

## EFFECTIVENESS OF WEB-BASED PROGRESSIVE MUSCLE RELAXATION (PMR) ON SLEEP QUALITY IN PATIENTS BREAST CANCER UNDERGOING CHEMOTHERAPY

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### ABSTRACT

Breast cancer is the uncontrolled growth of cells or tissue in the breast. Chemotherapy is the first therapeutic choice for treating cancer. One of the symptoms felt by breast cancer patients undergoing chemotherapy is a decrease in sleep quality. Sleep quality is a person's sense of satisfaction with their sleep. Decreased sleep quality can reduce the body's immune system to fight developing cancer cells. The recommended nursing action to overcome sleep disorders in breast cancer patients undergoing chemotherapy is web-based progressive muscle relaxation (PMR). PMR is a technique that focuses attention on muscle activity, by identifying tense muscles and then reducing tension by performing relaxation techniques to get a relaxed feeling. The aim of this study was to determine the effectiveness of web-based PMR on sleep quality in breast cancer patients undergoing chemotherapy at RSUP Dr. M. Djamil Padang. The research design uses a quasi-experiment in the form of a one group pretest-posttest approach. The sampling technique was purposive sampling with a sample size of 25 people. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Statistical test using Paired T-Test. The results showed a significant effect of web-based progressive muscle relaxation (PMR) on sleep quality in breast cancer patients undergoing chemotherapy ( $p$  value = 0.000;  $\alpha < 0.05$ ). In this study, it can be concluded that there is an influence of web-based progressive muscle relaxation (PMR) on sleep quality in breast cancer patients undergoing chemotherapy at RSUP Dr. M. Djamil Padang. This study recommends web-based progressive muscle relaxation (PMR) as an independent nursing intervention to improve sleep quality in breast cancer patients undergoing chemotherapy.

**Keywords:** *Progressive Muscle Relaxation (PMR)*.,breast cancer., chemotherapy.; sleep quality

### INTRODUCTION

Cancer is a non-communicable disease characterized by abnormal or continuous and uncontrolled cell growth so that it can damage the surrounding tissue and can spread to places far from its origin, which is called metastasis<sup>1</sup>. Malignant cancer cells can originate or grow from every type of cell in the human body. Cancer is a condition where cells cannot divide or cannot develop normally. The increasing number of cancers is a serious problem for both patients and their families. Cancer is a disease that causes death<sup>2</sup>.

The most common type of cancer found is breast cancer. In the world, the incidence of breast cancer has increased compared to 2018, namely there were 18.1 million cases with a death toll of 9.6 people and in Indonesia the number of new cases of breast cancer reached 65,858 people with a death toll of 22,430 people in 2020<sup>3</sup>. Meanwhile, the incidence of breast cancer in West Sumatra Province also experienced a rapid increase. West Sumatra Province ranked first in breast cancer sufferers in Indonesia in 2019 which

reached 11.6% with 2,089 million new cases and the death rate reached 8.2% with 783,000 million deaths<sup>4</sup>. Treatment that can be given to breast cancer patients is pharmacological and non pharmacological treatment. Pharmacological is the process of treating cancer by means of surgery, radiation and chemotherapy<sup>5</sup>. Chemotherapy is a therapy that is often used for systemic therapy and cancer with clinical or subclinical metastases. Chemotherapy is a form of cancer treatment using chemicals or drugs in pill form or through infusion with the aim of inhibiting the spread of cancer cells and preventing the cancer cells from growing again<sup>6</sup>.

In research<sup>7</sup> it was said that chemotherapy is the main choice of cancer treatment therapy, and it was found that 41 respondents (61.2%) had breast cancer patients undergoing chemotherapy. Research conducted by<sup>8</sup> breast cancer patients undergoing chemotherapy was 69 patients (83.13) at RSUP Dr. Hasan Sadikin. In Padang City, one of the referral hospitals has facilities and complete infrastructure

for chemotherapy therapy is RSUP Dr. M. Djamil Padang, where data was obtained from the medical records of RSUP Dr. M. Djamil. In Padang in 2020 there were 1,045 breast cancer patients undergoing chemotherapy and this will increase in 2022 to 1,147 people.

Chemotherapy treatment will cause side effects for the user because chemotherapy drugs are very strong and cytostatics. The side effects of chemotherapy will affect both physically and psychologically cancer patients. The most common physical side effects of chemotherapy are spinal cord suppression, mucositis, nausea and vomiting, fatigue, diarrhea, hair loss, infection, infertility and sleep disorders. Meanwhile, psychologically it is helplessness, anxiety, shame, depression and stress. The effects of chemotherapy can worsen functional status after chemotherapy. This decrease in functional status includes fulfilling the need for sleep rest<sup>9</sup>.

Based on research<sup>10</sup>, it was found that 93.3% of breast cancer patients undergoing chemotherapy experienced sleep disturbances. According to another study<sup>11</sup> breast cancer patients undergoing chemotherapy had poor sleep quality, namely 63.6% of patients due to fatigue, pain, psychological stress, room conditions and environmental conditions.

In breast cancer patients undergoing chemotherapy who experience sleep disturbances, this can reduce the body's immune system to fight developing cancer cells. As a self-defense response, the brain will suppress the production of the hormone melatonin to replace it with more stress hormones such as cortisol and adrenaline. Melatonin can improve immune function. When the body does not produce enough melatonin, the immune system will have difficulty preventing cell and tissue damage caused by chemotherapy<sup>12</sup>.

Sleep has a role in recovering from disease, controlling pain, reducing fatigue, increasing blood circulation to the brain, increasing protein synthesis, balancing disease-fighting mechanisms in the immune system, helping the body carry out natural detoxification to remove toxins in the body, increasing cell repair and growth, increasing healing, and reduce tension<sup>12</sup>. Meanwhile, according to<sup>11</sup>, sleep is needed to maintain mental, emotional, physiological and health balance. Therefore, quality sleep is really needed by breast cancer patients who are undergoing chemotherapy.

Several treatments that can be done to improve sleep quality in breast cancer patients undergoing chemotherapy are pharmacological therapy and non-pharmacological therapy. Pharmacological therapy is therapy used with drugs. However, excessive use of drugs will cause side effects such as addiction and overdose. Meanwhile, non-pharmacological therapy is therapy that does not use drugs, such as music therapy, guided imagery, massage, cognitive behavioral therapy, and physical activity therapy<sup>9</sup>. And another non-pharmacological therapy is progressive muscle relaxation (PMR)<sup>13</sup>.

PMR is a technique that focuses attention on muscle activity, by identifying tense muscles and then reducing

tension by performing relaxation techniques to get a relaxed feeling. The progressive muscle relaxation technique is carried out by resting the muscles, mind and mentality with the aim of reducing sleep disorders. The benefit of PMR is that it is a muscle relaxation technique that has been proven in programs to treat fatigue, muscle cramps, pain, nausea, vomiting and sleep disorders<sup>8</sup>.

According to research conducted by<sup>10</sup>, progressive muscle relaxation therapy is a component of complementary therapy that provides comfort. Progressive muscle relaxation is given in 15 steps and is given once a day for 7 consecutive days, by progressively tightening and relaxing the muscles to reduce fatigue, muscle cramps, and increase concentration carried out successively on one part of the body which aims to provide a feeling of physical relaxation thereby improving sleep quality<sup>14</sup>.

Web-based PMR research on sleep quality in breast cancer patients has never been studied before, but the PMR research that has been studied is PMR on sleep quality in chronic disease patients, namely hemodialysis patients. Research conducted by<sup>15</sup> was on hemodialysis patients whose research results showed that before being given PMR, 62% of their sleep patterns were in the poor category and after the PMR intervention, 62% of their sleep patterns were in the good category.

Research on PMR in breast cancer patients that has been studied is on the psychological side effects of chemotherapy such as anxiety, where in theory the impact of these side effects results in a decrease in sleep quality in breast cancer patients. The previous research in question was "the effect of progressive muscle relaxation on anxiety levels in chemotherapy patients at the Denpasar cancer shelter" conducted by<sup>13</sup> which stated that progressive muscle relaxation or PMR was effective in reducing anxiety levels in cancer patients undergoing chemotherapy.

Another research conducted by<sup>16</sup> regarding "the effectiveness of progressive muscle relaxation therapy on the level of fatigue in cancer patients undergoing chemotherapy is indeed effective in reducing the level of fatigue in cancer patients. Cancer patients who experience physical stress in conditions like this substantially cause a decrease in sleep quality and have the potential to interfere with treatment compliance, therefore it is very important to pay close attention to the physical stress of cancer sufferers while undergoing chemotherapy. From several studies, it was concluded that there had been no research on breast cancer patients who used web applications.

Several applications in the form of software or hardware or a combination of both can be used to improve the delivery of health services. One thing that can be used in nursing is e-health. E-health applications can be computer-based or integrated with smartphones. The opportunities for e-health applications in Indonesia are quite large, especially mhealth and telemedicine<sup>17</sup>.

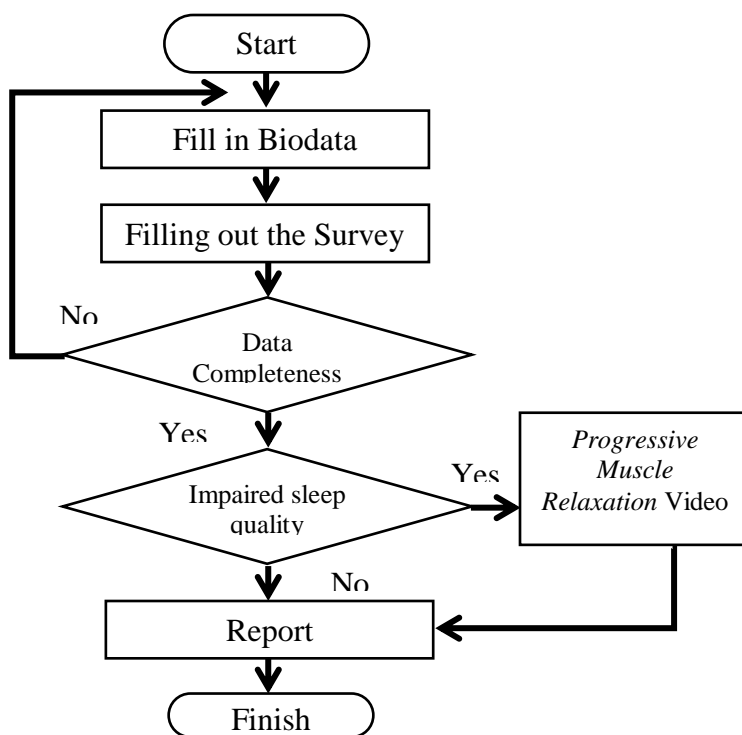
E-Health applications can be computer, web, internet or smartphone based. Information technology users continue to

increase from year to year. The number of smartphone users in Indonesia in 2020 will be 30% of the total population of Indonesia. This data shows that more than a quarter of Indonesia's population has access to smartphone use. This allows applications that can improve people's health status to be integrated into web-based smartphone technology to increase patient accessibility to health information<sup>17</sup>.

In general, a web or website is a collection of pages consisting of several pages and containing information in digital form, whether written (text), animated images provided via the internet so that it can be accessed by many people throughout the world who have an internet connection<sup>18</sup>.

Based on medical record data from RSUP Dr.M.Djamil Padang. In 2021, 1,045 patients with breast cancer underwent chemotherapy. And in 2022 there will be 1,147 breast cancer patients undergoing chemotherapy. According to information provided by the patient, until now there has been no nursing or medical action to treat web application-based sleep disorders. If the patient feels there is a decrease in sleep quality, then there is no effort to overcome it. Until now there has been no research on the effect of web-based PMR therapy on sleep quality for breast cancer patients undergoing chemotherapy. The benefit of this therapy is that

**Scheme 1. Flowchart**



it is easy to use and time efficient because with this website patients can do it without needing to be visited by researchers, researchers only monitor patients in carrying out virtual PMR procedures every day. Bias in this study can also be minimized because patients undergoing PMR therapy use videos that have been recorded and entered on the web, so there will be no pauses or long periods of time from one movement to the next. It is very easy for there to be pauses and repetitive movements from researchers to patients, resulting in unequal treatment between one patient and another.

Thus, the above background is the basis for researchers to determine "the effect of web-based progressive muscle relaxation (PMR) therapy on sleep quality in breast cancer patients undergoing chemotherapy at RSUP. Dr. M. Djamil Padang".

**MATERIALS AND METHODS**

The type of research carried out is quasi experimental design with a one group pre-test post-test design approach, namely research carried out on one group without using a comparison (control) group, which aims to test the changes that occur after the web-based experiment<sup>19</sup>. The application can be detailed with the diagram below:

In this study, sample selection was in accordance with the researcher's inclusion and exclusion criteria. The inclusion criteria in the study were: willing to be a respondent and

follow the research procedures up to the final stage, breast cancer patients in middle adulthood (30-50 years), breast cancer patients who have undergone chemotherapy more

than once, breast cancer patients who are still vulnerable stage I-III, breast cancer patients undergoing chemotherapy who experience decreased sleep quality with a PSQI score > 5, breast cancer patients undergoing chemotherapy but have never had PMR. Meanwhile, the exclusion criteria are breast cancer patients with stage IV where the cancer has spread widely, breast cancer patients who take sleeping pills and suffer from neurological disorders (stroke).

The population was all breast cancer patients undergoing chemotherapy in the one day care chemotherapy room at RSUP. Dr. M. Djamil Padang. The total sample in this study was 25 respondents. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) instrument. The questionnaire consists of 18 questions covering seven components of sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disorders, use of sleeping medication,

and daytime activity dysfunction. Filling out the PSQI questionnaire takes 5-8 minutes, and the assessment takes 5 minutes. Assessment is carried out by giving a score of 0-3 to each component. A score of 0 is the highest value for each indicator. Then the scores from the 7 components are added up to produce an overall score from the PSQI which has a score range of 0-21.

**RESULTS**

Average Sleep Quality Score Before Implementing Web-Based Progressive Muscle Relaxation (PMR) in Breast Cancer Patients Undergoing Chemotherapy at RSUP Dr. M. Djamil Padang. The following is the average sleep quality score before implementing web-based progressive muscle relaxation (PMR) in breast cancer patients undergoing chemotherapy at RSUP Dr. M. Djamil Padang:

**Table 1.** Average Sleep Quality Score Before Implementing Web-Based Progressive Muscle Relaxation (PMR) in Breast Cancer Patients Undergoing Chemotherapy at RSUP Dr. M. Djamil Padang

Mean Sleep Quality Score	n	Mean	SD	Min	Max
Before intervention	25	11,48	2,988	6	16

The following is the average sleep quality score after implementing web-based progressive muscle relaxation

(PMR) in breast cancer patients undergoing chemotherapy at RSUP Dr. M. Djamil Padang.

**Table 2** Differences in Sleep Quality Scores Before and After Treatment

Mean Sleep Quality Score	n	Mean	SD	Min	Max
After Intervention	25	6,76	1,832	4	11

The difference in mean sleep quality scores in cancer patients undergoing chemotherapy before and after web-

based progressive muscle relaxation (PMR) intervention can be seen in the following table:

**Table 3.** Differences in Mean Sleep Quality Scores in Breast Cancer Patients Undergoing Chemotherapy Before and After Implementing Web-Based Progressive Muscle Relaxation (PMR) at RSUP Dr. M. Djamil Padang

Group	Difference Mean	SD	SE	95 % CI		p value
				Lower	Upper	
Pretest-posttest Sleep Quality Score	4,720	2,807	0,561	3,562	5,878	0,000

**DISCUSSION**

Average Sleep Quality Score Before Implementing Web-Based Progressive Muscle Relaxation (PMR) in Breast Cancer Patients Undergoing Chemotherapy at RSUP Dr. M. Djamil Padang

Based on table 1, it is known that based on table 1, it is known that the average sleep quality score before implementing web-based progressive muscle relaxation (PMR) was 11.48. Web-based PMR research on sleep

quality in breast cancer patients has never been studied before, but the PMR research that has been studied is PMR on sleep quality in chronic disease patients, namely hemodialysis patients. Research conducted by 15 was on hemodialysis patients whose research results were obtained before being given PMR and found that 62% of their sleep patterns were in the poor category.

In this study, based on pretest data from 7 components of sleep quality, it was found that the most problematic

component was sleep disturbance (100%). Sleep disturbances experienced by respondents in general were waking up in the middle of the night, namely all respondents twice a week, followed by disturbances in daytime activities (88%), then subjective sleep quality (60%) was in the poor category, followed by sleep efficiency (52%) in the form of respondents saying that when they go to bed it takes 16-30 minutes to fall asleep and the duration of sleep of respondents (32%) is more than 7 hours, (32%) less than 5 hours, (20%) 6-7 hours, and (16%) is in the 5-6 hour range. This data is in line with research conducted by <sup>20</sup> on the sleep quality of breast cancer patients based on the therapy given at RSUP Dr. Hasan Sadikin Bandung found that the problematic component of sleep disorders in cancer patients undergoing chemotherapy was waking up in the middle of the night or too early in the morning (82%) and followed by (80%) respondents experiencing disturbances in daytime activities. In terms of characteristics, the length of time undergoing chemotherapy tends to be more, namely 2 times chemotherapy (33.3%), 1st chemotherapy (25%), 3 times chemotherapy (16.7%), 5th chemotherapy (16.7%), 4 times chemotherapy. (8.3%). In research <sup>20</sup>, it was stated that the longer the patient underwent chemotherapy, the worse the patient's sleep quality became. Based on research <sup>10</sup>, it was found that 93.3% of breast cancer patients undergoing chemotherapy experienced sleep disturbances. According to another study, 11 breast cancer patients undergoing chemotherapy had poor sleep quality, namely 63.6% of patients due to fatigue, pain, psychological stress, room conditions and environmental conditions. In breast cancer patients undergoing chemotherapy who experience sleep disturbances, this can reduce the body's immune system to fight developing cancer cells. As a self-defense response, the brain will suppress the production of the hormone melatonin to replace it with more stress hormones such as cortisol and adrenaline. Melatonin can improve immune function. When the body does not produce enough melatonin, the immune system will have difficulty preventing cell and tissue damage caused by chemotherapy<sup>12</sup>.

Based on the research results in table 2, it was found that the average sleep quality score in breast cancer patients undergoing chemotherapy at RSUP. Dr. M. Djamil Padang after implementing web-based progressive muscle relaxation (PMR) was 6.76, meaning that the patient's sleep quality score after implementing web-based progressive muscle relaxation (PMR) had increased. Research that has been carried out by <sup>15</sup> is on hemodialysis patients whose research results were obtained before being given PMR and found that their sleep patterns after the PMR intervention were 62% in the good category.

In this study, based on posttest data after intervention for 7 days related to the application of web-based progressive muscle relaxation (PMR) of 7 components of sleep quality, it was found that the component of sleep disorders (100%) had decreased. Sleep disturbances in the form of frequently

waking up in the middle of the night from 2 times a week have been reduced to 1 time a week, followed by sleep efficiency (88%) in the form of respondents saying that when they go to bed it takes  $\leq 15$  minutes to fall asleep, for disturbances in daytime activities decreased (84%), then subjective sleep quality (52%) was in the good category, and respondents' sleep duration increased, namely (64%) more than 7 hours, (20%) 6-7 hours, (16%) was at range of 5-6 hours and (0%) is in the range of less than 5 hours.

Sleep has a role in recovering from disease, controlling pain, reducing fatigue, increasing blood circulation to the brain, increasing protein synthesis, balancing disease-fighting mechanisms in the immune system, helping the body carry out natural detoxification to remove toxins in the body, increasing cell repair and growth, increasing healing, and reduce tension<sup>12</sup>. Meanwhile, according to <sup>11</sup>, sleep is needed to maintain mental, emotional, physiological and health balance. Therefore, quality sleep is really needed by breast cancer patients who are undergoing chemotherapy. Good sleep quality is determined by how a person prepares their sleep patterns at night, such as the depth of sleep and the ease of falling asleep without medical assistance. Good sleep quality is demonstrated by the ease with which a person starts sleeping, maintains sleep, and transitions from sleep to waking up in the morning easily<sup>12</sup>. Based on research conducted by researchers on breast cancer patients undergoing chemotherapy at RSUP. Dr. M. Djamil Padang found that there was a decrease in sleep quality scores after being given the intervention. Based on the research results in table 3, you can see the average sleep quality score before implementing web-based progressive muscle relaxation (PMR) in breast cancer patients undergoing chemotherapy at RSUP. Dr. M. Djamil Padang was 11.48 and after implementing web-based progressive muscle relaxation (PMR) it was 6.76 so the decrease in sleep quality score resulted in a mean difference of 4.720. The statistical test results obtained a p value = 0.000, so it can be concluded that there is an influence of the application of web-based progressive muscle relaxation (PMR) on sleep quality scores in breast cancer patients undergoing chemotherapy at RSUP. Dr. M. Djamil Padang so Ha was accepted. This is in line with research<sup>15</sup> on hemodialysis patients which found that there was an influence of PMR on the sleep quality of hemodialysis patients. Research on PMR in breast cancer patients that has been studied is on the psychological side effects of chemotherapy such as anxiety, where in theory the impact of these side effects results in a decrease in sleep quality in breast cancer patients. The previous research in question was "the effect of progressive muscle relaxation on anxiety levels in chemotherapy patients at the Denpasar cancer shelter" conducted by <sup>13</sup> which stated that progressive muscle relaxation or PMR was effective in reducing anxiety levels in cancer patients undergoing chemotherapy.

Another research conducted by <sup>16</sup> regarding "the effectiveness of progressive muscle relaxation therapy on

the level of fatigue in cancer patients undergoing chemotherapy is indeed effective in reducing the level of fatigue in cancer patients. Cancer patients who experience physical stress in conditions like this substantially cause a decrease in sleep quality and have the potential to interfere with treatment compliance, therefore it is very important to pay close attention to the physical stress of cancer sufferers while undergoing chemotherapy. Relaksasi otot progresif dapat mengurangi kelelahan pada pasien kanker karena terapi ini dapat mengurangi aktivitas sistem saraf simpatik, yang ditingkatkan oleh aktivitas psikologis atau fisiologis. Berkurangnya aktivitas sistem saraf simpatis menghasilkan detak jantung (HR) yang lebih rendah, laju pernapasan yang lebih rendah (RR), dan tekanan darah yang lebih rendah. Selanjutnya, terapi relaksasi otot secara efektif mengatur sistem saraf perifer dan pusat, yang mengurangi stres, kecemasan, depresi, gangguan tidur dan telah menunjukkan efektivitas dalam pengelolaan beberapa masalah kesehatan<sup>21</sup>. Progressive muscle relaxation can reduce fatigue in cancer patients because this therapy can reduce sympathetic nervous system activity, which is enhanced by psychological or physiological activity. Reduced sympathetic nervous system activity results in a lower heart rate (HR), lower respiratory rate (RR), and lower blood pressure. Furthermore, muscle relaxation therapy effectively regulates the peripheral and central nervous system, which reduces stress, anxiety, depression, sleep disorders and has shown effectiveness in the management of several health problems<sup>12</sup>. Poor sleep quality is influenced by various things, namely physical disorders in the form of responses to the patient's illness, responses to chemotherapy as well as mental and spiritual disorders in the form of feelings of helplessness, hopelessness and denial of the reality of the illness they are facing. Breast cancer patients undergoing chemotherapy experience responses to the side effects of chemotherapy both physiologically and psychologically. This is because chemotherapy drugs are very strong and cytostatics. The most common physiological side effects of chemotherapy are spinal cord suppression, mucositis, nausea and vomiting, fatigue, diarrhea, hair loss, infection and infertility. Meanwhile, psychologically it is helplessness, anxiety, shame, depression and stress<sup>9</sup>. According to <sup>10</sup> sleep disorders that occur due to chemotherapy, namely the components of sleep latency and awakening at night. Chemotherapy causes a person to need 35 minutes to start falling asleep and wake up 21-29 times during the night. According to <sup>22</sup>, breast cancer patients undergoing chemotherapy experience increased fatigue. This fatigue can delay the patient from sleeping longer. These various things result in the short time the patient has to sleep. If this situation is allowed to continue, it will have an impact on the cancer sufferer's ability to function. And the most risky impact is that the sufferer can no longer continue therapy at the next stage, because his strength and condition are decreasing. So in this case the role of nurses is needed to carry out assessments and provide appropriate

interventions in order to improve the quality of life of cancer patients. Several applications in the form of software or hardware or a combination of both can be used to improve the delivery of health services. One thing that can be used in nursing is e-health. E-health applications can be computer-based or integrated with smartphones. The opportunities for e-health applications in Indonesia are quite large, especially mhealth and telemedicine<sup>17</sup>. According to the World Health Organization (WHO), e-Health is the use of information technology in the health sector. e-Health technology is information technology in the health sector that can be used by both health workers and clients. e-Health applications can be computer, web, internet or smartphone based. Information technology users continue to increase from year to year. The number of smartphone users in Indonesia in 2020 will be 30% of the total population of Indonesia. This data shows that more than a quarter of Indonesia's population has access to smartphone use. This allows applications that can improve people's health status to be integrated into web-based smartphone technology to increase patient accessibility to health information<sup>17</sup>. In this research, the webintoapp application was used. In general, a web or website is a collection of pages consisting of several pages and containing information in digital form, whether written (text), animated images provided via the internet so that it can be accessed by many people throughout the world who have an internet connection.

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