

# Mobile Content and Scenario-Based Manikin for Improving Learning Outcomes in Obstetrics of Preclinical Medical Students

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**Background:** Multimedia programs have emerged in higher education institutions, including medical school. There is no clear evidence that such a movement can improve medical student's learning, application, and self-confidence especially high clinical skill procedures that are required to prepare before clinical year.

**Objective:** To assess learning outcomes of knowledge, skill, application in medical students' performance, and self-confidence in Leopold maneuver after using instructional media, mobile content compared with scenario-base manikin.

**Material and Method:** All of third year medical students received standard objective structural clinical examination guide prior to perform maneuver then self-study with Suranaree University of Technology (SUT) mobile content before traditional lecture and scenario-based manikin in laboratory room. Student's learning outcome, knowledge skill, application, and self-confidence in obstetrics maneuver were assessed. Paired t-test was used to analyze data.

**Results:** All 60 medical students completed the basic obstetrics, Leopold maneuver in introduction to clinical medicine course. Knowledge about indication, contraindication, and complication in scenario-based manikin, was higher than SUT mobile content significantly ( $p = 0.03$ ). Clinical skills are statistically significant different between SUT mobile content and scenario-based manikin ( $p < 0.01$ ), except fourth step of Leopold maneuver, fetal heart sound assessment and interpretation. Preparation before procedure in first, second, and third step of Leopold maneuver, scenario-based manikin was significantly higher than SUT mobile content ( $p = 0.03$ ,  $p < 0.01$ ,  $p = 0.04$  and  $p = 0.04$ , respectively). Application in knowledge to publish and self-confidence is better in scenario-base manikin ( $p = 0.01$  and  $p < 0.01$ , respectively). Teacher has better ability of knowledge transfer to medical students in SUT mobile content than manikin ( $p = 0.01$ ) but the use of learning time is no different.

**Conclusion:** SUT mobile content has reported increased learning outcomes to performed Leopold maneuver in knowledge and clinical skills. The application in knowledge to interpretation and applied to real practice were not different in both groups. The scenario-based manikin has higher self-confidence than mobile content.

**Keywords:** Preclinical medical students, Obstetrics skill, Leopold maneuver, Mobile content, Scenario-base manikin

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Medical institutions across the world have installed clinical skill laboratories to train students' clinical skills<sup>(1)</sup>. Skill laboratories are used to train

preclinical, clinical, and post graduate students, however in this study we will focus on skills training for preclinical students. In skill laboratories, preclinical students practice their clinical skills with peers, manikins, and simulated patients. Skills laboratories provide a safe environment for practice and learning processes<sup>(2)</sup>. Medical students feel anxious and stressful when they have to perform diagnostic or therapeutic procedures with patients because they fear

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to harm patients especially in obstetrics<sup>(3)</sup>. However, preclinical medical students sometimes complete their educational programs armed with theoretical knowledge but lack many of the clinical skills for their work. Medical school is universally accepted that clinical skills constitute an essential learning outcome<sup>(4)</sup>. One of the most important steps in curriculum development is the introduction of clinical medicine in preclinical medical students for teaching and learning. To bridge the gap between the preclinical and clinical years, and to help students prepare for the different learning environment, many medical schools offer transitional courses before the third-year clerkships<sup>(5,6)</sup>. Early clinical exposure in the introduction to medicine curriculum for preclinical students was supposed to prepare preclinical students to improving students' learning outcome.

Objective of the study is to assess learning outcomes in medical students' performance and confidence in Leopold maneuver after using SUT mobile content compare with scenario-based manikin.

## **Material and Method**

### ***Study population***

This study was conducted with 60 preclinical students who were randomly sampled from a full class of third year medical students of Institute of Medicine, Suranaree University of Technology, Thailand. These students were in the last semester of their preclinical studies of the medical curriculum of introduction to clinical medicine. Ethical approval for this project was obtained from Suranaree University of Technology (EC-58-03).

### ***Study protocol***

All of them received standard objective structural clinical examination (OSCE) guide prior to perform maneuver. Then training with SUT mobile content and scenario-based manikin. This questionnaire consisted of knowledge, clinical skill and clinical application and followed by the discussion. Discussing each item thoroughly with 3 medical staff and researchers at the university, ensured face validity of the study. Demographic questions about academic year, gender were also included in the study.

### ***Sample collection***

Data collection took place during the second and third semesters of the academic year of 2014, in March 2015. Data were collected at least two weeks after the term started, not during examination period.

Participants were approached before and after lectures and skill laboratory class. The goals of the study were explained to them and answer any questions they might have. Those who consented to participate in this study were then given the study questionnaire and instructed to fill it without discussing it with their classmates.

### ***Definition of term***

SUT mobile content is defined as animation about Leopold maneuver by obstetrics and gynecology expert and was produced by the Center for Educational Innovation and Technology, Suranaree University of Technology.

Scenario-based manikin is the practice to Leopold maneuver training with manikin after receiving scenario case-based.

Learning Outcome is defined as knowledge, clinical skill, and clinical application.

Preclinical medical students are referred to the third year of the six-year medical curriculum of medical school students who study introduction to clinical medicine course to the concepts of history and physical examination.

### ***Statistical analysis***

Descriptive statistics were obtained and reported as necessary. Student's knowledge and self-confidence in obstetrics maneuver were assessed paired t-test was used to analyze difference in knowledge and confidence between those instructional media.

## **Results**

Sixty preclinical medical students, 23 males and 37 females were recruited in this study. Comparison knowledge mean  $\pm$  SD score between SUT mobile content and scenario-based manikin after finishing introduction to clinical medicine course has been analyzed. The statistical differences are shown in Table 1. All aspect of Leopold maneuver are statistically significant different between SUT mobile content and scenario-based manikin ( $p < 0.01$ ).

Table 2 show all learning outcomes, knowledge, clinical skills, and clinical application. Knowledge about indication, contraindication, and complication increased after scenario-based manikin more than SUT mobile content significantly ( $p = 0.03$ ). Learning about skill preparation before procedure, first, second, and third grip Leopold maneuver increase after scenario-base manikin more than SUT mobile content. However, clinical skill in fourth Leopold maneuver, fetal heart sound assessment, and interpretation were not

**Table 1.** Comparison knowledge between SUT mobile content and scenario-based manikin

Items	SUT mobile content Mean ± SD	Scenario-based manikin Mean ± SD	p-value
Indication, contraindication and complication	3.72±0.76	3.88±0.74	<0.01*
Preparation before procedure skill	3.82±0.79	4.00±0.66	<0.01*
First grip leopold maneuver	3.80±0.76	4.03±3.78	<0.01*
Second grip leopold maneuver	3.85±0.76	4.00±0.76	<0.01*
Third grip leopold maneuver	3.82±0.77	3.98±0.79	<0.01*
Fourth grip leopold maneuver	3.83±0.81	3.97±0.82	<0.01*
Fetal heart sound assessment	3.92±0.70	3.97±0.84	<0.01*
Interpretation	3.82±0.70	3.87±0.79	<0.01*
Total	30.57±5.22	31.70±5.47	<0.01*

\* Significant difference at  $p<0.05$

**Table 2.** Comparison of learning outcome difference between SUT mobile content and scenario-based manikin

Items	Before-After score	Paired differences				p-value
		Mean	SD	95% CI		
				Lower	Upper	
Student knowledge	Knowledge about indication, contraindication and complication	-0.17	0.59	-0.32	-0.02	0.03*
Students skills	Preparation before procedure skill	-0.18	0.62	-0.35	-0.02	0.03*
	First grip leopold maneuver	-0.23	0.53	-0.37	-0.10	<0.01*
	Second grip leopold maneuver	-0.15	0.58	-0.30	-0.00	0.04*
	Third grip leopold maneuver	-0.17	0.62	-0.33	-0.01	0.04*
	Fourth grip leopold maneuver	-0.13	0.65	-0.30	0.04	0.12
	Fetal heart sound	-0.05	0.75	-0.24	0.14	0.61
	Interpretation	-0.05	0.59	-0.20	0.10	0.52
Teacher	Ability of teacher to transfer of knowledge	0.22	0.64	0.05	0.38	0.01*
	Time spent	-0.08	0.62	-0.24	0.08	0.30

\* Significant difference at  $p<0.05$

statistically significant different between the groups. The teacher's perception about ability of knowledge transfer to medical students indicates that the SUT mobile content is better than manikin ( $p = 0.01$ ) but the use of learning time is no different.

About learning outcome for application, applied to interpretation, and real practice are not significantly different in both methods. However, the ability to apply, the knowledge to publish, and the self-confidence in manikin is significantly greater than with the mobile content, as shown in Table 3.

## Discussion

After finishing introduction to clinical

medicine course, SUT mobile content provides medical students additional basic obstetric knowledge and Leopold maneuver procedure. Using SUT mobile is easy and can be learned fast. The scenario-based manikin increases knowledge and skills better than SUT except for the fourth grip Leopold maneuver, fetal heart sound assessment, and interpretation (about preparation before procedure, first, second, and third grip Leopold maneuver). Scenario-based manikin has higher teacher's ability of transfer knowledge, ability to applied knowledge to publish, and self-confidence than mobile content to perform obstetrics skills. SUT mobile content was not different in applied to interpretation and real practice compared with scenario-based manikin.

**Table 3.** Learning outcome between SUT mobile content and scenario-based manikin

Items	Paired Differences				<i>p</i> -value
	Mean	SD	95% CI		
			Lower	Upper	
Ability to interpretation	-0.05	0.59	-0.20	0.10	0.52
Ability to use in real practice	-0.13	0.60	-0.29	0.02	0.09
Ability to applied knowledge to publish	-0.18	0.54	-0.32	-0.05	0.01*
Self-confident	-0.27	0.58	-0.42	-0.12	<0.01*

\* Significant difference at  $p < 0.05$

The result of the Leopold maneuver was interpretation with medical staffs for check accuracy. The reflection of medical students and feedback from staff to medical students add on mobile content and scenario-base manikin may have effectiveness of learning outcome relies on the quality of supervision.

Teaching in introduction to medicine course can enhance by the addition of a clinical laboratory component with mobile content and manikin into traditional lecture. SUT mobile content resource allows medical students to proceed through the steps of a basic obstetrics and gynecology's experiment, without time, cost, or safety constraints of a traditional laboratory exercise. Additionally, the faculty time savings due to decrease in facilitation would allow more programs to incorporate laboratory experiences into their curriculum<sup>(7)</sup>. However, for many courses, laboratory exercises with manikin or medical simulation in some medical school has been found to enhance clinical competence at the undergraduate and postgraduate levels but are too expensive and time consuming<sup>(8,9)</sup>. Previous studies were using scenario-based simulation or problem-based application with interactive software to virtual laboratory study to support undergraduate course<sup>(10-13)</sup>. Although more advanced equipment and procedures may not be available in skill laboratory, this setting was apparently clinical enough such as scenario-based learning with standard patients to satisfactorily prepare preclinical students for functioning in the hospital setting. Furthermore, self-directed learning practices seems to improve motivation more than traditional lecture<sup>(14)</sup>.

A major challenge for preclinical medical students is the application of theoretical knowledge to the management of patients in clinical year. In future study, we intend to use involve objective assessed tools to compare the clinical performance of medical

students during their first clerkships. A suitable approach in this respect could be assessment by direct observation using the Mini-Clinical Evaluation Exercise in clinical year.

The limitation of this study is that the assessment of the learning outcome is only based on medical student opinions. Furthermore, we have taken the paucity of significant comments by facilitator and peer participants on the summary of the obstetrics sessions as support for the validity of the process as applied.

### Conclusion

SUT mobile content reveal an increase of learning outcome to perform Leopold maneuver in knowledge, clinical skills, and less time use but some skills such as fourth grip Leopold maneuver and fetal heart sound assessment were not different with scenario-based manikin. The application of knowledge to interpretation and applied to real practice were not different between mobile content and scenario-based manikin. The scenario-based manikin has higher self-confidence to perform Leopold maneuver than mobile content after the study.

### What is already known on this topic?

The early clinical exposure in introduction to medicine can use based on common skills is relevant to students' clerkship experiences and can increase students' self-reported preparedness for the clinical years of medical school.

### What this study adds?

The present study investigated learning outcome in medical students in three domains, knowledge, skill, and application to real practice, using mobile content or scenario-based manikin to improve

self-confidence and motivation to learning in clinical years.

### **Acknowledgement**

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### **Potential conflicts of interest**

None.

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การใช้สื่อโอบายคอนเทนตและหุ่นจำลองร่วมกับสถานการณ์จำลองเพื่อปรับปรุงทักษะการเรียนรู้ทางสูติศาสตร์ในนักศึกษา  
แพทย์ชั้นปรีคลินิก

ปัทมา ทองดี, กุลศิริ เตียนศรี, สุทธิณี ศรีสวัสดิ์, อัจฉรา งามนวน, ขวัญเรือน ปิ่นวันนา, พรทิพย์ นิมขุนทด

ภูมิหลัง: โปรแกรมมัลติมีเดียได้เข้ามามีบทบาทในสถาบันอุดมศึกษารวมทั้งโรงเรียนแพทย์ แต่ไม่มีหลักฐานที่แน่ชัดว่าการประยุกต์ใช้ดังกล่าวสามารถปรับปรุงการเรียนรู้ ทักษะ การประยุกต์ใช้ในทางปฏิบัติ รวมทั้งความมั่นใจของนักศึกษาแพทย์โดยเฉพาะหัตถการที่ต้องใช้ทักษะมากเพื่อเตรียมตัวก่อนขึ้นชั้นคลินิกต่อไป

วัตถุประสงค์: เพื่อประเมินผลทักษะการเรียนรู้ในความรู้ ทักษะการปฏิบัติและการประยุกต์ใช้ของนักศึกษาแพทย์และความเชื่อมั่นในการตรวจครรภ์ทางหน้าท้อง หลังการใช้สื่อการเรียนการสอนโอบายคอนเทนตและหุ่นจำลองร่วมกับการใช้สถานการณ์จำลอง

วัสดุและวิธีการ: ผู้เข้าร่วมวิจัยทั้งหมดได้รับคู่มือคำแนะนำการตรวจครรภ์ทางหน้าท้องมาตรฐานก่อนการตรวจ ต่อจากนั้นการศึกษาด้วยสื่อการเรียนการสอนโอบายคอนเทนตของมหาวิทยาลัยเทคโนโลยีสุรนารี (มทส) ด้วยตนเองก่อนการเรียนบรรยายและหุ่นจำลองร่วมกับการใช้สถานการณ์จำลอง นักศึกษาที่ได้รับการประเมินความรู้ ทักษะ การประยุกต์ใช้ รวมทั้งความมั่นใจในตนเองต่อการทำหัตถการทางสูติศาสตร์สถิติที่ทดสอบถูกใช้ในการวิเคราะห์

ผลการศึกษา: นักศึกษาแพทย์ทั้งหมด 60 คน เสร็จสิ้นการฝึกทักษะทางสูติศาสตร์เบื้องต้น โดยตรวจครรภ์ทางหน้าท้องในรายวิชาบทบาททางคลินิก ความรู้เกี่ยวกับข้อบ่งชี้ ข้อห้าม และภาวะแทรกซ้อน มีการเพิ่มขึ้นในการฝึกโดยหุ่นจำลองร่วมกับการใช้สถานการณ์จำลองมากกว่าการใช้สื่อการเรียนการสอนโอบายคอนเทนต ( $p = 0.03$ ) ทักษะการตรวจ มีความแตกต่างระหว่างสื่อการเรียนการสอนโอบายคอนเทนตและหุ่นจำลองร่วมกับการใช้สถานการณ์จำลองอย่างมีนัยสำคัญทางสถิติ ( $p < 0.01$ ) ยกเว้นการตรวจในท่าที่ 4 การประเมินการเต้นของหัวใจทารกในครรภ์และการแปลผลส่วนการเรียนรู้การเตรียมตัวก่อนการตรวจ การตรวจครรภ์ทางหน้าท้องท่าที่ 1, 2 และ 3 โดยใช้หุ่นจำลองสูงกว่าการใช้สื่อการเรียนการสอนโอบายคอนเทนต ( $p = 0.03$ ,  $p < 0.01$ ,  $p = 0.04$  และ  $p = 0.04$  ตามลำดับ) การประยุกต์ใช้ความรู้เพื่อเผยแพร่ ต่อยอด และความมั่นใจในตนเองโดยการใช้หุ่นจำลองร่วมกับการใช้สถานการณ์จำลองดีกว่า ( $p = 0.01$  และ  $p < 0.01$  ตามลำดับ) ความสามารถของอาจารย์ในการถ่ายทอดความรู้ให้กับนักศึกษาแพทย์ในสื่อการเรียนการสอนโอบายคอนเทนตดีกว่าการใช้หุ่นจำลองร่วมกับการใช้สถานการณ์จำลอง โดยที่เวลาที่ใช้ในการสอนไม่แตกต่างกันในสองกลุ่ม

สรุป: การใช้สื่อการเรียนการสอนโอบายคอนเทนตของมหาวิทยาลัยเทคโนโลยีสุรนารีได้รายงานว่าการเพิ่มขึ้นของผลลัพธ์การเรียนรู้ในการตรวจครรภ์ทางหน้าท้องในเรื่องของความรู้ ทักษะการตรวจ ส่วนการประยุกต์เรื่องความรู้ในการแปลผลและการประยุกต์ใช้ในชีวิตจริงไม่แตกต่างกันในสองกลุ่ม การใช้หุ่นจำลองร่วมกับการใช้สถานการณ์จำลองนั้นเพิ่มความมั่นใจในการตรวจครรภ์ทางหน้าท้องมากกว่าสื่อการเรียนการสอนโอบายคอนเทนต

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