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PERCEPTION OF MEDICAL DOCTORS ON CHEST TUBE THORACOSTOMY SIMULATION MODEL

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ABSTRACT

***Background**: Chest tube thoracostomy is a common procedure that offers in patients with medical emergency conditions. Severe complications or even death can occur to the patients if medical doctors do not well perform and skillfully. This study aims to find medical doctors' perception of the realistic features of the chest tube thoracostomy simulation model, which was developed by researchers.*
***Methods**: Fifteen Myanmar medical doctors were voluntarily to enroll in a half-day, chest tube thoracostomy workshop. Data of medical doctors' perception was collected using a 5-points Likert's scale self-evaluation survey form. In addition, the participants were asked to write their comments or suggestions for the realistic features of the chest tube thoracostomy simulation model.*
***Results**: Medical doctors' perception on the realistic features of the chest tube thoracostomy simulation model was positive by responding as agree and strongly agree. All experts perceived as strongly agree in cost effectiveness of the model (100%) and using the model in the procedural training (100%). The postgraduate doctors responded to similar human sensations and complying procedural steps as agree (92.3%) in both statements. All experts rated to self-confidence (100%) as agree whereas the postgraduate doctors responded to it as agree (84.6%). Participants preferred the structures of the simulation model and its educational values for the chest tube thoracostomy procedural skills training. They suggested to use this simulation model for training medical students.*
***Conclusion**: The perception of the medical doctors on the realistic features of the chest tube thoracostomy simulation model showed that this simulation model could use as an effective educational tool in the procedural skills training.*

***Keywords**: Chest tube thoracostomy, simulation model, procedural skills training*

INTRODUCTION

In health care environment, simulation model or medical simulator is a device that represents the real patient or represents some parts of a real patient, which provide for user interaction [1]. Simulation model is contributed to the teaching of the medical students instead of using the real patient in the clinical training [2]. Simulation models can offer the medical students to learn a wide range of knowledge and technical skills for specific procedures. It can also allow the students to get the experiences from their actions and promote the continued practice in the stress free environment [3]. The students can get the immediate feedback and deliberate practice by using the simulation models [4].

Chest tube thoracostomy is the placing of a chest tube into the pleural cavity to evacuate air, blood, pus, or other fluids [5]. It is an invasive medical procedure, namely as a chest tube insertion procedure or

intercostal tube drainage procedure. This procedure is a common medical procedure, which is widely used in various clinical settings such as emergency medicine, surgery, and trauma care [6,7]. In the treatment or management of some specific medical diseases such as pneumothorax or pleural effusion, intercostal tube drainage procedure could offer to save the lives of the patients [7]. However, severe complications or even death would happen due to inadequate training and/or inexperience of the procedural skills of medical doctors [8].

According to British Thoracic Society guideline, medical practitioners should be adequately trained and completed the intercostal tube drainage procedure with supervision [9]. It is time to encourage the acquisition of intercostal tube drainage procedural skills by using proper technique, supervision and documentation in medical training [10]. Procedural skills training using simulation models could provide the opportunities to acquire necessary knowledge and skills among medical practitioners effectively [11,12]. There was reported to the improvement of procedural skills and self-confidence of medical doctors after providing the chest tube insertion training using simulation models [13]. However, it needs to be well design of the simulation models and it could support to training of the medical practitioners effectively [3]. The research question of this pilot study was; What are the medical doctors' perception on the realistic features of the chest tube thoracostomy simulation model after practicing chest tube thoraccostomy procedural skills?

METHODS

This pilot study was set as chest tube thoracostomy workshop. Fifteen Myanmar medical doctors were voluntarily participated in this chest tube thoracostomy workshop. This workshop was taken half-day duration at a teaching hospital (1000 bedded) in Yangon, Myanmar during January 2018. In addition, the participants had the experiences of the chest tube thoracostomy procedural skills. Thirteen of them are currently attending the Master degree of Surgery in Myanmar. One of them studied the Doctorate degree of Cardio-thoracic surgery. The other is a specialist medical doctor in Respiratory medicine.

Instrument

Self-evaluation form was provided to the participants at the end of the workshop to survey their perception on the realistic features of the chest tube thoracostomy simulation model. The survey form consists of 11, 5-points Likert's scales (strongly disagree, disagree, neither agree nor disagree, agree and strongly agree) items, and 1 open-ended question for additional comments or suggestions. Cronbach's alpha of the instrument was 0.72, which was acceptable to use in this study [14].

Data collection and analysis

Participants reviewed all of steps and technical skills that involved in chest tube thoracostomy skills performance by using the British Thoracic Society guideline, 2003 for 30 minutes. All participants carried out the intercostal tube drainage procedure using the chest tube thoracostomy simulation model. The responses of 5-points Likert's scale were presented as percentages and numbers of response. The thematic analysis was used to analyze the responses of open-ended question to explore the participants' perception on the chest tube thoracostomy simulation model.

RESULTS

Fifteen Myanmar medical doctors enrolled in the chest tube thoracostomy workshop in this study. Table.1 displayed the numbers of participant, their educational backgrounds, years of working as medical doctor, and previous experiences of chest tube thoracostomy procedural skills.

Table 1: Background information of the participants

No.	Educational backgrounds	Years of working as medical doctor	Previous experiences with chest tube thoracostomy procedural skills	Numbers of participant
1.	Master's degree of Surgery	5 years	< 5 times	10
2.	Master's degree of Surgery	6 years	5-10 times	3
3.	Doctorate's degree of Cardiothoracic surgery	10 years	10-50 times	1
4.	Specialist in Respiratory medicine	12 years	> 50 times	1
		TOTAL		15

In the table 1, all participants worked as medial doctors for at least 5 years duration. The participants had varied experiences of the chest tube thoracostomy procedural skills. Among them, the medical doctor who hold the Doctorate's degree of cardiothoracic surgery and the medical doctor who was a specialist in respiratory medicine are named as the experts in the chest tube thoracostomy procedural skills. The table 2 showed the results of distribution of percentage and numbers of response to all statements in the self-evaluation form.

Table 2: Results of participants' responses on chest tube thoracostomy simulation model

No.	Statement(s)	Postgraduate doctors			Experts		
		N	Agree (%) (n)	Strongly Agree (%) (n)	N	Agree (%) (n)	Strongly Agree (%) (n)
Physical structures of the model							
1.	The simulation model represents to similar anatomical structures of human chest wall	13	84.6% (11)	15.4% (2)	2	100 % (2)	-
2.	The simulation model gives similar sensations of human chest wall	13	92.3% (12)	7.7% (1)	2	100 % (2)	-
3.	The simulation model has portable structure	13	53.8% (7)	46.2% (6)	2	50 % (1)	50 % (1)
4.	The simulation model is cost effective model	13	76.9 % (10)	23.1 (3)	2	-	100 % (2)
Procedural skills acquisition							
5.	The simulation model helps to comply the all steps of intercostal tube drainage procedural skills	13	92.3% (12)	7.7% (1)	2	50% (1)	50% (1)
6.	The simulation model helps to understand the complications of intercostal tube drainage procedural skills	13	84.6 % (11)	15.4 % (2)	2	50% (1)	50% (1)
7.	The simulation model provides to acquire adequate intercostal tube drainage procedural skills	13	84.6 % (11)	15.4 % (2)	2	100 % (2)	-

No.	Statement(s)	Postgraduate doctors			Experts		
		N	Agree (%) (n)	Strongly Agree (%) (n)	N	Agree (%) (n)	Strongly Agree (%) (n)
8.	My interaction with this simulation model improved my intercostal tube drainage procedural skills	13	84.6 % (11)	15.4 % (2)	2	100 % (2)%	-
9.	Overall of performing experience can enhance learning of intercostal tube drainage procedural skills	13	76.9% (10)	23.1% (3)	2	100 % (2)	-
10.	The simulation model should use in intercostal tube drainage procedural skills training	13	69.2 % (9)	30.8 % (4)	2	-	100 % (2)
Self-confidence							
11.	My interaction with this simulation model increased my confidence on performing intercostal tube drainage procedural skills	13	84.6 % (11)	15.4 % (2)	2	100 % (2)	-

In the table 2, the response rate was 100% in this study. All participants responded to the events of model's physical structures, procedural skills acquisition and self-confidence as agree and strongly agree. There was no response to those events as neither agree nor disagree, disagree or strongly disagree. For the event of physical structures of the model, all participants answered as agree and strongly agree in the statement of similar anatomical structures, similar human sensations, portable structure, and cost effectiveness of the model. Of them, all experts responded as strongly agree in cost effectiveness of the model (100%). All experts also rated as agree in similar anatomical structures (100%) and similar human sensations (100%) respectively. The experts received as strongly agree in portable structure (50%). The postgraduate doctors answered as agree in similar human sensations (92.3%). The postgraduate doctors also responded as agree in similar anatomical structures (84.6%), cost effectiveness of the model (76.9%), and portable structure (53.8%) respectively.

Regarding the event of procedural skills acquisition, all participants responded as agree and strongly agree in the statement of complying procedural steps, understanding complications, providing adequate skills, improving the skills, enhancing the skills learning, and using the model in procedural training. All experts rated as strongly agree in the statement of using the model in procedural training (100%). The experts answered as agree in providing adequate skills (100%), improving the skills (100%), and enhancing the skills learning (100%) respectively. The experts rated as agree or strongly agree in complying procedural steps (50%) and understanding complications (50%). The postgraduate doctors responded as agree in complying procedural steps (92.3%). The postgraduate doctors rated as agree in understanding complications (84.6%), providing adequate skills (84.6%), improving the skills (84.6%), enhancing the skills learning (76.9%) and using the model in procedural training (69.2%).

In the event of self-confidence, the experts provided as agree in this event (100%). The postgraduate doctors rated as agree (84.6%) and strongly agree (15.4%) in the event of self-confidence respectively. Three themes are emerged from their comments or suggestions;

Model realism

The participants perceived on the structures of the simulation model. The structures of the model reflects to us as a upper part of the adult human body *(participant 2).* The model supports to practicing chest tube insertion procedural skills well, as done in the patients especially for finding the insertion site *(participant 14).*

Educational values
Some participants expressed their perception on the educational values of the simulation model. The model is suitable for training medical students *(participant 3).* We could perform repetitively in some steps of procedural skills with this model *(participant 7).*

Suggestion from open-ended question
The participants provided their suggestion towards the simulation model. This model should apply in teaching medical students in the academic training *(participant 5)*. This model can use as a training tool in the procedural skills acquisition *(participant 10).*

DISCUSSION

According to the results of participants' perception on physical structures of the model, the chest tube thoracostomy simulation model represented similar characters of the human chest wall [15]. This simulation model could provide the structure of upper part of adult human body comparing with other simulation models [16,17]. Portable structure of this simulation model might allow the opportunities for carrying and using it easily. Interestingly, the experts more preferred to the costs of the model than the postgraduate medical doctors did. In this study, the experts seemed to use other simulation models in the past and this situation might affect to this case. However, the result of cost effectiveness of the model showed medical practitioners could affordable to use it in their practicing the procedural skills. It might allow to the availability of using this simulation model for educational environment especially in the resource-limited settings [13,17,18].

The results of procedural skills acquisition with the simulation model showed that this chest tube thoracostomy simulation model was perceived as an educational tool for practicing the procedural skills appropriately [9]. Similarly, other studies also reported that simulation model could support to learn the chest tube thoracostomy procedural skills acquisition [17,19]. However, this simulation model could comply and provide the all steps of the procedure especially in finding the insertion site [20,21]. In the emergency procedural skills training environment, it was challenging to get the chance of practicing specific proccedural skills to be mastery [22]. Interestingly, some participants also valued the repetitive practice of their procedural skills with the simulation model in this study. The medical practitioners could practice the chest tube insertion procedural skills repetitively anytime instead of using a cadaver model [23]. All participants accepted this simulation model could help to improve their skills, to aware complications and to enhance their learning for chest tube thoracostomy procedure. Furthermore, the statement of using simulation model' results responded by all participants showed the acceptability of this simulation model among different level of medical doctors. Similar findings were reported in the study of evaluation of Trauma-Man simulator for chest tube insertion procedural training [20]. In this study, more expression of the experts' response on this statement related to their previous experiences and numbers of expert who enrolled in this study. Some participants also commended to use this simulation model for teaching medical students in academic training. These findings presented the acceptability of the model for the training in medical education.

In this study, chest tube thoracostomy simulation model could help to improve the medical practitioners' confidence on chest tube insertion procedural skills acquisition. Similarly, one study of chest tube insertion procedural skills training using simulation model reported the improvement of participants' confidence after using the simulation model [10]. However, a cross-observational study addressed that confidence of medical doctors on a procedure is associated with their previous experiences of that procedure [24].

LIMITATION

One requirement for the participants is the experience of the chest tube thoracostomy procedural skills. Therefore, the numbers of participant is quite small.

CONCLUSION

The chest tube thoracostomy simulation model was realistic, cost effectiveness, and replicable structure for practicing chest tube thoraostomy procedural skills among medical practitioners. Therefore, chest tube thoracostomy simulation model has a potential use as an effective educational tool in the training for chest tube thoracostomy procedural skills.

ETHICAL CONSIDERATION

This pilot study was approved from ethical committee of Institute for Population and Social Research (IPSR- IRB), Mahidol University. Inform consent was taken from all of the participants in this study. Participants are also free to withdraw from this study anytime.

RECOMMENDATIONS

Further study is need to determine the effectiveness of this simulation model for chest tube thoracostomy procedural training in the large different group. Future planning for our model is to study the effectiveness of this simulation model for training the intercostal tube drainage procedural skills among medicals students.

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