

ORIGINAL RESEARCH

Development of latex wound models for the wound dressing training of nursing students

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ABSTRACT

A model is an essential instrument for the practical training of nursing students before field training in the ward, and an aid which creates skill and confidence for the students. The objective of this research is to develop a latex wound model for the wound dressing training of nursing students. Three research procedures are 1) to study documents and data relating to the development of latex wound models, 2) to construct the latex wound models and the research instruments, and 3) to try out the latex wound models, and evaluate the latex wound models efficiency. Participants are the 60 second-year nursing students. A wet dressing type latex wound model efficiency evaluation form and a dry dressing type latex wound model efficiency evaluation form were used for data collection. A reliability of 0.884 and 0.889 was acquired. The data were analyzed using descriptive statistics and Wilcoxon Signed Ranks Test. The finding of the studying results indicated that the mean scores of efficiency of both invented wet dressing type and dry dressing type latex wound model were higher than that of the original wound model of the Faculty of Nursing at statistical significance ($p < .05$). The finding indicated that the latex wound model had higher quality than those of the original wound model. Also, it helps the Faculty of Nursing save budget on purchasing expensive models.

Key Words: Wound model, Wound dressing, Nursing student, Innovation

1. INTRODUCTION

Wound dressing is part of patient nursing and is included in the basic nursing course to ensure proper wound dressing of the nursing students for the patients.^[1-6] Each student will be instructed for theory and practical training both in dry dressing and wet dressing once before field practice with the patients.^[7] According to learning and teaching management, the number of both dry and wet wound models were inadequate for self-study and learning of students.^[8] Therefore, skill training of the students could be performed only 1-2 times per person. The finding from the current situations indicated lesser practical training in wound dressing with the patients as the university is a studying source of the faculties

relating to health science, particularly the practical training of the students in various faculties that must be carried out with the same patients. One reason may be due to patient rights, which makes students less likely to perform procedures with patients.^[9] This caused lesser field training of the nursing students in wound dressing with the patients. Thus, the instructors have managed their teachings in the theoretical learning and teaching management of the nursing students, using a model for practical training support.^[8-10]

The wound model of the Faculty of Nursing has currently been a model made of silicone used for both small dry and wet wounds. The wound model appearance has been quite hard, without a binder. Upon training use, a clear adhesive

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tape must be used to fasten with the basic model, resulting in a practical inconvenience. Also, the hard-wound attribute has caused a failure to place in the plane alignment to be adjacent to the model for basic nursing practice. The current studied price of the wound models was around 1,000-2,000 Baht per piece and sold in a set, whereas the price of a small set was at 4,000 Baht, and the price of a large set was at 95,000 Baht.^[11] Some pieces of wound models were seldomly used for practical training. Most practical trainings have been basic, resulting in the student's recognition of dry dressing and wet dressing method only. The real images of other wound attributes will be seen by the students from the theoretical study. Therefore, it has been unnecessary to use some pieces of the wound model, which was purchased in the set for training. Even though the prices of the studied wound models were low due to their small sizes, but the income was lost to foreign countries despite the availability of domestic raw materials, which can produce models as a substitute for silicone models from foreign countries. The finding of the study on the development of the latex arm model for the suture skill training indicated that latex was used to invent a suture model and it was a raw material in large quantities in the country and exported abroad. The study result described the similarity of its size, color, and appearance to the real arm. Upon trial use of the model, and evaluation when compared with a sponge, the finding described the highest mean of durability for using when compared with meat, the highest mean of recycling when compared with silicone made model, and the highest mean of stability after suture training.^[12] Therefore, the latex-invented model can be used as a substitute of sponge, meat, and silicone model, and then the wound model should be produced using latex as raw material as well.

According to the aforesaid reasons and literature reviews, the researcher has realized the significance of the development of a wound model with soft skin in natural appearance and a binder to be used for the student's training, anywhere, and anytime that supports the student's learning. The students can borrow the said wound model for their self-practical training at the dormitory. An invention cost was cheaper than the cost of the model imported from abroad, contributing to the promotion of learning without the student's time and place limitation. Moreover, the wound dressing training skill will be successful if the nursing students have more opportunities for frequent training.^[8] They will then become familiar, proficient, and have good wound dressing skills, promoting a good attitude towards learning and building confidence in nursing activity practice.^[13] In addition, the proper practical result has also contributed to a reduction of complications, resulting in an improvement in service quality and patient

satisfaction in clinics.

Aim and hypothesis

This research consists of two parts as follows: 1) the latex wound model development, and 2) the evaluation of the effectiveness of the latex wound model. The following is the objective of this research. 1) To develop a latex wound model for wet dressing and dry dressing. 2) To compare the efficiency of the latex wound model with that of the original wound model of the Faculty of Nursing. The research hypothesis is the efficacy of the latex wound model higher than that of the original wound model of the Faculty of Nursing.

2. MEDTHOD

2.1 Study design

The research title on the development of latex wound model for wound dressing training is a research & development as per the following details and three research procedures.

In the first procedure, study documents and information relating to the development of the latex wound model both in the wound anatomy and materials and equipment, which will be used for constructing a wound model.

In the second procedure, develop through the following three procedures.

First, develop a latex wound model starting from a model sketch, consult the expert on the selection of materials/equipment which will be used for constructing a latex wound model, and hire an expert in constructing a latex wound model as per the following production procedure in brief. 1) Prepare a cement mold for casting workpieces 2) Pour the concentrated latex in the said cement mold for casting workpieces 3) Dry the said mold in the sun until completely dried 4) Pull workpieces out of the said mold, and then cleanse workpieces 5) Take workpieces for painting.

Second, construct an instrument for both wet dressing type and dry dressing type latex wound model efficiency evaluations.

Third, inspect the quality of invention and research instruments.

In the third procedure, Wound model tryout and wound model efficiency evaluation are the procedures in which the invented latex wound model is tried out by the nursing students. The student opinions, relating to the efficiency of both wet dressing type and dry dressing type latex wound models, are studied. This procedure will be commenced for operation after the research project has already been passed for the consideration of the third set of the Human Research Ethics Sub-Committee, Thammasat University.

2.2 Samples and setting

The participants are the second-year nursing students of a university in the central region, who have already been passed for the theoretical teaching relating to wound dressing. The characteristics of the participants are as follows: 1) being a second-year nursing student who has already been taught wound dressing theory, 2) being a person who is inexperienced in wound dressing with the patient, 3) willing to participate in the study. Due to no standard calculation formula for determining the participants to evaluate the model efficiency, the researcher, therefore, reviewed the literature relating to the participants used by several previous studies.^[14-17] The findings of the said studies indicated sample sizes of 20 persons and more in the model efficiency evaluation.^[16] The students and the general people interested up to 85 students were studied.^[15] Also, the nursing instructors and nursing students were studied.^[15] The researcher defined the sample size for 60 persons in this research. For the recruitment of the participants, the researcher explains the research objectives, research methods, and the benefits of the research to students. The researcher does not coercion students to participate in this study.

2.3 Ethical considerations

This research was approved by the third set of the Human Research Ethics Sub-Committee, Thammasat University, No. 086/2560. The researcher has protected the right of the participants before data collection and clarified the research objective to the participants for acknowledgment. The participants are entitled to accept or deny participating in the research without enforcement and can withdraw from the research all the time without clarification of his/her reason. Those denial results will have no impact on the participants for the learning and teaching evaluation of the participants. The data acquired from the research will be kept as confidential and used particularly in studying only. The overall image of the research results will be proposed. If the participants are in doubt or feel anxious, he/she can inquire the details from the researcher throughout the research methodology duration.

2.4 Research instruments

2.4.1 Latex Wound Model Efficiency Evaluation Form (Wet wound)

It is a questionnaire constructed by the researcher from a literature review and consists of 8 items in total. The rating scale query consists of a 1-5 score level. The queries are classified into two individual aspects which are 1) production efficiency for 2 items, and 2) usability efficiency for 6 items. The queries are positive queries containing five multiple choices. The rating criteria is 5 = most agreed, and 1

= least agreed. The samples of queries include "similarity of the model shape to the real human wound", and "stability of the primary model shape after usability." The scores are from 5 – 40 scores. The mean of the questionnaire is determined, and the mean score is divided into 5 score levels. The range score interval is calculated from the formula^[18] whereas mean of 4.21-5.00 means the highest level of efficiency, mean of 3.41-4.20 means the high level of efficiency, mean of 2.61-3.40 means the moderate level of efficiency, mean of 1.81-2.60 means the low level of efficiency, and mean of 1.00-1.80 means the lowest level of efficiency.

2.4.2 Latex Wound Model Efficiency Evaluation Form (Dry wound)

It is a questionnaire constructed by the researcher from a literature review and consists of 8 items in total. The rating scale query consists of a 1-5 score level. The queries are classified into two individual aspects which are 1) production efficiency for 2 items, and 2) usability efficiency for 6 items. The queries are positive queries containing five multiple choices. The rating criteria is 5 = most agreed, and 1 = least agreed. The samples of queries include "similarity of the model shape to the real human wound", and "stability of the primary model shape after usability." The scores are from 5 – 40 scores. The mean of the questionnaire is determined, and the mean score is divided into 5 score levels. The range score interval is calculated from the formula^[18] whereas mean of 4.21-5.00 means the highest level of efficiency, mean of 3.41-4.20 means the high level of efficiency, mean of 2.61-3.40 means the moderate level of efficiency, mean of 1.81-2.60 means the low level of efficiency, and mean of 1.00-1.80 means the lowest level of efficiency.

2.4.3 Content Validity Test

Three experts, comprising of one doctor who is an expert in the invention, one nursing instructor who is expert in the invention, and one nurse with a working experience of no less than 5 years, conducted content validity test on Latex Wound Model Efficiency Evaluation Form (Wet wound) and Latex Wound Model Efficiency Evaluation Form (Dry wound). Content validity was acquired at 0.94 and 0.88, respectively.

2.4.4 Reliability Test

The researcher tried out the instruments which were conducted for content validity test and improved by the experts, with 10 second-year nursing students who have similar characteristics as the samples but not being samples; and analyzed to determine the reliability of the questionnaire using Cronbach's Alpha Coefficient Method. A reliability of 0.619 was acquired from the Latex Wound Model Efficiency Evaluation Form (Wet Dressing) and after using it with 60 participants, a reliability of 0.884 was acquired. A reliability of 0.638 was

acquired from the Latex Wound Model Efficiency Evaluation Form (Dry Dressing), and after using it with 60 participants, a reliability of 0.889 was acquired.

2.5 Data collection

The researcher will explain the research procedure to the 60 participants, and then use the model of the Faculty of Nursing and latex wound model, invented by the researcher, in the self-wet and dry dressing. The participants spent approximately ten to fifteen minutes in dressing the wounds with the latex wound model and the original wound model. After completion of the model tryout, the participants will fill the Latex Wound Model Efficiency Evaluation Form (Wet wound) and the Latex Wound Model Efficiency Evaluation Form (Dry wound).

2.6 Data analysis

Personal data are analyzed by descriptive statistics for determining percentage, mean, and standard deviation. Fisher's exact test and Chi-square test are used to test the difference of the personal data. Wilcoxon Signed Ranks Test is used to test the difference between the mean score of the invented latex wound model efficiency and the mean score of the original

wound model efficiency of the Faculty of Nursing.

3. RESULTS

Most participants were female for 93.30%, having 19-21 years of age, whereas most of them were aged 20 years old or 50%, having experiences in wet dressing while studying/in the laboratory for 2-6 times, whereas most of them had the experiences for 3 times or 43.30%, and having experiences in dry dressing while studying/in the laboratory for 1-6 times, whereas most of them had experienced for 3 times or 36.70%, as shown in Table 1.

A total of 60 second-year nursing students using wet dressing type latex wound model remarked their opinions on the wet dressing type latex wound model that the said model was entirely efficient at the highest level of 4.41 (S.D. = .47), portable and mobile at the highest level of 4.70 (S.D. = .53), and ease of the usability by 4.56 (S.D. = .59). The secondary aspect was the stability of the primary model shape after usability and stability of the model skin elasticity after usability by 4.51 (S.D. = .62). In their opinions, the model shape was at least like the real human wound by 3.39 (S.D. = .84), as shown in Table 2.

Table 1. Demographic characteristics of the participants in the control and experimental groups

Demographic characteristic	Total n (%)	Control group n (%)	Experimental group n (%)	Statistic test value	p-value *
Gender				1.071*	.612
Female	56 (93.30)	27 (90.00)	29 (96.70)		
Male	4 (6.70)	3 (10.00)	1 (3.30)		
Age (year)				6.749 [†]	.017
19	26 (43.30)	15 (50.00)	11 (36.70)		
20	30 (50.00)	11 (36.70)	19 (63.30)		
21	4 (6.70)	4 (13.30)	0 (0.00)		
Experiences in wet dressing while studying/in the laboratory (times)				3.258 [†]	.516
2	1 (1.70)	0 (0.00)	1 (3.30)		
3	26 (43.30)	16 (53.00)	10 (33.30)		
4	21 (35.00)	9 (30.00)	12 (40.00)		
5	9 (15.00)	4 (13.00)	5 (16.70)		
6	3 (5.00)	1 (3.00)	2 (6.70)		
Experiences in dry dressing while studying/in the laboratory (times)				4.735 [†]	.449
1	7 (11.70)	4 (13.30)	3 (10.00)		
2	13 (21.70)	6 (20.00)	7 (23.30)		
3	22 (36.70)	10 (33.30)	12 (40.00)		
4	12 (20.00)	5 (16.70)	7 (23.30)		
5	4 (6.70)	4 (13.30)	0 (0.00)		
6	2 (3.30)	1 (3.30)	1 (3.30)		

Note. * = Fisher's exact test † = Chi-square test

A total of 60 second-year nursing students using dry dressing type latex wound model expressed their opinions on the dry dressing type latex wound model that the said model was

entirely efficient at the highest level of 4.46 (S.D. = .45), portable and mobile at the highest level of 4.66 (S.D. = .54) and ease of use of 4.60 (S.D. = .55). The secondary aspect

was the stability of the model skin color after usability after usability by 4.56 (S.D. = .56). In their opinions, the model shape was at least like the real human wound by 4.15 (S.D. = .84) as shown in Table 3.

The finding from the comparative result between the mean

score of efficiency of the invented latex wound model and that of the primary wound model indicated that the mean score of efficiency of the invented latex wound model was higher than that of the primary wound model of the Faculty of Nursing at statistical significance ($p < .05$) as shown in Table 4.

Table 2. Mean of efficiency of wet dressing type latex wound model

Efficiency of Wet Dressing Type Latex Wound Model	\bar{x}	S.D.	Efficiency Level
Production Efficiency			
1. Similarity of the model shape to the real human wound	3.93	.84	High
2. Similarity of the model skin color attribute to the real human wound	4.26	.77	Highest
Usability Efficiency			
3. Stability of the primary model shape after usability	4.48	.53	Highest
4. Stability of the model skin color after usability	4.48	.59	Highest
5. Stability of the model skin elasticity after usability	4.51	.62	Highest
6. Portability and mobility	4.70	.53	Highest
7. Easy of cleaning and storage	4.36	.66	Highest
8. Ease of usability	4.56	.59	Highest
Total Score	4.41	.47	Highest

Table 3. Mean of efficiency of dry dressing type latex wound model

Efficiency of Dry Dressing Type Latex Wound Model	\bar{x}	S.D.	Efficiency Level
Production Efficiency			
1. Similarity of the model shape to the real human wound	4.15	.73	High
2. Similarity of the model skin color attribute to the real human wound	4.23	.69	Highest
Usability Efficiency			
3. Stability of the primary model shape after usability	4.55	.53	Highest
4. Stability of the model skin color after usability	4.56	.56	Highest
5. Stability of the model skin elasticity after usability	4.53	.59	Highest
6. Portability and mobility	4.66	.54	Highest
7. Easy of cleaning and storage	4.43	.64	Highest
8. Ease of usability	4.60	.55	Highest
Total Score	4.46	.45	Highest

Table 4. Comparative result between the mean score of efficiency of the invented latex wound model (wet wound) and the mean score of efficiency of the original wound model (wet wound) of the Faculty of Nursing

Variables	$\bar{x} \pm S.D.$	Mean rank (Sum of rank)	Z	p-value*
Efficiency of the invented latex wound model	35.31 ± 3.82	22.63 (90.50)	-5.928	.000
Efficiency of the wound model of the Faculty of Nursing	28.61 ± 8.10	30.01 (1,620.50)		

Note. * = Wilcoxon Signed Ranks Test

The finding from the comparative result between the mean score of efficiency of the invented latex wound model and that of the primary wound model (dry dressing) indicated that the mean score of efficiency of the invented latex wound

model was higher than that of the primary wound model of the Faculty of Nursing at statistical significance ($p < .05$) as shown in Table 5.

Table 5. Comparative result between the mean score of efficiency of the invented latex wound model (dry wound) and the mean score of efficiency of the original wound model (dry wound) of the Faculty of Nursing

Variables	$\bar{x} \pm S.D.$	Mean rank	Z	p-value*
		(Sum of rank)		
Efficiency of the invented latex wound model	35.73 \pm 3.63	24.50 (24.50)	-6.250	.000
Efficiency of the wound model of the Faculty of Nursing	28.05 \pm 6.21	28.06 (1515.50)		

Note. * = Wilcoxon Signed Ranks Test

4. DISCUSSION

In the opinions of the second-year nursing students, using the latex wound model in a total of 60 persons, wet dressing type and dry dressing type latex wound models were entirely efficient at the highest level. The efficiency of both wet and dry dressing type latex wound models in individual items gave consistent results and the mean score of efficiency of latex wound model was higher than that of the original wound model of the Faculty of Nursing at statistical significance ($p < .001$). However, it might be due to the latex wound model which has been the instructional media in the tangible 3D characteristic, resulting in an easy understanding of the learners and a proper conceptualization as per the following details.^[19] The highest portability and mobility of the model was due to the model size which is 10 cm. width and 10 cm. length in the thin sheet. Therefore, the said model is portable and mobile, and is similar to the small-sized and mobile wound model of the Faculty of Nursing. The secondary aspect was the ease of usability. The finding in case of consideration described that according to the latex wound model, alcohol can be used for wound dressing, transpore tape can be used for closing the wound, and a band is available for fastening the model to be fixed so that at the time of the wound dressing training, the model will not slide. While alcohol cannot be used with the wound model of the Faculty of Nursing for cleaning the wound, no band is available, and micropore tape must be mostly used for closing the wound to prevent the band-aid. Moreover, in the opinions of the students, the model is stable in skin color, primary shape, and elasticity due to the property of the para rubber-made wound model that latex can be stable like resin or fiberglass, elastic like the real organ, and durable, without fracture from fall.^[20] The model is soft, similar to human skin, and has bulges and wrinkles like skin, having more like the feel of the real wound dressing than the original model. In the opinions

on the model skin color attribute, it is similar to the human real wound, and can be easily cleaned and stored. The students rated the efficiency score at the highest level due to the reality of the skin attribute and color. The colors indicating the wound discharge in the wet wound and the realistic wound stitches in the dry wound are used to make the wound look real and different from the original model that has one color. In the opinions of the students, the possible cause of the lowest level of similarity of the model shape to the real human wound included the different shapes and wound depth sizes of the real wound attribute in each position, while the invented latex wound model consists of smooth wound edge and level wound depth. The price of latex wound model is 1,000 baht per piece because the researcher has ordered a small amount of work, causing the price to be high. However, the price of latex wound model is not higher than the original model of the Faculty of Nursing.

5. CONCLUSION

This study was the latex wound model development. It was not comparison study. The finding of this research results indicated that the wet dressing type and dry dressing type latex wound models were entirely efficient at the highest level and the latex wound model had higher quality than those of the original wound model of the Faculty of Nursing. Thus, the nursing instructors can use the latex wound model in the wound dressing skill training for improving the nursing student skills. In addition, it helps the Faculty of Nursing save budget on purchasing expensive models.

Limitation

The number of participants in this study was small, so the generalization of the results from this study is limited.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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