Development of an Online OSCE Midwifery Test Package: A Practical Response to Academic Challenges

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Abstract: To developed an educational tool for an online OSCE to evaluate the practice readiness of the fourth-year nursing students. Online professional proficiency evaluation of nursing students can be a valid alternative to traditional methods. We designed a one group pre-posttest study. The 51 nursing students were recruited. We implemented a 3-stage of online Objective Structured Clinical Examination Midwifery Test Package (OSCEMTP). The package covered seven segments which developed to enhance the cognitive capability, clinical capability, and professional capabilities. The Practice readiness questionnaire was developed to assess the nursing students' readiness. Content validity index was 1, and reliability with Cronbach's alpha was 0.79. OSCEMTP contains 7 segments: 1) contraceptive; 2) antenatal care; 3) admission interview; 4) first stage of labor; 5) second and third stage of labor; 6) fourth stage of labor and 7) breastfeeding. Each segment has a scenario, a competency evaluation, and tools box for demonstration of clinical skills. Practice readiness was improved in the post-test ($p<.001$). Performance OSCEMTP should be evaluated across diverse population of nursing students to ascertain its validity. An online OSCE Test package is an education tool to enhance the practice readiness before turning to be a professional nurse.

Keywords: Clinical competency, Midwifery, Nursing Practice, Nursing Students, Online Education

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Introduction

The transition from a student of nursing sciences into a nursing professional requires competency in technical

knowledge, clinical skills, and cognitive preparedness (Baker et al, 2021). The practice readiness, which has three attributes, evaluates progression of a nursing student in assuming the role and responsibilities of a nursing professional. The first attribute, cognitive capability asserts the student's competency in effective clinical reasoning, decision-making skills, and situational awareness; while, the second attribute, clinical capability, emphasizes on the student's psychomotor skills, acumen in clinical assessment, delivery of healthcare services and effective time management; finally, the third attribute, professional capability, focuses on solidification of professional identity and ethics in profession of nursing (Mirza, Manankil-Rankin, Prentice, Hagerman, & Draenos, 2019).

Concerns about the adequacy of academic and clinical trainings of nursing students have been raised (Walker et al., 2017; Masso et al., 2022). Research findings suggest that newly graduated students from nursing programs are limited in their scopes and understandings of the three attributes of practice readiness. Institutional support, i.e., implementation of Objective Structured Clinical Examination (OSCE), can assist with strengthening the cognitive, clinical, and professional dexterity of the nursing students. Application of OSCE among nursing and midwifery students have been reported to improve students' effectiveness and efficiency in the delivery of healthcare services and patient-provider communication skills (Barry, Bradshaw & Noonan, 2013; Harden, 2016).

The necessity of social distancing has been a sobering experience and has challenged our technical agilities and resiliencies in developing educational evaluation alternatives to the traditional in-person approaches. Furthermore, advancement of technology and the availability of various educational tools now permit to remotely assess practice readiness of our students. In consequence, we design and developed an educational tool for an online OSCE midwifery Test with the objective of assessing its utility in evaluating the practice readiness of the fourth-year students from nursing sciences. Here, we report the design, development, and implementation of this online educational tool with the goal of sharing our experience with the academic nursing professionals to facilitate the development of such educational tools at their institutions.

Methods

This study was a developmental and implementation design. For the purpose of this study, we develop the online OSCE midwifery competency test and to apply the package as the "intervention" as that was architected by our research team. We designed a one group pre-posttest study and the practice readiness as the "outcome".

Study Participants

A total of 131 students who graduated in May of 2022, were contacted by the Faculty of Nursing at the Chiang Mai University to take part in this study. Of these, 51 (38.93%) consented to participate in the study. If the

participants availed the termination option. They were disenrolled from the study but the practice score from the OSCE test was still offered. The development scheme of our study constituted of three stages: 1) Planning and Preparation; 2) Implementation, and 3) Evaluation.

Planning and Preparation Stage

During the planning and preparation stage, we first analyzed contents of the midwifery core courses which are the required courses for undergraduate students in nursing sciences. We designed OSCE midwifery test package to capture various clinical scenarios in addressing antenatal, intrapartum, and postpartum phases. The final version of OSCE midwifery test package contains seven segments covering the concepts of: 1) contraceptive; 2) antenatal care; 3) admission interview; 4) first stage of labor; 5) second and third stage of labor; 6) fourth stage of labor and 7) breastfeeding (see in Table 1). Each segment of OSCE midwifery test package has three components: a) scenario; b) competency evaluation items checklist and c) tools for demonstration of clinical skills (see in Figure 1, A and B) (Shehata, Kumar, Arekat, Alsenbesy, Mohammed Al Ansari, Ahmed, et al, 2020). The OSCE midwifery test package intended to encourage and strengthen the cognitive ability (critical thinking, decision-making skills, and situational awareness), clinical ability (health assessment, perform activities), and professional abilities (ethical practice) of the test takers. For example, we deliberately limited clinical information in a few of the clinical scenarios to goad test takers to take additional clinicodemographic history and/or to give nursing diagnostic assessment or nursing care (see in Table 2).

For the instrument, we developed a 9-item of practice readiness questionnaire. The content of this 9-item questionnaire was grounded on the concept analysis work by Mirza et al. (Mirza, Manankil-Rankin, Prentice, Hagerman, & Draenos, 2019).The items were developed to assess nursing proficiency of students in four domains of nursing practice: 1) Cognitive ability consisting of effective clinical reasoning, decision-making skills, and situational awareness, (items 3,4 and 8) 2) Clinical ability consists of health assessment and perform clinical skills (items 1,2 and 6), 3) Professional ability includes the ethical practice (items 5 and 7), and 4) the perception of their self-efficacy to practices (item 9). It is a 5-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (5). The content validity index of the practice readiness questionnaire was calculated at 1.00. The Cronbach’s alpha reliability of the practice readiness questionnaire was calculated at 0.79.

Furthermore, we developed seven sets of competency evaluation items, one set for each scenario of OSCE midwifery test package. Number of evaluation items varies from 10 to 38, depending on the context of each scenario (scenario 1: 14 items; scenario 2: 14 items; scenario 3: 25 items; scenario 4: 10 items; scenario 5: 19 items; scenario 6: 15 items; and scenario 7: 38 items). Response to each item is categorized as” Yes or No”. A higher score for a specific scenario gets translated to a higher professional skill in that specific segment. The OSCE midwifery practice package overall score can be trichotomized into, excellent nursing proficiency (score range 81-100%), moderate nursing proficiency (score range 61-80%) or need to improve nursing proficiency (score range ≤60%). Finally, a certificate of successful completion of OSCE midwifery practice package is

issued at the level of excellence or moderate nursing proficiency performance.

Additionally, we developed detailed instructions for student test takers and scoring criteria for assessing students' performances. Furthermore, we drafted an itemized guideline for the supporting IT staff. During the planning and preparation stage, with the support from the IT staff, we uploaded OSCE midwifery practice package into the KC Moodle. The KC Moodle (Modular Object-Oriented Dynamic Learning Environment) is an open-source software (version 3.11) which provides the learning management system to students at Chiang Mai University.

The researchers met with prospective study participants in advance of the testing; during this meeting the researchers explained the purpose of the performance evaluation and details of the operational mechanism of the study. For example, the structure of the OSCE instrument and mechanism of completing OSCE, i.e., use of mobile phone camera with accessibility to the Zoom or the requirements for connection to KC Moodle were explained to the prospective study participants. The students who agreed to be the participants were signed inform consent via the online form. They had the rights to withdraw from our study without any repercussion. The link of personal information and practice readiness questionnaire was provided as the pre-test. The mock test and the test date will be informed.

Implementation Stage

During the implementation stage, we administered two mock OSCE midwifery test as an alpha testing, and the actual OSCE test as the beta testing. The objective of two mock tests were to identify potential unforeseen problems, and to develop corrective algorithms to resolve these problems before the actual OSCE midwifery test package.

Alpha Testing of OSCE Midwifery Test Package

The first mock test was administered to the two members of our research team who were trained and instructed to assume the mind frames of the fourth-year students from nursing sciences. The second mock test was administered to the study participants (n=51). These two mock tests were taken via the KC Moodle and Zoom application systems. During the two mock tests, access to the toolbox application was restricted; this restriction was imposed to reduce the likelihood of finding the answers to questions.

Beta Testing of OSCE Midwifery Test Package

On the scheduled testing day, the study participants were sent invitation to join Zoom via their mobile phones or iPads, 30 minutes prior to the start of OSEC midwifery testing. Microphones were muted to reduce the likelihood of noise distraction and/or verbal exchanges among the test takes. Participants were instructed to enter their Zoom ID systems and login to the KC Moodle via their personal computer workstations or laptops

with camera. Participants were reminded to Zoom record their performances. Participants were given a total of 15 minutes to complete each segment of OSEC midwifery test package and 5 minutes to upload their answers and their video clips into the KC Moodle system. Therefore, a total of 20 minutes was allocated to complete each segment of the OSEC midwifery testing package or 140 minutes to complete the seven segments. Finally, participants were instructed upon completion to turn off their KC Moodle, collect their tools back into their toolboxes, close the sticker bar and exit the Zoom portal. Students were instructed to return their toolboxes to the university, Faculty of Nursing either in person or by secured mailing system. The link of practice readiness questionnaire was provided as the post-test.

Evaluation Stage

This step was followed by assigning members of our research team (evaluators) to evaluate the segments of OSCE midwifery testing package based on their expertise in antenatal, intrapartum, or postpartum in the delivery of clinical services. Before evaluating process, two evaluators in each segment were assigned to five randomly selected recorded video clips of participated in the OSCE midwifery test package. Each evaluator, independent of the other, viewed and scored the performance of students using the standardized checklist. Concordance between the evaluators was assessed using Inter Class Correlation (ICC) statistical techniques (SPSS, version 18). The ICC value of 0.75 was set as a priori value for the acceptable concordance between the two evaluators. In case of ICC values < .75, we had planned for a third evaluator to view and score the performance of students; however, concordance values between the pairs of evaluators ranged between .89 and 1. After the concordance values met the criteria, the evaluation all the clips were run on the process.

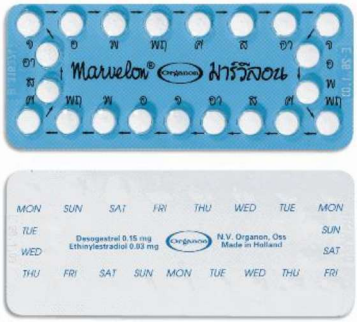
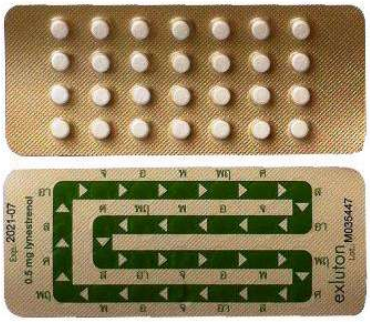
Table 1: Roadmap for an online OSCE test packages

Case scenario	OSCE	OSCE title	Description of activity	Number of items	ICC
Pre-conception	1	Contraceptive	The students acquire to choose an appropriate contraceptive pill to the case (between combined vs minipill) and give the recommendation of how to use.	14	.973
ANC	2	Antenatal care	The antenatal booklet is provided. The scenario needs the student give nursing diagnosis and calculate gestational age, pregnancy due date, and give the recommendation.	14	.993
Labor	3	Admission interview	Clip sound of patient is given. The students need to catch up the necessary in labor unit admission.	25	1.00
Labor	4	First stage	The information in first stage of labor	10	.988

Case scenario	OSCE	OSCE title	Description of activity	Number of items	ICC
		of labor	with external fetal monitoring graph was provided. The scenario needs the student assess 5 P (power, passenger, passage, physiological, and psychological) and give the appropriate nursing care to the case.		
Labor	5	Second stage of labor	The picture of crowning position is provided. The students need to demonstrate the fetal head delivery with safe perineum and modified Ritgen's maneuver. Demonstrate how to delivery when cord around the baby neck.	19	.898
Labor	6	Fourth stage of labor	The information of delivery is provided. The students need to assess, nursing diagnosis and give the nursing intervention to the case.	15	.993
Postpartum	7	Breastfeeding	Breastfeeding in postpartum mother scenario was given, the students need to history taking, point out the problem and give an accuracy therapeutic for the case.	38	.911

Table 2: An example of OSCE test package: Contraceptive

Clinical Scenario	**Competency Evaluation**	**Tools for demonstration of clinical skills**
Segment 1: Contraceptive 25-year-old woman, Para 1-0-0-1 last 1 year. After giving a birth, she used injection for her contraceptive. Today, she makes an appointment for a contraceptive injection, but she wants to switch from injectable to oral.	1. Please identify what additional question should be asked from this patient. **Answer** • Ask about whether breastfeeding. • Ask for contraindications for the use of combined pills. • Ask how long contraceptives	Number 1: 21-tablet of combined pills

Clinical Scenario	Competency Evaluation	Tools for demonstration of clinical skills
Physical examination: BW=90 kg, BP=130/80 mmHg, HR=92 bpm **Additional background:** Currently, children are raised from formula milk. After birth, she had a thrombophlebitis several times. She needs one year for birth control before having the second child. During using injection, she was no menstruation. She received information that if she used injected contraceptive for a long time, she might be difficult to getting the baby, so she needs to switch to the pills.	are needed. • Ask for side effects from the use of injections. • Ask the last menstruation. • Ask her experience of using contraceptive pills. 2. Please give nursing diagnosis for this woman in this situation **Answer** • Knowledge deficit of the contraceptive pills due to inexperience in using. 3. Please select the appropriate contraceptive pill for this woman and give a reason. **Answer** • Choose number 2, a minipill which having only progesterone. • There are contraindications for using estrogen, including venous inflammation, obesity, BW=90 kg. 4. Please make the recommendation for the appropriate use of contraceptive pills. **Answer** • Recommend the start date (i.e., start taking your first contraceptive today). • Suggest how to take contraceptive pills (take 1 pill a day at the same time	 Number 2: 28-tablet of minipills 

Clinical Scenario	Competency Evaluation	Tools for demonstration of clinical skills
	every day, when you complete the 28th pill, start a new pack). • Recommended how to take the pill in case of missing one dose (i.e., missing 1 tablet, or missing 2 tablets, or more than 2 tablets). • Recommend side effects (common side effects such as vaginal bleeding, etc.) • Caution is recommended when using contraceptive pills (combination of medications/antibiotics, diarrhea, vomiting may impair its effectiveness in preventing pregnancy).	

Figure 1A

Figure 1B

Figure 1: An illustration of a toolbox and its content

In Figure A: The necessary tools were provided (1. tools in each segment, 2. blank paper, 3. security shipping seal. 4. return shipping label)

In Figure B: Examples of tools in segment 7 (1. breast model, 2. breast milk storage bag with labelling sticker, 3. towel for breast compression, 4. extra clinicodemographic information).

Ethics and Protection of Rights of Study Participants

This project was approved by the ethics and human subjects committee of the Faculty of Nursing, Chiang Mai University (Study Code: 2022-EXP017; Research ID: 024/2022). The study participants were informed of the objective and the scope of the project. Study participants were fully informed that they had the rights to withdraw from our study without any repercussion.

Data Analyses

Descriptive statistics was calculated. Paired t-test was used. Differences between before and after of the practice readiness were considered as statistically significant at P value of 0.05. If the data comprised non-normal distribution, the Wilcoxon sign-rank test was applied. SPSS version 18 was used in all analyses.

Results

The fourth-year nursing students who enrolled in the research were mostly female (n = 42, 82.35%). Greater than 60% of all participants pass in each segment. (see in Table 3) All components and total score between pre and post-test were statistically significant (p = <.001). (see in Table 4)

Table 3: The performance in each unit of the fourth-year nursing students.

Unit	Excellent Number (%)	Moderate Number (%)	Need to be improved Number (%)	Pass (%)
Pre-conception	12(23.53)	20 (39.22)	19(37.25)	32 (62.75)
Antenatal unit	9(17.65)	26 (50.98)	16(31.37)	35 (68.63)
Labor unit	2(3.92)	46(90.20)	3(5.88)	48 (94.12)
Postpartum unit	1(1.96)	49(96.08)	1(1.96)	50 (98.04)

Table 4: The practice readiness scores and subscale of the fourth-year nursing students.

Score	Range	Pre Mean (SD)	Post Mean (SD)	P value
Cognitive capability	1-15	11.60 (1.92)	13.39 (1.79)	000*
Clinical capability	1-15	11.51(1.85)	13.06 (1.96)	000*
Professional capability	1-10	8.17 (1.21)	9.07 (1.11)	000*
Self-efficacy	1-5	3.98 (0.71)	4.49 (0.73)	000*
Practice readiness	1-45	35.27 (5.00)	40.01 (5.02)	000*

* p < .001

Discussion

The necessity of finding credible methods, alternative to the traditional methods, to assess professional proficiency of nursing students became well pronounced and palpated during the lock down of 2020-2021. In response we designed, developed, and implemented an online midwifery test package to assess skills our nursing students and their readiness in assuming their professional responsibilities. During the alpha testing of OSEC midwifery test package we identified two technical issues and one software flaw. The technical issues were relatively easy to address and rectify; meanwhile, resolving the software flaw required time and collaboration with the Office of Information Technology at our university. Essentially, this flaw in the software, would have permitted for every test taker to complete the OSCE midwifery testing package at the level of excellent or moderate nursing proficiency. Implementation of the alpha testing when developing an educational

software package can be an efficient approach in identifying and resolving the limitations of a software package.

The operational version of OSCE midwifery test package which was beta tested among the fourth-year students from the nursing sciences contained seven segments; we developed these segments to challenge cognitive, clinical, and professional dexterity of our students. For example, we deliberately excluded important pieces of clinicodemographic information from various clinical scenarios to provoke thinking and the best clinical decision making of the students.

Furthermore, the result suggests that the practice readiness score improved on the post-experience online OSCE ($p<.001$). Significant improvements were observed for 4 components: cognitive capability, clinical capability, professional capability, and self-efficacy ($p<.001$). (Table 4) Our findings concur with previous reports stating that the OSCE provides a mechanism to standardize summative assessment across diverse practice (Martin, et al, 2020). Likewise, OSCE is a skill-based assessments to whole care scenarios, in terms of history taking, nursing diagnosis, and applied nursing care. Although online OSCE was applied, nursing process was included as a key component of the OSCE strategy. Moreover, the toolbox is another component which simulate scenario as in the real case, as sitting in front of the mother. As same as the studies of Shehata et al. (2020) that have designed online clinical performance tests.

The OSCE with the use of toolboxes for medical students was applied. The design of clinical performance tests consists of three main stages: 1) planning and preparation the scenario and equipment involved in the test, 2) implement the performance tests through zoom systems, and 3) evaluation the capability of the students. Although the different in case scenario content was observed, the outcome of online OSCE was also influenced in the student performance. This study indicates that online OSCE may be a reliable alternative to enhance practice readiness in clinical competency based acquired (New, Edwards, Norris, 2022).

Conclusion

The next normal era offered an opportunity to explore the possibilities alternative to the traditional methods to evaluate midwifery competency of nursing students. Our team seized this opportunity to develop an online OSCE midwifery test package to prepare our nursing students for their professional responsibilities. As shown in the result that the students' practice readiness was improved on the post-experience online OSCE. Further studies should compare reliability and validity of OSCE and online OSCE evaluations of the student. Additionally, our study suggests that future research may be needed to quantity the impact of online OSCE to other performance of the test taker.

Recommendations

When using the online OSCE midwifery practice package, the instructors should include task-specific-tools for

each segment of the package. For example, in the breastfeeding segment, students should be able to demonstrate the manual pumping and milk collection. Therefore, tools such as a breast model, a breast milk storage bag and sticker for labeling date and time of milk collection should be included in their toolboxes. Furthermore, evaluators should allocate adequate time and effort for reviewing and evaluating the video clips of students' performances; planning for and dedicating adequate time can reduce the likelihood of mental fatigue and therefore bias when assessing students' proficiencies in nursing knowledge and skills.

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