

Evaluating the effectiveness and applicability of ubiquitous-based learning about post-operative care of gastrointestinal cancer surgery for patients' family caregivers

Vo Thi Bich Nga¹, Nguyen Thi May², Vo Thi Diem Binh²,
Ho Thi Thuy Trang², Nguyen Thi Anh Phuong^{2*}

(1) Danang Oncology Hospital

(2) Faculty of Nursing, Hue University of Medicine and Pharmacy, Hue University

Abstract

Background: Utilizing Ubiquitous - Based Learning (UBL) in health education within the hospital setting has practical support for the patient's care. However, the application of technology in health education programs in a hospital environment is still limited. **Objectives:** This study aimed to evaluate the effectiveness and applicability of UBL in the post-operative care of gastrointestinal cancer surgery for patients' family caregivers at Department of Surgery 1, Da Nang Oncology Hospital from April 2020 to February 2022. **Materials and method:** A quasi-experimental study was conducted on 70 family members of patients being treated after gastrointestinal cancer surgery at Department of Surgery 1, Da Nang Oncology Hospital. **Results:** *The effectiveness of UBL:* The findings revealed no significant difference between the two groups' knowledge scores before the intervention. However, the post-test mean scores increased in both groups; in which, the intervention group's mean score of knowledge was significantly greater compared to the control group with 3.23 ± 0.84 and 1.82 ± 0.92 respectively ($p < 0.05$). *The applicability of UBL:* All family members agreed and completely agreed on the features of UBL in family health education about caring for patients after gastrointestinal cancer surgery. **Conclusion:** The teaching method utilizing UBL is significantly more effective than traditional teaching methods, and it is necessary to enhance its application in health education in hospitals and the community.

Keywords: Ubiquitous-based Learning, Health education, gastrointestinal cancer surgery.

1. INTRODUCTION

Comprehensive renovation of education, especially medical education, is a current trend in the world as well as in Vietnam. Ubiquitous-based learning (UBL) is a new learning model, overcoming the disadvantages of previously existing learning models such as E-learning and Mobile learning. UBL can be used online with an internal network connection system or used in a disconnected state. This is a form of education that can be provided anytime, anywhere through smart devices and is not limited in time, place, or environment or on the internet, 3G, or Wifi [1]-[3]. UBL is widely used in many countries around the world in training natural and social sciences such as Korea, Indonesia, Philippines, Mongolia, Nepal, and Vietnam [8], [10]. The use of UBL in health education in hospitals and communities is a new but promising experience that can provide practical support for the treatment and care of patients [4].

Vietnam has five gastrointestinal cancers ranked in the top 10 cancers with the highest incidence

and mortality [11-12]. People with gastrointestinal cancer when treated with surgery have many risks and possible complications. Therefore, care for the patient has a certain influence on the outcome of treatment and prognosis. The Ministry of Health has determined: "In the care of people with cancer, family members are members of the care team. Therefore, training in the care of the patient's family members is essential" [5].

Due to a number of objective and subjective reasons, the application of technology in health education programs in hospitals is limited. In order to develop and apply the UBL method better in the future, contributing to improving the quality of training, care services, and better service for patients at the Department of Surgery 1, Da Nang Oncology Hospital from April 2020 to February 2022 we decided to conduct this study with the following objectives:

1. *Evaluating the effectiveness of UBL in educating the post-operative care of gastrointestinal cancer surgery for patients' family caregivers at*

the Department of Surgery 1, Da Nang Oncology Hospital from April 2020 to February 2022

2. Examine the applicability of UBL in educating the post-operative care of gastrointestinal cancer surgery for patients' family caregivers at the Department of Surgery 1, Da Nang Oncology Hospital from April 2020 to February 2022

2. METHODS

ADDIE (Analysis - Design - Development - Implementation - Evaluation) model was used to develop the course on the post-operative care of gastrointestinal cancer for patients' family caregivers. In the analysis phase, the instructional problems were clarified, and the instructional goal and course content were established. We conducted a preliminary survey on the knowledge of post-operative care of gastrointestinal cancer surgery for family caregivers. Our survey revealed 83.3% of caregivers did not have sufficient knowledge about post-operative care of gastrointestinal cancer surgery and 91.7% needed training on this content. The design and development phase established learning content, lesson planning, and media selection and installation. We gathered answers from the analysis phase on the topic provided by information with evidence. The content of the course included basic post-operative care for patients with gastrointestinal cancer: infection control, rehabilitation, pain, and nausea/vomiting management which contents were developed depending on the result of a preliminary survey. UBL system was set up at Hue UMP in 2015 and was used to develop and install the multi-media lectures. The training was implemented within 60 minutes per group 2 or 3 days before the operation. The participants were divided into sub-group of 5 - 7 persons (6 sub-groups per group). Pre-test and post-test (4 weeks after the course) were used to evaluate the effectiveness of the course and UBL applicability questionnaires were used for the study group.

2.1. Population and sample: family caregivers of patients were being treated after gastrointestinal cancer surgery.

2.2. Place and time: surgery Department 1, Da Nang Oncology Hospital from April 2020 to February 2022.

2.3. Study design: A quasi-experimental study.

2.4. Sample size: G*power 3.1.9.2 was used to calculate the sample size required (significance level $\alpha = .25$; effect size = .5, power = .80). As the required sample size estimated for this study was

32 family caregivers per group, the total number of participants required was 64. After estimating the potential dropout rate (5%), 35 family caregivers were recruited per group.

2.5. Sampling methods

Inclusive criteria: family caregivers from 18 - 60 years old have a high school degree or higher, capable of listening and speaking. Voluntarily participate in research based on clearly explained information, rights, and obligations of study participants.

Exclusive criteria: not include the family caregivers who have mental disorders.

Sampling: randomly selected 70 family caregivers were to meet the study requirements and divided into 2 groups similar in age, gender, and educational background.

- Control group: implementing the post-operative care of gastrointestinal cancer surgery in the traditional method of oral presentation.

- Study group: implementing the post-operative care of gastrointestinal cancer surgery in the UBL system. Educational content is integrated with multimedia forms and effects on tablets.

2.6. Data collection: two questionnaires evaluating the effectiveness and applicability of UBL in the post-operative care of gastrointestinal cancer surgery for patients' family caregivers were developed by researchers.

Questionnaire to evaluate the effectiveness of UBL in educating the post-operative care of gastrointestinal cancer surgery for patients' family caregivers. included 10 items. The passing rating for 1 correct answer is 1 point, with a total score range of 0 - 10, where ≤ 4 indicates weak, 5 - 6 is average, 7 - 8 is good, and ≥ 9 indicates excellent. Then compare the knowledge ratio of both groups before and after the course to evaluate the effectiveness of applying UBL technology.

The questionnaire to evaluate the applicability of UBL in the post-operative care of gastrointestinal cancer surgery included 14 items. Each question was evaluated on a Likert scale of 1 to 5 points with the following levels: 1. Strongly disagree, 2. Disagree, 3. No opinion, 4. Agree, and 5. Totally agree.

2.7. Data Analysis

All statistical analyses were performed, using SPSS 20.0. The tests used for this analysis included descriptive statistics for describing the variables, t-test for comparing the two groups with regard to age, and Kolmogorov-Smirnov test for investigating the normality of the data. In addition, Mann-Whitney test was used to compare the two groups

concerning the means of the quantitative variables. Considering the comparison of each group before and after the intervention, Wilcoxon signed-rank test was used for quantitative variables and Chi-square test for qualitative variables.

2.8. Ethical consideration

This study was conducted after being approved

by the Ethics Committee of Hue University of Medicine and Pharmacy and the permission of Danang Oncology Hospital. The purpose of the research study was explained to all subjects, and all subjects gave their consent to participate. The test results and consciousness survey results were carefully managed to maintain anonymity.

3. RESULTS

3.1. The general information

Table 1. General information (n = 70)

Demographic characteristics		UBL group (n = 35)		Control group (n = 35)		p-value
		n	%	n	%	
Age	Mean \pm SD	39.29 \pm 9.05		39.03 \pm 8.80		
Gender	Male	19	54.3	19	54.3	
	Female	16	45.7	16	45.7	
Educational background	High school	21	60.0	21	60.0	
	Vocational Secondary/ College/University	13	37.1	13	37.1	> 0.05
	Graduate	1	2.9	1	2.9	
Relationship with patients	Spouse	10	28.6	6	17.2	
	Child	23	65.7	25	71.4	
	Siblings, cousins.	2	5.7	4	11.4	

There was no significant difference in demographic characteristics between the control group and the intervention group.

3.2. The effectiveness of UBL application in educating patients' family caregivers about post-operative care of gastrointestinal cancer surgery.

Table 2. Comparison of the knowledge of patient's family caregivers before and after attending the course (n = 70)

Time Statistic Group		Pre-test score (Mean \pm SD)	Post-test score (Mean \pm SD)	Z	p-value* (Within groups)
Knowledge about basic post-operative care for patients with gastrointestinal cancer	UBL group (n = 35)	1.20 \pm 0.47	3.23 \pm 0.84	-5.11	< 0.001
	Control group (n = 35)	1.11 \pm 0.32	1.82 \pm 0.92	-3.57	< 0.001
P-value ** (Between groups)		0.47	< 0.001		

Notes: *Wilcoxon signed-rank test was used. **Mann-Whitney test was used.

The findings revealed no significant difference between the two groups' knowledge scores before the intervention. However, the post-test mean scores increased in both groups, in which, the intervention group's mean score of knowledge was significantly greater compared to the control group with 3.23 \pm 0.84 and 1.82 \pm 0.92 respectively (p < 0.05).

3.3. The ability of UBL application in educating patients' family caregivers about post-operative care of gastrointestinal cancer surgery

Table 3. Distribution of the ability of UBL application in educating patients' family caregivers about post-operative care of gastrointestinal cancer surgery (n = 35)

Contents		Strongly disagree (n,%)		No opinion (n,%)	Agree (n,%)	Totally Agree (n,%)
Expected performance	Useful in health education	0	0	0	2 (5.7)	33 (94.3)
	Convenience in health education	0	0	0	1 (2.9)	34 (97.1)
	Faster understanding of the lesson	0	0	0	0	35 (100)
Expected necessity	Easy to use	0	0	0	2 (5.7)	33 (94.3)
	Accessing the system is convenient	0	0	0	1 (2.9)	34 (97.1)
	Learning of running the UBL system is easily	0	0	0	1 (2.9)	34 (97.1)
Social influence	U-learning should be widely used in health education for patients' family caregivers in hospitals	0	0	0	0	35 (100)
	U-learning should be used to update the patient care knowledge for patients' family caregivers	0	0	0	0	35 (100)
	Health educators are very helpful in using U-learning related to activities to update patient care knowledge	0	0	0	0	35 (100)
Favorable condition	Having the necessary supporting equipment	0	0	0	2 (5.7)	33 (94.3)
	Having the necessary supporting equipment	0	0	0	1 (2.9)	34 (97.1)
	Always have support from a health worker or hospital	0	0	0	0	35 (100)
The intention of behavior	Plan to participate in next health education programs using UBL apps	0	0	0	0	35 (100)
	Plan to always participate in health education programs using UBL apps.	0	0	0	0	35 (100)

All of the patient's family caregivers agreed and totally agreed that the UBL application help understand easily the lesson; more useful and convenient in health education.

All the patient's family caregivers thought that the UBL app was running smoothly and easily.

All of the patient's family caregivers totally agreed on the social impact of the UBL application.

100% of participants in the study group plan to participate in the next health education programs using UBL apps.

4. DISCUSSION

The results of our study showed that there was no significant difference between the two groups' knowledge scores before the intervention with $p > 0.05$. However, the post-test mean scores increased in both groups; in which. the intervention group's mean score of knowledge was significantly greater compared to the control group with 3.23 ± 0.84 and 1.82 ± 0.92 respectively ($p < 0.05$).

Thus, it can be seen that after being educated, whether by traditional method or UBL application,

the knowledge of patients' family caregivers has increased significantly. Health counseling and education are one of the duties of health workers, including nurses. However, the most common beneficiaries of nursing health education are the patients [6], [7]. Family members of patients receive little guidance and health education. For cancer patients, especially in the postoperative period, family members play a very important role in supporting and caring for patients, ensuring the basic needs of patients as well as preventing post-operative complications. The above results suggest that health education for patients' families at Da Nang Oncology Hospital in particular and medical facilities in general needs be promoted. Health workers, especially nurses, need to increase the provision of information as well as guide family members on how to care for the patients. Because the information provided by nurses is reliable and very effective in improving the understanding of patients and their family members [6], [7]. When family members have the right and complete knowledge of how to take care of patient, they will coordinate well with medical staff in the process of caring at the hospital as well as at the stage of discharge home.

Notably, at the time after health education, the average knowledge score of family members in the intervention group using the UBL method increased significantly when compared to the control group with $p < 0.05$. With the advantage of learning anytime, anywhere and integrating multimedia applications such as images, videos, visual and vivid on tablets, the UBL application may have created newness, helping family members conveniently arrange study time, remember lessons better, have the opportunity to view and review the knowledge of patient care, especially difficult knowledge, which needs to be repeated many times. Meanwhile the traditional method in the form of oral presentations, information is only provided once, and the content is presented mainly in oral and paper form. Therefore, the acquisition and memory of family members' knowledge are also more limited. With the 4.0 era, nurses in particular and health workers in general need to take advantage of the outstanding advantages of digital technology, applied in the care of patients as well as health counseling and education for patients, their families, and the community. The application of UBL is one of the technologies that nurses can apply in training and health education.

In the research findings of Tran Thi Thuy

conducted in 2011 aimed to build and evaluate the quality of U-learning applications in training at Nam Dinh Industrial College and showed that the U-learning system has a positive impact on the teaching of lecturers and the learning of students. In addition, U-learning's communication tools for student-to-student and student-to-faculty exchanges are enhanced [5]. Studies on the effectiveness of UBL application in student training and evaluation have also shown very positive results with high student satisfaction [8], [9]. Although current studies evaluating the effectiveness of UBL in health education for patients or their relatives are rarely reported in the medical literature, through the results of our study, it can be seen that UBL application is not only effective in training or evaluating students, which has been noted in previous studies but also can apply to the field of health counseling and education for patients' families. The World Health Organization has emphasized the need to use digital technology in the provision of health services, including health consultation and education, in order to achieve universal health coverage. Health education using the UBL application can be a new approach, helping nurses improve the quality of health consultation and education for patients and family members about the content of patient care.

Regarding the ability of the UBL application in educating patients' family caregivers about post-operative care of gastrointestinal cancer surgery, about the expected performance of UBL application, all 35 participants in the intervention group agreed and totally agreed on the expected performance of the UBL application the UBL application helped to understand easily the lesson; more useful and convenient in health education. In the UBL application. we have integrated several multimedia resources such as images. and videos. ... The patient's family caregivers learned on the tablet so this has created something new and attractive, creating a positive effect on the family's acquisition of knowledge. In addition, with digital devices, the patient's family caregivers could access information about patient care whenever they want. Therefore, they felt the convenience as well as efficiency when receiving health education through the UBL method.

About the expected necessity of UBL application, this study result showed that all the patient's family caregivers thought that the UBL app was running smoothly and easily. This result was similar to the research of Jaiswal S. (2012) conducted on Chinese students in the US with 70% of the students

agreeing and totally agreeing about the expected effort of U-learning: easy to use for learning activities; the design features of U-learning were easy to use so most of the students agreed had the positive attitude toward UBL application in learning [1]. Moreover, the research in Nam Dinh Industrial College indicated that the UBL app was running smoothly and easily so it helped the students easily learn and found knowledge [5]. UBL application had also applied at Hue University of Medicine and Pharmacy to train and evaluate capacity. UBL was assessed as stable; did not interrupt student learning easily content accessed; the UBL design was harmonious and easy [9], [10].

Regarding the Social influence of the UBL application, all intervention group participants agreed and totally agreed that UBL should be widely used in health education and update the patient care knowledge for patients' family caregivers in hospitals. All caregivers in the intervention group also believe that favorable conditions for using UBL are having the necessary support equipment, having knowledge of using the U-learning system and having the support of medical staff and lecturers.

For favorable conditions of UBL application, the research of Jaiswal S. (2012) conducted on Chinese students in the US showed that the majority of students mentioned that favorable conditions for using U-learning were having the necessary equipment and the knowledge to use it [1]. This result was similar to our results, it could be explained by the outstanding features of UBL or U-Learning - allowed education at any time and anywhere, including application to health education [2], [5], [9].

The percentage of patients' family caregivers in our study who gave positive feedback on U-learning (100%) was similar to the results in a study at Hue

University of Medicine and Pharmacy Hospital conducted on postpartum women (85.74%). Those results showed that UBL has applicability in health education for both the patient and the patient's family. As can be seen, UBL has been applied in many places, fields, and disciplines [1-5]. The results of the studies show a positive impact of UBL and user satisfaction on this application. The UBL application in health education for patients and their family members is rarely reported in the medical literature in the world as well as in Vietnam. Our research results initially show the potential effectiveness of this application in the field of health counseling and education for patients and their families. More interventions need to be implemented to fully evaluate the effectiveness of UBL application in health communication, counseling, and education for patients and their families.

5. CONCLUSION

There was no significant difference between the two groups' knowledge scores before the intervention with $p > 0.05$. The post-test mean scores increased in both groups; in which, the intervention group's mean score of knowledge was significantly greater compared to the control group with 3.23 ± 0.84 and 1.82 ± 0.92 respectively ($p < 0.05$).

All of the patient's family caregivers agreed and totally agreed that the UBL application helped to understand easily the lesson; more useful and convenient in health education; the UBL app was running smoothly and easily and totally agreed on the social impact of the UBL application.

The teaching method utilizing UBL is significantly more effective than traditional teaching methods, and it is necessary to enhance its application in health education in hospitals and the community.

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