwifery Practice was authenticated years of experience around 7 years as an advance midwife. Thus, subjects were classified into two groups of more than 7 years and less than 7 years.

11

The average score of the cervical dilatation was 2.3 ± 1.2 points, The average score of the position of cervix was 2.3 ± 1.0 points, The average score of the cervical consistency was 2.7 ± 0.9 points, The average score of the cervical effacement was 3.0 ± 0.9points, The average score of the height of the presenting part (the fetal head) was1.4±1.0 points, which represent the lowest values in 0 ～6years of experience. The average score of the total scores was11.7±2.7 points. The average score of the cervical dilatation was 2.4± 1.1points, The average score of the position of cervix was 2.3 ± 1.0points, The average score of the cervical consistency was 2.5± 1.0points, The average score of the cervical effacement was 3.0± 0.9points, The average score of the height of the presenting part (the fetal head) was 1.5 ± 1.0+points, which represent the lowest values in more than 7years of experience. The average score of the total scores was11.7±2.5 points.

The Student t-test was performed to determine the relation between the total score of each five factors in vaginal examination and the midwives' clinical experience in the two groups. The results showed that in terms of the degree of cervical consistency, midwives with 0–6 years of experience had a significant higher score. (P< 0.05). There was no significant difference in cervical dilatation, position of cervix, cervical effacement, station of fetal head, between the total scores of midwives with different numbers of clinical experience. (Table3)

We examined whether there were any difference in the relation between the five factors in the vaginal examination and the number of births assisted by the midwives. The average score of the cervical dilatation was 2.3± 1.1, The average score of the position of cervix was 2.5 ± 1.0, The average score of the cervical

consistency was 2.6±0.9, The average score of the cervical effacement was 3.0 ± 0.9 ,The average score of the height of the presenting part (the fetal head) was 1.5 ±1.0, which represent the lowest values among midwives who had assisted 1 －199 births. The average score of the total scores was11.6±2.8 points.

The average score of the cervical dilatation was 2.3±1.1, The average score of the position of cervix was 2.4 ± 1.0, The average score of the cervical consistency was 2.5± 0.9 , The average score of the cervical effacement was 3.0±0.9 points, The average score of the height of the presenting part (the fetal head)of was1.5± 1.0, which represent the lowest values among midwives who had assisted ≧200 births. The average score of the total scores was11.6±2.5points. The Student *t*-test was performed to determine the relation between the total score of each of the five factors in vaginal examination and the number of births assisted in the two groups, independently, The results showed that in terms of the degree of In terms of the total score, each five factors there was no significant difference with the number of births assisted by the midwives. (Table 4)

Discussion

Concerning the rate of erroneous judgments in the vaginal examination -based diagnosis, the results of this study were similar to those reported in previous studies. The rate of erroneous judgments concerning the degree of cervical dilatation was 42.0%; cervical effacement, 26.2% (the lowest rate); position of the cervix, 42.7%; consistency of the cervix, 32.8%; and height of the presenting part (the fetal head), 67.4% (the highest rate[11]) .

No relationship was found between the total scores of vaginal examination techniques, the midwives' clinical experience, and the number of births they had assisted. There was no significant difference between the scores of the station of the presenting fetal head, and the midwives' experience, and the numbers of births they had assisted by the midwives.

The Bishop pelvic score, which has been established and is currently used as evidence, has been given considerable importance clinically and is used worldwide as a standard criterion for the determination of cervical ripening, and is considered an effective method for the selection of cases of induced labor as well as for the prediction of the progression of childbirth [12) 13)]. The diagnosis of the five factors involved in the Bishop pelvic score (namely, the cervical dilatation, cervical consistency, position of the cervix, cervical effacement, and station of the presenting part) is mandatory. These five factors are considered skills that must be acquired during basic midwifery education. About half of midwives student acquired through only the actual place training before clinical practice, and the spread of education teaching-materials such as vaginal examination models is necessary. In addition, it is believed that in the clinical setting and during the progression of labor and delivery, vaginal examination cannot be replaced by any other method for the diagnosis of the cervical canal [14)]. In view of the fact that there are limitations to transabdominal ultrasonographic examination-based diagnosis as mentioned earlier.

According to the Japan Nursing Association standards on perinatal nursing practice, issued in December 2000, "whenever the progression of childbirth is abnormal, a physician must be notified immediately, and the issue must be

handled in collaboration with the physician[15]. In other words, midwives are required to be able to predict deviations from normalcy, and to respond immediately. In case of abnormal labor and delivery, such as in the case of vacuum extraction or forced delivery, capability to conduct midwifery diagnosis, including accurate vaginal examination, is needed to manage the situation in collaboration with a physician.

In the field of obstetrics, the evaluation of the height of the presenting part through vaginal examination is extremely important for the determination of abnormal labor and delivery, such as in cases of vacuum extraction or forced delivery[16)17)]. In Europe and the United States, the method for the evaluation of the height of the presenting part has been standardized since 1989[18]. Now that it has not been recognized that two evaluation methods exist at the same time, judgments based on records are likely to be erroneous. In other words, it will be impossible to secure the safety of child delivery. The absence of a consensus about the proper position of the station of the presenting fetal head[19], is an issue in obstetric malpractice cases, The results of this study were virtually similar to those of studies on vaginal examination techniques reported over the past 20 years, which suggests that there has been no change in the quality of diagnosis. Vaginal examination is believed to be a continuing chain of vague, traditional, and poorly accurate techniques that are impossible to evaluate through objective indicators or by a third party. The learning and acquisition of skills in vaginal examination techniques similar to those of obstetricians are also applied in basic health-care education. Accurate vaginal examination techniques acquired by doctors and midwives can be an important source of

information for vacuum extraction, or provide standard criteria for the preparation of guidelines [20] in obstetrics, and may greatly contribute to a marked improvement in the safety of deliveries.

The postgraduate education in the clinical setting, and most midwives teachers need the continuous education in facilities because there is not the attendance of the workshop about the vaginal examination techniques.

Considering the invasiveness of vaginal examination to pregnant women, more accurate and correct vaginal examination techniques is requested.

It is conceivable that the establishment of the educational model system for the medical staffs by a noninvasive educational model may be one of tools to promote in parallel with the time-dependent changes of social conditions which surrounds medical treatments such as the peculiarity of vaginal examination and a rise of a patient right. It is vital to promote the advanced management, including acquisition of the exact vaginal examination techniques which doctors and midwives, desire the realization of basic education using the standardized educational teaching-materials, and the establishment of common grounds which guarantee the opportunity for the postgraduate education in the clinical setting. The clinical training with using virtual-reality educational model which refers the progression of labor may contribute to the promotion of the ability of vaginal examination in midwives. This study will serve as basis for constructing basic data for practical use in an educational system for the learning and mastery of diagnostic skills.

Conclusions

In this study, the accuracy rate of vaginal examination techniques among midwives in A Prefecture was 57.8%, which is the same to that reported in previous studies.

Among the five factors in vaginal examination, evaluation of the station of the presenting fetal head showed the lowest accuracy rate. No relationship was found between the total scores of vaginal examination techniques, the midwives' clinical experience, and the number of births they had assisted.

Virtual-reality model may be one of tools to promote the ability of vaginal examination in midwives.

Study limitations

This study had the following limitations: a multicentered study has yet been done; the study was not conducted among health-care professionals (in other word, physicians and midwives) from various institutions; and no time-course analysis of the efficacy was carried out.

References

1. Tuffnal DJ, Nicholas Johnsons, et al. Simulation of cervicalChangesLabour: Reproducibity of expert Assessment. Lancet 334(8671)4:1089-1090, 1989.

2. Sherer DM, Miodovnik M, et al. Intrapartum fetal head posit I ;Comparison between transvaginal digital examination and transabdominal ultrasound assessment duing the active stage of labor. Ultrasound Obstet Gynecol 19(3):258-263, 2002.

3. Sherer DM, Miodovnik M, et al. Intrapartum fetal head position 2 Comparison betweentransvaginal digital examination and transabdominal ultrasound assessment duringthe second stage of labor Ultrasound Obstet Gynecol 19(3):264-268, 2003.

4. Blix E, Sviggum O, et al. Intre-observer vatiation in assessment of 845 labor admissiontests: comparison between midwives and obstetricians in the clinical setting and twoexpect. BJOG 110(1):1-5, 2003.

5. Lim BH, Mahmood TA, et al. A prospective comparative study of transvaginalultrasonography and digital examination for cervical assessment   in the third trimesterof pregnancy J Clin Ultrasound20(9):599-603, 1992.

6. O'Leary JA, Ferrell RE, et al. Comparison of ultrasonographic and digital cervcal evaluation. Obstet Gynecol 68(5):718-719, 1986.

7. Sherer DM, Abulafia O. Intrapartum assessment of fetal head engagement: comparison between transvaginal digital and transabdominal ultrasound determinations.Uitrasound Obstet Gynecol 21(5):430-436, 2003.

8. Japan Nursing Association publication society. Nursing relations statistics date,2011.

9. I Kawabata, A Nagasa, et al. Factors influencing the accuracy of digital examination for Determining fetal head position during the first stage of labor. J Nippon Med School 77(6):290-295, 2010.

10. Eiki Tsushima. Medical system multivariate data analysis to learn in SPSS The fifth edition, Tokyo, Tokyo book publication, 1-17, 2011.

11. Oliver Dupuis, Ruimark Silveira, et al. Birth simulator: Reliability of transvaginal assessment of fetal head station as defined by the American College of Obstetrians and Gynecologists classification.American Journal of Obstrtrics and Gynecol 192:868-874, 2005.

12. Rozenberg P, Goffinet F, et al. Comparison of the Bishop score, ultrasonograhically measured cervical length, and fetal fibronectin assay in

predicting time until delivery and type of delivery at term. Am J Obstet Gynecol.182(1pt1):108-13, 2000.

13. Gonen R, Degani S, et al. Prediction of successful induction of laver: comparison of transvaginal ultrasonography and the Bishop score. Eur J Ultrasound.7(3):183-7, 1998.

14. Lames A, O'Leary, et al. Comparison of Ultrasonographic and digital cervical evaluation Obstet Gynecol. 68(5):718-719, 1986.

15. Japan Nursing Association midwife's professional ability Committee The first edition the second impression midwifery service handbook new publication February, 2006.

16. Murphy DJ, Koh DK. Cohort study of the decision to delivery interval and neonatal outcome for emergency operative vaginal delivery. Am J Obstet Gynecol 196(2):145e1-7, 2007.

17. Meniru Gl. An analysis of recent trends in vacuum extraction and forceps delivery in the United Kingdom. Br J Obstet Gynecol 103(2):168-170, 1996.

18. F. Gary Cunningham, Kenneth J. Leveno, et al. 23rd Edition Williams OBSTETRICS. Mc Graw-Hill's ACCESS Medicin. Sept. 2009.

19..Public interest Japan Council for Quality Health Care Foundation. Report about the prevention of obstetrics medical care compensation system recurrence,42-51, The second May 2012.

20..Public interest incorporated association Japan Society of Obstetrics and Gynecology. Guideline for Obstetrical Practice in Japan, 181-185, 2011.

Figure 1 Experiment setting model
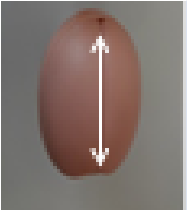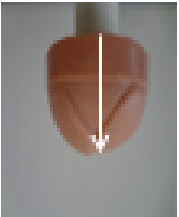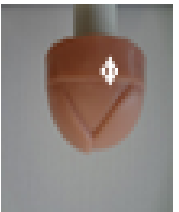
1 Experiment setting model	Dilation of cervix	Position of cervix	Consistency of cervix	Cervical effacement	Station of fetal head
	1~2cm	Medium	Medium	0%	Station -1cm
2 Experiment setting model	Dilation of cervix	Position of cervix	Consistency of cervix	Cervical effacement	Station of fetal head
	3~4cm	Anterior	Medium	50%	Station 0
3 Experiment setting model	Dilation of cervix	Position of cervix	Consistency of cervix	Cervical effacement	Station of fetal head
	8~9cm	Anterior	Soft	100%	Station +1cm
4 Experiment setting model	Dilation of cervix	Position of cervix	Consistency of cervix	Cervical effacement	Station of fetal head
	10 cm	Anterior			Station +2cm

20

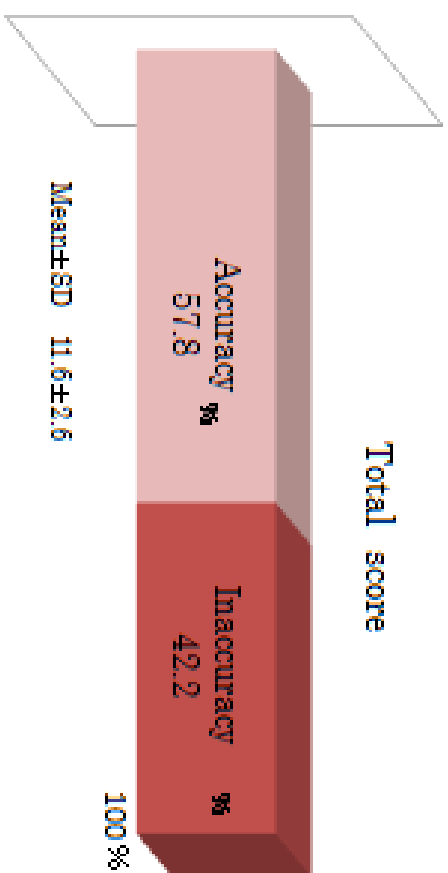Figure 2 Accuracy rate and Inaccuracy rate of Total score of vaginal examination

Figure 3 Accuracy rate and Inaccuracy rate of five factors of vaginal examination

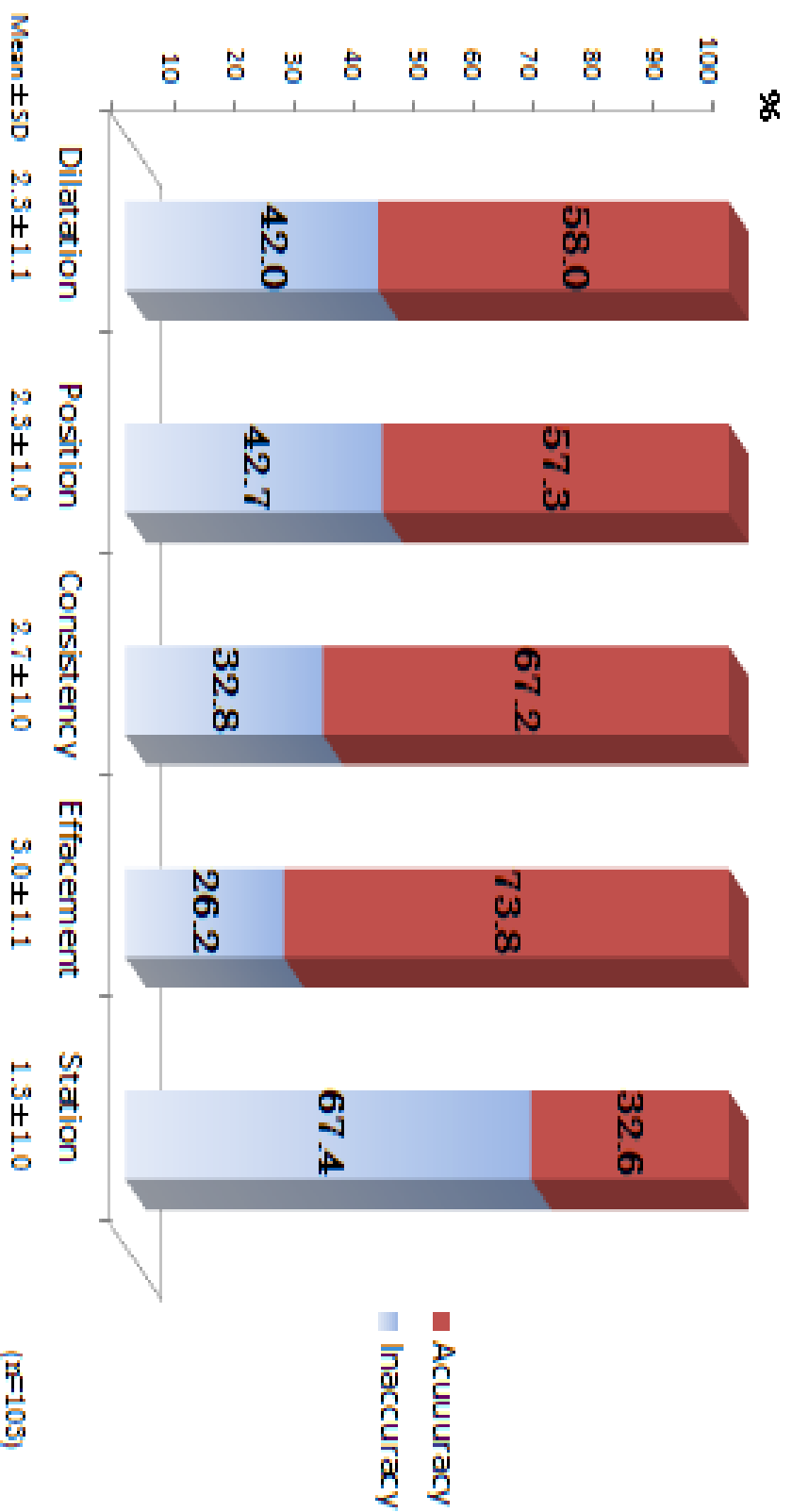|	Dilatation	Position	Consistency	Effacement	Station
Accuracy	58.0	57.3	67.2	73.8	32.6
Inaccuracy	42.0	42.7	32.8	26.2	67.4
Mean±SD	2.3±1.1	2.3±1.0	2.7±1.0	3.0±1.1	1.3±1.0

(n=105)

Acuuuracy
Inaccuracy

Table 1 Target attribute

Years of clinical experience		Births assistance numbers	
0~3 years	40	1~99births	44
4~6 years	15	100~199births	24
7~9 years	9	200~299births	12
10~12years	9	300~399births	9
≥13 years	30	≥400births	14
Total	103	Total	103

Table 2 Learning situation of vaginal examination techniques in midwifes' basic education and midwifes' postgraduate education

1. How did you learn the vaginal examination techniques ?

Only as for the textbook	48
Model of dilatation of cervix	53
Vaginal examination model	2
	103

2. Was there the workshop that improved of the vaginal examination techniques in midwifes' postgraduate education?

	Yes	No
Participated in a workshop	4	99
Participated in an in-hospital workshop	0	103
Participated in the study session which I planned in a ward	4	99

Table 3 Comparison of each total score of five factors of vaginal
examination with midwives' clinical experience

(mean±SD)

Factors	0~6 years of experience (n=59)	≧ 7 years of experience (n=44)
Cervical dilatation	2.3±1.2	2.4±1.1
Position of cervix	2.3±1.0	2.3±1.0
Cervical consistency	2.7±0.9 *	2.5±1.0
Cervical effacement	3.0±0.9	3.0±0.9
Station of fetal head	1.4±1.0	1.5±1.0
Total score	11.7±2.7	11.7±2.5

Student's t-test ;   *p < 0.05

Table 4 Comparison between the number of births assisted by the midwives and the total score of each of the five factors in vaginal examination

(mean±SD)

Factors	1 ~ 199births (n =66)	≧ 200births (n = 37)
Cervical dilatation	2.3± 1.1	2.3± 1.1
Position of cervix	2.5± 1.0	2.4± 1.0
Cervical consistency	2.6± 0.9	2.5± 0.9
Cervical effacement	3.0± 0.9	3.0± 0.9
Station of fetal head	1.5± 1.0	1.5± 1.0
Total score	11.6± 2.8	11.6± 2.5

Student's t-test ; no significant

26

Figure 1 legend

One quantifiable method used to predict labor induction out-comes is the score described by Bishop .As favorability or Bishop score decreases, the rate of induction to effect vaginal delivery also declines. A Bishop score of 9 conveys a high likelihood for a successful induction. Bishop score of 4 or less identifies an unfavorable cervix and may be an indication for cervical ripening.

Experiment setting model 1 (A Bishop score of 5)

Experiment setting model 2(A Bishop score of 8)

Experiment setting model 3 (Bishop score of 13)

Experiment setting model 4 (A Bishop score of more than 13)

Figure2 legend

The Bar graph expresses Accuracy rate and Inaccuracy rate of the vaginal examination of the each five factors.

Mean SD expresses the mean of five factors and standard deviation value.