
Effectiveness Of Preoperative Education Using Digital Leaflet And Motion Media On Oncology Surgery Patients' Knowledge Of Surgical Procedures At Pku Muhammadiyah Hospital Yogyakarta

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Abstract

Patients' lack of knowledge regarding surgical procedures may lead to anxiety, fear, and unpreparedness in facing surgical interventions. Preoperative education is one of the strategies used to improve patients' understanding and preparedness before surgery. The use of educational media, such as digital leaflets and motion media, is expected to enhance oncology surgery patients' knowledge regarding surgical procedures. This study aimed to determine the effectiveness of preoperative education using digital leaflets and motion media on oncology surgery patients' knowledge of surgical procedures at PKU Muhammadiyah Hospital Yogyakarta. This study employed a quantitative approach with a quasi-experimental design using a pretest-posttest with two-group design. A total of 30 respondents were selected using purposive sampling and divided into two groups: the digital leaflet group and the motion media group. Data were collected using an oncology surgery patient knowledge questionnaire and analyzed using the Wilcoxon Signed Rank Test and Mann-Whitney U Test with a significance level of 0.05. The results showed that education using digital leaflet media increased the mean knowledge score from 3.73 ± 1.49 to 5.47 ± 1.25 ($p = 0.001$). In the motion media group, the mean knowledge score increased from 4.07 ± 1.53 to 6.60 ± 1.40 ($p = 0.001$). The Mann-Whitney U Test showed a p-value of 0.032, indicating a significant difference in effectiveness between the two educational media. Motion media demonstrated greater improvement in patient knowledge, with a mean rank of 18.87 compared with 12.13 for digital leaflet media. Preoperative education using both digital leaflet and motion media was effective in improving oncology surgery patients' knowledge regarding surgical procedures. However, motion media proved to be more effective than digital leaflets in enhancing patients' understanding of surgical procedures.

Keywords: Preoperative Education, Digital Leaflet, Motion Media, Patient Knowledge

INTRODUCTION

Surgical procedures are among the most complex medical interventions and constitute an essential component of modern healthcare services. In addition to affecting patients' physical conditions, surgical interventions also influence psychological aspects, particularly during the preoperative phase. Patients who are scheduled to undergo surgery frequently experience anxiety, fear, and stress due to insufficient knowledge regarding surgical procedures, the effects of anesthesia, and potential postoperative complications (Salim et al., 2025). These psychological conditions may affect patients' readiness to undergo surgery, their level of compliance with medical instructions, and the overall success of the surgical intervention (Edwar, 2024).

Globally, the demand for surgical services continues to increase. The World Health Organization reported that the number of surgical procedures performed worldwide increased from approximately 140 million procedures in 2020 to 234 million procedures in 2022 (World Health Organization, 2023). This increase has also occurred in oncological surgical services in line with the rising incidence of cancer in many countries. Nevertheless, several international studies have shown that many patients still undergo surgery without receiving adequate preoperative education, resulting in suboptimal understanding of surgical procedures (Mac Quene et al., 2022).

In Indonesia, surgical services constitute an integral component of the healthcare system. National data indicate that the volume of surgical procedures reached 1,308,578 procedures in 2019, equivalent to 1,025.5 procedures per 100,000 population (Arif et al., 2022). The high number of surgical interventions highlights the importance of improving service quality, including the provision

of comprehensive preoperative education. Preoperative education aims not only to enhance patient knowledge but also to improve patient safety and the quality of hospital services (Edwar, 2024).

Ideally, preoperative education should be provided at least one day prior to surgery to allow patients sufficient time to understand the information provided and to ask questions regarding the procedure they will undergo (Al Islam, 2019). In perioperative nursing practice, preoperative education plays a crucial role in preparing patients physically and psychologically. This becomes increasingly important among oncology surgery patients, who generally experience higher levels of anxiety due to their disease diagnosis. The Ministry of Health of the Republic of Indonesia, through the Regulation of the Minister of Health of the Republic of Indonesia Number 11 of 2017 concerning Patient Safety and the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/MENKES/1128/2022 concerning Hospital Accreditation Standards, emphasizes that patient education is an obligation of healthcare professionals and must be delivered systematically, in an understandable manner, and supported by appropriate educational media (Tunde et al., 2023).

The use of appropriate educational media is an important factor in the successful delivery of health information. Commonly used educational media include verbal explanations, digital leaflets, booklets, videos, and interactive motion media. However, educational practices in many healthcare facilities are still dominated by lecture-based methods or verbal explanations without adequate visual support (Szilágyiné Lakatos et al., 2023). This condition may limit patients' understanding of the information provided. Digital leaflets have several advantages, including ease of distribution, the possibility of repeated reading, and relatively low costs; however, their effectiveness is influenced by patients' reading ability and literacy levels (Notoatmodjo, 2021). In contrast, motion media or educational videos can present information through a combination of visual, audio, and animation elements, making them more engaging and enabling patients to understand surgical procedures more comprehensively (Sadeghi et al., 2025).

Several previous studies have demonstrated that motion media tend to be more effective than printed media in improving patient knowledge. A study conducted by Nurlaelasari and Ermanto (2023) found that both digital leaflets and motion media were effective in improving the knowledge of postpartum mothers following cesarean section surgery (p -value = 0.000); however, motion media proved to be more effective than digital leaflets. Another study by Hidayati and Rahayuningsih (2022) also found that health education delivered through motion media was more effective than digital leaflets in improving knowledge, attitudes, and postpartum care practices, with p -values of 0.006 for knowledge, 0.010 for attitudes, and 0.002 for practices. Nevertheless, most previous studies have focused on postpartum mothers, and only limited research has examined the effectiveness of these educational media among oncology surgery patients, particularly regarding their understanding of surgical procedures.

The results of a preliminary study conducted by the researchers at PKU Muhammadiyah Hospital Yogyakarta during the period of August to October 2025 indicated that there were approximately 15 preoperative oncology surgery patients per day or around 450 patients per month. Approximately 80% of patients received only verbal education without structured visual media, while about 70% reported that they did not fully understand the surgical procedures they would undergo. These findings indicate the existence of an implementation gap in the delivery of preoperative education in the hospital setting. To date, standardized preoperative educational media have not been available, and the most effective educational medium for implementation within the service context of PKU Muhammadiyah Hospital Yogyakarta has not yet been identified.

Based on the above considerations, there is a need to evaluate the effectiveness of educational media that can improve oncology surgery patients' knowledge regarding surgical procedures. This study is expected to provide scientific evidence to support the development of more effective and patient-oriented standards for preoperative education. Therefore, this study aims to determine the effectiveness of preoperative education using digital leaflets and motion media on the knowledge of

adult oncology surgery patients (≥ 18 years old), both male and female, regarding surgical procedures at PKU Muhammadiyah Hospital Yogyakarta.

RESEARCH METHODS

This study was conducted in the Surgical Ward of PKU Muhammadiyah Hospital Yogyakarta. The population of this study consisted of all patients scheduled to undergo oncology surgery during the study period. The sampling technique used was purposive sampling, which involves selecting participants based on specific considerations aligned with the research objectives. The study included a total of 30 respondents divided into two groups: 15 respondents in the educational intervention group using digital leaflets and 15 respondents in the educational intervention group using motion media. The inclusion criteria were patients scheduled for oncology surgery with stable general conditions, the ability to read and understand the information provided, and willingness to participate as respondents by signing an informed consent form. The exclusion criteria included patients in emergency conditions or unconscious states, those with severe hearing or visual impairments, and patients who did not complete the entire research process.

The independent variable in this study was preoperative education delivered through digital leaflets and motion media, whereas the dependent variable was the level of knowledge of oncology surgery patients regarding surgical procedures. Both groups received the same educational content, which included information on the objectives of surgery, preoperative preparation, surgical procedures, anesthesia, and postoperative care. The only difference between the interventions was the method of information delivery. The first group received education through digital leaflets, while the second group received education through motion media in the form of an educational video with a duration of approximately 5–10 minutes.

Data were collected using a knowledge questionnaire developed based on the health education theory proposed by Notoatmodjo (2018). The questionnaire consisted of eight multiple-choice questions covering the definition and objectives of preoperative education, preoperative preparation, surgical procedures, and postoperative care. Each correct answer was assigned a score of 1, whereas each incorrect answer was assigned a score of 0. Knowledge levels were categorized as good (76–100%), moderate (56–75%), and poor ($\leq 55\%$) (Notoatmodjo, 2018). Knowledge levels were measured twice: before the educational intervention (pretest) and after the intervention (posttest).

Data processing was performed through editing, coding, processing, and cleaning stages using the Statistical Package for the Social Sciences (SPSS) software. Data analysis consisted of univariate and bivariate analyses. Univariate analysis was used to describe respondents' characteristics and the distribution of knowledge levels in the form of frequencies, percentages, means, and standard deviations. Bivariate analysis was conducted to determine differences in knowledge levels before and after the intervention within each group using the Wilcoxon Signed Rank Test. Furthermore, differences in effectiveness between digital leaflets and motion media were analyzed using the Mann–Whitney U Test. The selection of these statistical tests was based on the results of the normality test, which indicated that the data were not normally distributed and were measured on an ordinal scale. All statistical analyses were performed at a significance level of $\alpha = 0.05$, and p-values less than 0.05 were considered statistically significant.

This study adhered to the ethical principles of research, including autonomy, beneficence, non-maleficence, justice, and confidentiality. All respondents received explanations regarding the objectives, benefits, procedures of the study, and their right to refuse participation or withdraw from the study at any time without any consequences for the healthcare services they received. Respondents' confidentiality was maintained by using identification codes on each questionnaire form, and all research data were used solely for scientific purposes.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of respondents in this study included age, gender, educational level, and disease diagnosis among oncology surgery patients who received preoperative education using digital leaflet media and motion media. Each intervention group consisted of 15 patients, resulting in a total sample size of 30 respondents. The distribution of respondent characteristics is presented in Table 1.

Table 1. Distribution of Respondent Characteristics Based on Intervention Groups

Characteristics	Leaflet (n=15)		Motion (n=15)		Total (n=30)	
	f	%	f	%	f	%
Age						
26–35 years	2	13.3	3	20.0	5	16.7
36–45 years	6	40.0	4	26.7	10	33.3
46–55 years	1	6.7	4	26.7	5	16.7
56–65 years	4	26.7	4	26.7	8	26.7
>65 years	2	13.3	0	0.0	2	6.7
Gender						
Male	2	13.3	4	26.7	6	20.0
Female	13	86.7	11	73.3	24	80.0
Educational Level						
Elementary School	2	13.3	2	13.3	4	13.3
Junior High School	8	53.3	5	33.3	13	43.3
Senior High School	5	33.3	7	46.7	12	40.0
Higher Education	0	0.0	1	6.7	1	3.3
Diagnosis						
Lymphoma	3	20.0	3	20.0	6	20.0
Breast Cancer	6	40.0	5	33.3	11	36.7
Mandibular Cancer	2	13.3	1	6.7	3	10.0
Thyroid Cancer	2	13.3	3	20.0	5	16.7
Colon Cancer	2	13.3	3	20.0	5	16.7
Total	15	100	15	100	30	100

Based on Table 1, the majority of respondents in the digital leaflet group were aged 36–45 years, accounting for 6 respondents (40.0%). In contrast, the age distribution in the motion media group was relatively balanced across the age ranges of 36–45 years, 46–55 years, and 56–65 years, with each category consisting of 4 respondents (26.7%). Overall, most respondents belonged to the 36–45 years age group, totaling 10 respondents (33.3%).

Regarding gender, both intervention groups were dominated by female respondents, with 13 respondents (86.7%) in the digital leaflet group and 11 respondents (73.3%) in the motion media group. Overall, female respondents accounted for 24 participants (80.0%), whereas male respondents comprised 6 participants (20.0%).

In terms of educational level, the majority of respondents in the digital leaflet group had completed junior high school education, accounting for 8 respondents (53.3%). Meanwhile, most respondents in the motion media group had completed senior high school education, accounting for 7 respondents (46.7%). Overall, junior high school was the most common educational level among respondents, with 13 participants (43.3%), followed by senior high school education with 12 participants (40.0%). This relatively moderate level of education suggests that most respondents possessed adequate abilities to receive and understand the health information provided.

Based on disease diagnosis, the majority of respondents in both groups were diagnosed with breast cancer, comprising 6 respondents (40.0%) in the digital leaflet group and 5 respondents (33.3%)

in the motion media group. Overall, breast cancer was the most common diagnosis, accounting for 11 respondents (36.7%), followed by lymphoma with 6 respondents (20.0%), and thyroid cancer and colon cancer with 5 respondents each (16.7%). These findings indicate that breast cancer patients represented the largest group of oncology surgery patients undergoing surgical procedures at the study site.

In general, the respondents in this study were predominantly adult patients, female, had moderate educational attainment, and were diagnosed with breast cancer. These characteristics indicate that most respondents had a relatively good potential to receive and comprehend the preoperative education provided.

Distribution of Oncology Surgery Patients' Diagnoses Based on Intervention Groups and Age Range

The distribution of oncology surgery patients' diagnoses according to intervention groups and age ranges was analyzed to provide an overview of the variation in cancer types among the study groups. The distribution of respondents' diagnoses is presented in Table 2.

Table 2. Distribution of Oncology Surgery Patients' Diagnoses Based on Intervention Groups and Age Range

Diagnosis	Digital Leaflet Group n (%)	Age Range (Years)	Motion Group n (%)	Age Range (Years)
Lymphoma	3 (20.0)	29–54	3 (20.0)	21–50
Breast Cancer	6 (40.0)	39–69	5 (33.3)	38–60
Mandibular Cancer	2 (13.3)	37	1 (6.7)	47
Thyroid Cancer	2 (13.3)	31–39	3 (20.0)	35–58
Colon Cancer	2 (13.3)	58–67	3 (20.0)	20–61
Total	15 (100)		15 (100)	

Based on Table 2, the distribution of diagnoses among oncology surgery patients in the digital leaflet group showed that the majority of respondents were diagnosed with breast cancer, accounting for 6 respondents (40.0%) with an age range of 39–69 years. Lymphoma was identified in 3 respondents (20.0%) with an age range of 29–54 years, while mandibular cancer, thyroid cancer, and colon cancer were each identified in 2 respondents (13.3%). In the motion media group, the highest proportion of diagnoses was also found among patients with breast cancer, accounting for 5 respondents (33.3%) with an age range of 38–60 years. Diagnoses of lymphoma, thyroid cancer, and colon cancer were each identified in 3 respondents (20.0%), whereas mandibular cancer was identified in only 1 respondent (6.7%). Overall, the diagnostic characteristics of both groups demonstrated relatively similar distribution patterns, with breast cancer cases predominating among middle-aged and older adult patients. The comparable distribution of diagnoses between the two groups indicates that both groups possessed relatively homogeneous clinical characteristics, allowing a more objective comparison of the effectiveness of digital leaflet and motion media interventions in improving patient knowledge.

Knowledge Levels of Oncology Surgery Patients Before and After Receiving Preoperative Education Using Digital Leaflet Media

The analysis of knowledge levels among oncology surgery patients in the digital leaflet group was conducted to determine changes in respondents' knowledge before (pretest) and after (posttest) receiving preoperative education using digital leaflet media. Differences in knowledge levels were analyzed using the Wilcoxon Signed Rank Test. The results of the analysis are presented in Table 3.

Table 3. Results of the Wilcoxon Signed Rank Test for Knowledge Levels of Oncology Surgery Patients Before and After Preoperative Education Using Digital Leaflet Media

Variable	Mean ± SD	Median	Mean Rank	Z	p-value	Mean Difference
Pretest	3.73 ± 1.49	4.00				
Posttest	5.47 ± 1.25	5.00	7.00	-3.269	0.001	1.74

Based on Table 3, the mean knowledge score of oncology surgery patients before receiving education using digital leaflet media was 3.73 ± 1.49 , with a median score of 4.00. Following the educational intervention, the mean knowledge score increased to 5.47 ± 1.25 , with a median score of 5.00. These findings indicate an increase of 1.74 points in the knowledge score after the provision of preoperative education using digital leaflet media. The results of the Wilcoxon Signed Rank Test showed a mean rank value of 7.00, a Z value of -3.269, and a p-value of 0.001. The p-value, which was lower than 0.05, indicates a statistically significant difference in the knowledge levels of oncology surgery patients before and after receiving education using digital leaflet media. Therefore, preoperative education delivered through digital leaflet media was proven to be effective in improving patients' knowledge regarding surgical procedures at PKU Muhammadiyah Hospital Yogyakarta. Furthermore, the standard deviation observed in the posttest results (1.25) was lower than that of the pretest results (1.49). This finding suggests that after receiving education through digital leaflet media, respondents' knowledge levels not only improved but also became more homogeneous or consistent across participants.

Knowledge Levels of Oncology Surgery Patients Before and After Receiving Preoperative Education Using Motion Media

The analysis of knowledge levels among oncology surgery patients in the motion media group was conducted to determine changes in respondents' knowledge levels before (pretest) and after (posttest) receiving preoperative education using motion media. Differences in knowledge levels before and after the intervention were analyzed using the Wilcoxon Signed Rank Test. The results of the analysis are presented in Table 4.

Table 4. Results of the Wilcoxon Signed Rank Test for Knowledge Levels of Oncology Surgery Patients Before and After Preoperative Education Using Motion Media

Variable	Mean $\pm$ SD	Median	Mean Rank	Z	p-value	Mean Difference
Pretest	4.07 ± 1.53	5.00				
Posttest	6.60 ± 1.40	7.00	8.00	-3.508	0.001	2.53

Based on Table 4, the mean knowledge score of oncology surgery patients before receiving education using motion media was 4.07 ± 1.53 , with a median score of 5.00. Following the educational intervention, the mean knowledge score increased to 6.60 ± 1.40 , with a median score of 7.00. These findings indicate an increase of 2.53 points in the knowledge score after the provision of preoperative education using motion media. The results of the Wilcoxon Signed Rank Test demonstrated a mean rank value of 8.00, a Z value of -3.508, and a p-value of 0.001. Since the p-value was lower than 0.05, there was a statistically significant difference in the knowledge levels of oncology surgery patients before and after receiving education using motion media. Therefore, preoperative education delivered through motion media was shown to be effective in improving patients' knowledge regarding surgical procedures at PKU Muhammadiyah Hospital Yogyakarta. Furthermore, the increase in knowledge scores observed in the motion media group (2.53 points) was greater than that observed in the digital leaflet group, which showed an increase of 1.74 points. The increase in the median score from 5.00 to 7.00 also indicates that the majority of respondents experienced improvements in their knowledge levels after receiving education through motion media. These findings suggest that motion media can deliver information in a more engaging, interactive, and comprehensible manner through the integration of visual, audio, and animation elements, thereby facilitating a more optimal understanding of surgical procedures among patients.

Differences in Knowledge Levels of Oncology Surgery Patients Before and After Receiving Preoperative Education Using Digital Leaflet and Motion Media.

The analysis of differences in the effectiveness of preoperative education using digital leaflets and motion media was conducted by comparing the differences in knowledge scores (delta scores), which were calculated by subtracting pretest scores from posttest scores for each respondent. The use of delta scores aimed to determine the magnitude of knowledge improvement following the intervention in each group. Based on the results of the normality test, the data were found to be non-

normally distributed, and the two groups were independent; therefore, differences in effectiveness were analyzed using the Mann–Whitney U Test. The results of the analysis are presented in Table 5.

Table 5. Results of the Mann–Whitney U Test Comparing the Effectiveness of Digital Leaflet and Motion Media Education

Group	Mean Rank	Asymp. Sig. (2-tailed)
Digital Leaflet	12.13	0.032
Motion Media	18.87	

Based on Table 5, the comparison of effectiveness was performed using the difference in knowledge scores (delta scores) between posttest and pretest values in each intervention group. The results of the Mann–Whitney U Test showed a p-value of 0.032 ($p < 0.05$), indicating a statistically significant difference in effectiveness between education delivered through digital leaflets and motion media in improving oncology surgery patients' knowledge regarding surgical procedures. The mean rank value in the motion media group was 18.87, which was higher than that of the digital leaflet group (12.13). These findings indicate that the increase in knowledge observed in the motion media group was greater than that observed in the digital leaflet group. Therefore, motion media were considered more effective than digital leaflets in improving oncology surgery patients' knowledge regarding surgical procedures at PKU Muhammadiyah Hospital Yogyakarta. Overall, the findings of this study demonstrate that both educational media were effective in improving the knowledge of oncology surgery patients. However, motion media produced a greater improvement in knowledge compared with digital leaflets. This finding suggests that the delivery of information through a combination of visual, audio, and animation elements in motion media facilitates a more optimal understanding of educational materials compared with media relying primarily on text and static images.

Discussion
Respondent Characteristics

The results of this study showed that the majority of respondents were aged 36–45 years, accounting for 10 respondents (33.3%). In addition, 8 respondents (26.7%) were aged 56–65 years, 5 respondents (16.7%) were aged 26–35 years, 5 respondents (16.7%) were aged 46–55 years, and 2 respondents (6.7%) were older than 65 years. These findings indicate that most oncology surgery patients undergoing surgical procedures belonged to the adult and early elderly age groups.

These findings are consistent with the study conducted by Supramanto (2020), which reported that cancer incidence is more common among adults and older individuals due to the accumulation of risk factor exposure, hormonal changes, and a decline in the body's cellular regenerative capacity. Increasing age is also associated with physiological changes, including a decline in immune system function, which may increase susceptibility to various chronic diseases, including cancer (Riyadi & Apriyani, 2024). According to Notoatmodjo (2018), age is one of the factors influencing an individual's ability to receive and understand health information. Adults generally possess greater cognitive maturity, enabling them to better comprehend information provided by healthcare professionals.

Based on observations made during the study, several respondents reported unhealthy lifestyle patterns, including inadequate consumption of fruits and vegetables, insufficient physical activity, habitual sleep deprivation, and infrequent participation in routine health examinations. These conditions may have contributed to the development of cancer. Furthermore, some respondents demonstrated limited understanding of their disease and the surgical procedures they were scheduled to undergo, resulting in fear and anxiety before surgery. Therefore, preoperative education plays a crucial role in improving patients' knowledge and preparedness for surgical intervention.

The findings also revealed that the majority of respondents were female, accounting for 24 respondents (80.0%), whereas male respondents represented only 6 participants (20.0%). The predominance of female respondents in this study was associated with the high number of patients diagnosed with breast cancer compared with other cancer types.

These findings are consistent with reports from the World Health Organization, which indicate that breast cancer is one of the most prevalent cancers among women worldwide (World Health Organization, 2024). Similarly, Riyadi and Apriyani (2024) reported that oncology surgery patients are predominantly female due to the high prevalence of breast cancer and cancers affecting female reproductive organs. According to DeVita Jr. et al. (2023), women have a higher risk of developing certain types of cancer due to hormonal influences, reproductive factors, and genetic predisposition.

Potter et al. (2020) suggested that women tend to be more proactive in seeking health information, pay greater attention to their health conditions, and are generally more cooperative in following treatment programs than men. During the study, most female respondents demonstrated high levels of enthusiasm toward the educational interventions, as reflected by their active participation in asking questions regarding surgical procedures, anesthesia processes, and potential postoperative complications.

Based on interview findings, several female respondents also reported unhealthy dietary habits, low consumption of fiber-rich foods, and insufficient rest due to household responsibilities or occupational demands. According to the researchers' observations, these factors may contribute to the occurrence of cancer. The predominance of female respondents in this study highlights the importance of educational strategies tailored to patient characteristics to ensure optimal delivery and comprehension of health information.

The study findings showed that most respondents had completed junior high school education (13 respondents; 43.3%) or senior high school education (12 respondents; 40.0%). These findings indicate that the majority of respondents had a moderate educational background.

This finding is consistent with the opinion of Nursalam (2020), who stated that education is an important factor influencing an individual's ability to receive, understand, and process information. Individuals with higher educational attainment tend to have a better ability to comprehend health information than those with lower educational levels. According to Notoatmodjo (2018), education contributes to the development of logical thinking, information analysis skills, and the ability to acquire new knowledge.

In the present study, most respondents were adults or older adults; therefore, not all respondents were familiar with obtaining health information through digital media or understanding medical terminology commonly used in healthcare services. During the study process, several respondents required repeated explanations to understand terms such as anesthesia, perioperative procedures, and postoperative complications.

Based on observational findings, respondents with higher educational attainment tended to be more active in asking questions and discussing their diseases and upcoming surgical procedures. In contrast, respondents with lower educational backgrounds tended to receive information more passively. Therefore, the use of educational media that are simple, attractive, and easy to understand is essential to effectively reach patients across all educational levels.

The study results further indicated that the majority of respondents were diagnosed with breast cancer (11 respondents; 36.7%), followed by lymphoma (6 respondents; 20.0%), and thyroid cancer and colon cancer (5 respondents each; 16.7%). These findings demonstrate that breast cancer was the most common diagnosis among oncology surgery patients at the study site. This result is consistent with reports from the World Health Organization (2024), which identify breast cancer as one of the most prevalent cancers globally and a major indication for surgical intervention among oncology patients. DeVita Jr. et al. (2023) emphasized that cancer patients require comprehensive management, including preoperative education, to improve their understanding and preparedness for surgery.

Each type of cancer has distinct disease characteristics, anatomical locations, surgical procedures, and potential complications, resulting in different informational needs among patients. In this study, patients diagnosed with breast cancer generally asked more questions regarding surgical procedures and postoperative physical changes, whereas patients with colon cancer were more concerned about postoperative recovery processes and dietary management following surgery.

Observations during the study revealed that several respondents still had limited understanding of their disease conditions and the surgical procedures they were about to undergo. Some patients were not fully aware of the objectives of surgery or the stages of the procedures to be performed. Such conditions may contribute to fear, worry, and anxiety before surgery. Therefore, preoperative education constitutes an essential component of perioperative care aimed at improving patient knowledge, reducing anxiety, and preparing patients physically and psychologically prior to surgical intervention.

Knowledge Levels of Oncology Surgery Patients Before and After Education Using Digital Leaflet Media

The findings of this study indicated that before receiving education through digital leaflet media, most respondents had limited knowledge regarding surgical procedures, anesthesia, and the perioperative stages they would undergo. This condition suggests that many oncology surgery patients had not received adequate information concerning the surgical interventions they were about to experience. Insufficient knowledge may lead to negative perceptions of surgery, causing patients to experience fear, anxiety, and uncertainty before the procedure.

These findings are consistent with the study conducted by Sandra et al. (2023), which reported that patients scheduled for surgery often possess limited knowledge regarding perioperative stages because the information provided has not been delivered systematically and in a structured manner. Similarly, Rahmawati (2014) found that inadequate understanding of surgical procedures may influence patients' readiness for surgery and increase preoperative anxiety.

According to Notoatmodjo (2018), an individual's level of knowledge is influenced by various factors, including age, educational background, experience, interests, and sources of information. Differences in educational attainment affect individuals' ability to receive, understand, and process health information. Furthermore, previous experiences and prior exposure to information play important roles in shaping an individual's knowledge level.

The low level of knowledge observed among respondents in this study was likely influenced not only by limited access to information but also by their condition as oncology surgery patients. Most respondents had been diagnosed with breast cancer, lymphoma, colon cancer, and thyroid cancer, all of which are classified as malignant diseases. A cancer diagnosis often imposes a substantial psychological burden because patients must cope with uncertainty regarding disease progression, treatment outcomes, the possibility of recurrence, and prospects for recovery.

During the study process, the researchers observed that most respondents asked more questions about the likelihood of recovery, surgical success, and the impact of the disease on their lives than about the surgical procedures themselves. Several respondents appeared sad, anxious, fearful, and worried about their health conditions, causing their attention to be focused more on the disease than on obtaining information about the upcoming surgery. According to Potter et al. (2020), psychological conditions such as anxiety and fear may impair an individual's ability to optimally receive and process health information.

Although health information is now widely accessible through digital media, not all patients possess the same ability to search for, understand, and evaluate reliable information. Most respondents in this study had junior high school or senior high school educational backgrounds and belonged to the adult and older adult age groups. Several respondents stated that they trusted information provided by healthcare professionals more than information obtained from the internet. This finding highlights the continued importance of healthcare professionals in providing structured and easily understandable education to improve patient knowledge prior to surgery.

The results of this study demonstrated that following education using digital leaflet media, patients' knowledge levels improved, as indicated by an increase in the mean knowledge score from 3.73 to 5.47. In addition, the Wilcoxon Signed Rank Test showed a p-value of 0.001 ($p < 0.05$), indicating a statistically significant difference between knowledge levels before and after the

intervention. These findings suggest that digital leaflets are effective educational tools for oncology surgery patients preparing to undergo surgical procedures.

These findings are in agreement with the study by Kusuma et al. (2024), which reported that leaflet-based educational media improve patient knowledge because the information is presented in a simple, systematic, and understandable format. Similarly, Arif et al. (2022) demonstrated that health education using leaflet media significantly improved patient knowledge because the materials could be reviewed repeatedly and used as a form of self-directed learning.

From a theoretical perspective, the effectiveness of digital leaflets can be explained by visual learning theory, which proposes that information presented in the form of text and images is more easily received and processed by the brain than information delivered solely through verbal explanations. According to Arsyad (2019), educational media integrating visual and verbal elements can enhance learners' attention, comprehension, and information retention. The systematic presentation of information through text, images, and key points allows patients to understand educational content in a more structured manner.

Furthermore, Information Processing Theory suggests that repeated exposure to information strengthens its storage in long-term memory, making the acquired knowledge easier to retrieve when needed (Santrock, 2018). One of the advantages of digital leaflets is that they can be reviewed multiple times, providing patients with opportunities to revisit information they have not fully understood and thereby enhancing the effectiveness of the learning process.

According to the researchers' observations, the improvement in knowledge following education using digital leaflets was influenced by several factors. The educational materials were developed using simple language, supported by illustrative images, and organized systematically, covering topics ranging from preoperative preparation and anesthesia procedures to postoperative care, thereby facilitating patient understanding. Moreover, during the study, the researchers not only distributed the leaflets but also provided direct assistance to respondents, offered explanations, and encouraged patients to ask questions about information they did not fully understand.

The two-way interaction between researchers and respondents during the educational process likely contributed to the improvement in patient knowledge. Direct guidance allowed clarification of misunderstood information and increased patient engagement in the learning process. Nevertheless, several respondents continued to demonstrate relatively low levels of knowledge after the intervention. This outcome may have been influenced by factors such as advanced age, reading ability, educational level, and individual differences in information processing capacity.

Overall, the findings of this study indicate that preoperative education delivered through digital leaflet media is effective in improving oncology surgery patients' knowledge regarding surgical procedures. This increase in knowledge is expected to enhance patient preparedness, reduce uncertainty, and support the success of perioperative care services in hospital settings.

Knowledge Levels of Oncology Surgery Patients Before and After Education Using Motion Media

The findings of this study showed that before receiving education using motion media, most respondents were categorized as having poor to moderate levels of knowledge. This condition indicates that the initial knowledge of oncology surgery patients regarding surgical procedures, anesthesia, and perioperative stages was still limited. The low level of knowledge suggests that most patients had not received adequate information regarding the surgical procedures they were about to undergo.

These findings are consistent with the study conducted by Sandra et al. (2023), which reported that patients scheduled for surgery still have limited knowledge regarding perioperative stages because the information they receive has not been delivered systematically and comprehensively. Similarly, Rahmawati and Sari (2020) found that inadequate understanding of surgical procedures may affect patients' readiness to undergo surgery.

According to Notoatmodjo (2018), an individual's level of knowledge is influenced by various factors, including age, education, experience, and sources of information. These factors affect the ability of individuals to receive, understand, and process health information, including information delivered through audiovisual media such as motion media.

The low level of respondents' knowledge prior to the intervention was also likely associated with the psychological condition of patients as oncology surgery patients. A cancer diagnosis often causes stress, anxiety, and uncertainty about the future, leading patients to focus more on their disease condition and chances of recovery than on the surgical procedures they will undergo. According to Potter et al. (2020), emotional conditions such as anxiety may impair an individual's ability to concentrate and optimally process health information.

Furthermore, respondent characteristics, particularly being predominantly adults and older adults with junior high school and senior high school educational backgrounds, also influenced their ability to understand technical health information. During the study, several respondents stated that they relied more on information provided directly by healthcare professionals than on information obtained independently through digital media. Therefore, before receiving education through motion media, respondents' knowledge levels remained within the poor and moderate categories. This finding highlights the importance of structured and understandable educational interventions for oncology surgery patients before surgery.

The results of this study demonstrated that after receiving education using motion media, patients' knowledge levels increased, as indicated by an increase in the mean knowledge score from 4.07 to 6.60. The Wilcoxon Signed Rank Test also showed a p-value of 0.001 ($p < 0.05$), indicating a statistically significant difference in knowledge levels before and after the intervention. These findings demonstrate that motion media are effective in improving oncology surgery patients' knowledge regarding surgical procedures.

These findings are consistent with the study by Putri et al. (2023), which reported that audiovisual media are more effective in improving knowledge than printed media because they attract attention, enhance learning focus, and facilitate information comprehension. Similarly, Nurlaelasari and Ermanto (2023) found that motion media were more effective than digital leaflets in improving respondents' knowledge because information was delivered through the simultaneous integration of visual and auditory elements.

From a theoretical perspective, the effectiveness of motion media can be explained by the Cognitive Theory of Multimedia Learning proposed by Mayer (2021), which states that learning becomes more effective when information is delivered simultaneously through visual and verbal channels. Information received through multiple senses is more easily understood, processed, and stored in long-term memory compared with information received through a single sensory channel.

In addition, Dual Coding Theory developed by Allan Paivio suggests that information presented in both verbal and visual forms is processed through two different cognitive systems, thereby enhancing retention and recall of the learned material (Paivio, 2014). Therefore, motion media that integrate moving images, animations, text, and audio can facilitate a more comprehensive understanding of information among patients.

According to the researchers, the effectiveness of motion media is not solely attributable to the attractiveness of the presentation but is also related to the physiological mechanisms underlying learning processes. Motion media simultaneously activate two sensory modalities, namely vision and hearing. Visual information is processed through the visual cortex in the occipital lobe, whereas auditory information is processed through the auditory cortex in the temporal lobe. The simultaneous activation of these sensory pathways allows for more optimal information processing in the cerebral cortex, resulting in stronger memory formation.

The motion media used in this study presented information through moving images, animations, text, and audio, enabling patients to obtain a clearer understanding of the surgical procedures they would undergo. Furthermore, during the educational sessions, researchers provided direct guidance to

respondents, offered additional explanations, and answered patients' questions. Such interactions facilitated a two-way learning process that improved respondents' understanding of the educational materials provided.

The combination of engaging visualizations, audio explanations, detailed and systematic content, and direct guidance from researchers likely contributed to the greater increase in knowledge observed in the motion media group compared with the digital leaflet group. Therefore, motion media may serve as an effective alternative educational tool for improving oncology surgery patients' knowledge regarding surgical procedures prior to surgery.

Differences in Knowledge Levels of Oncology Surgery Patients Before and After Education Using Digital Leaflet and Motion Media

Based on the results of the Mann–Whitney U Test, the Asymp. Sig. (2-tailed) value was 0.032 ($p < 0.05$), indicating a significant difference in effectiveness between digital leaflet media and motion media in improving oncology surgery patients' knowledge regarding surgical procedures. The mean rank value in the motion media group was 18.87, which was higher than that in the digital leaflet group (12.13). These findings indicate that motion media were more effective than digital leaflets in improving patient knowledge.

The magnitude of knowledge improvement was also reflected in the changes in mean scores before and after the interventions. In the digital leaflet group, the mean knowledge score increased from 3.73 to 5.47, representing an increase of 46.65%. Meanwhile, in the motion media group, the mean knowledge score increased from 4.07 to 6.60, representing an increase of 62.16%. These findings indicate that the increase in knowledge was greater in the motion media group, suggesting that motion media exerted a stronger practical effect on improving patient knowledge.

The greater increase in knowledge observed in the motion media group may be attributed to the ability of this medium to deliver information through a combination of audio, visual elements, moving images, and animations, making the information easier to understand and remember. These findings are consistent with Mayer's (2021) Cognitive Theory of Multimedia Learning, which states that learning is more effective when information is delivered simultaneously through visual and auditory channels. The activation of both sensory pathways facilitates deeper information processing, thereby enhancing understanding and memory retention.

Furthermore, Dual Coding Theory proposed by Paivio and Clark (2006) explains that information received in both visual and verbal forms is stored in two separate memory systems, making it easier to recall compared with information delivered through a single medium. Consequently, motion media enable patients to achieve a better understanding of surgical procedures because information is not only read but also seen and heard simultaneously.

The findings of this study are consistent with those of Mansyah and Rahmawati (2021), who found that health education using audiovisual media was more effective in improving patient knowledge than printed media. Similarly, Putri et al. (2023) reported that educational videos produced greater improvements in knowledge than leaflets because they enhanced patients' attention, comprehension, and memory retention regarding health information. Another study conducted by Nurlaelasari and Ermanto (2023) also demonstrated that motion media were more effective than digital leaflets in improving respondents' knowledge because they presented information in a more engaging and interactive manner. In addition to improving knowledge, audiovisual media may also help reduce patient anxiety by providing clearer explanations of the medical procedures they are about to undergo (Santoso & Hardiyani, 2025).

Nevertheless, digital leaflets were also shown to be effective in improving patient knowledge. The Wilcoxon test results for the digital leaflet group indicated a significant increase in knowledge following the intervention ($p = 0.001$). Leaflet media have the advantage of allowing information to be reviewed repeatedly at any time, thereby reinforcing patient understanding. According to Arsyad (2019), printed media such as leaflets are effective educational tools because they enable individuals to learn at their own pace and revisit information that has not yet been fully understood.

According to the researchers, the effectiveness of motion media in this study was also influenced by respondent characteristics, which were predominantly females aged 36–45 years diagnosed with breast cancer. This group demonstrated greater improvements in knowledge following the intervention. This finding may be explained by the fact that middle-aged women generally exhibit more stable cognitive maturity, greater receptiveness to information, and more active health information-seeking behaviors. In addition, patients within this age range tend to have better abilities to utilize audiovisual media compared with older age groups.

The predominance of patients diagnosed with breast cancer may also have contributed to these findings because this group has substantial informational needs regarding surgical procedures, physical changes, and postoperative recovery processes. Such high informational needs may have made patients more responsive to education delivered through motion media. Therefore, motion media may be recommended as an alternative preoperative educational tool for oncology surgery patients to improve their knowledge and preparedness for surgical procedures.

CONCLUSIONS

Based on the findings of this study regarding the effectiveness of preoperative education using digital leaflet and motion media on oncology surgery patients' knowledge of surgical procedures at PKU Muhammadiyah Hospital Yogyakarta, it can be concluded that both digital leaflet and motion media were effective in improving patients' knowledge regarding surgical procedures prior to surgery. However, motion media resulted in a greater improvement in knowledge compared with digital leaflets. Statistical analysis also demonstrated a significant difference in effectiveness between the two educational media, indicating that motion media were more effective in enhancing oncology surgery patients' knowledge of surgical procedures. Therefore, motion media can be recommended as an effective preoperative educational tool for implementation in perioperative services at PKU Muhammadiyah Hospital Yogyakarta.

Based on these findings, PKU Muhammadiyah Hospital Yogyakarta is encouraged to develop and implement a Standard Operating Procedure (SOP) for preoperative education based on motion media and to provide standardized educational videos containing information on surgical procedures, anesthesia, and perioperative care. Nurses and nurse anesthetists are also encouraged to utilize audiovisual media as part of preoperative education because such media have been shown to be more effective in improving patient knowledge. The use of motion media may be combined with digital leaflets and direct explanations from healthcare professionals to strengthen patient understanding.

In addition, oncology surgery patients are encouraged to actively participate in the educational process by paying attention to the information provided, asking questions when there are aspects they do not fully understand, and following the recommendations of healthcare professionals. Future researchers are advised to expand this line of research by examining additional variables, such as anxiety levels, surgical preparedness, patient compliance, and patient satisfaction. Furthermore, future studies should involve larger sample sizes and multiple hospital settings to obtain more comprehensive findings and improve the generalizability of the results.

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