

CHAPTER II THEORETICAL OVERVIEW

A. Concept of *Cancer*

1. Definition

Cancer is a disease caused by abnormal cell growth that is uncontrolled and able to spread to other tissues. This condition begins with the disruption of the normal cycle of cell division and death, so that damaged cells remain alive and continue to divide. These abnormal cells can form tumors, both benign ones that do not spread and malignant ones that can invade surrounding tissues and metastasize to other organs (Colonna, 2025).

Salt Cancer: It differs from normal cells in that it can grow without signals, ignore the command to stop dividing, and avoid apoptosis. In addition, these cells are capable of tricking the immune system, triggering new blood vessels, and undergoing repeated genetic changes that reinforce their malignant nature. Thus, Cancer not just abnormal cell growth, but the result of complex molecular changes that allow cells to multiply and spread uncontrollably (Institute, 2024).

2. Etiology

Etiology Cancer It is mainly related to genetic mutations that alter the function of cell cycle-regulating genes. These changes can be triggered by exposure to carcinogens (cigarettes, alcohol, radiation, chemicals), certain viral infections such as HPV and hepatitis, as well as chronic inflammatory processes. Hormonal factors, immune system disorders, and genetic predispositions also play a role in increasing susceptibility (Seong) et al., 2025).

In addition to biological factors, cancer risk is influenced by age, family history, unhealthy diet, obesity, and lack of physical activity. Environmental factors, such as pollution and ultraviolet exposure, may also increase the risk of mutations. Thus, cancer etiology results from a complex interaction of genetic, environmental, and lifestyle factors that contribute to malignant processes (Karen, 2024).

3. Pathophysiology

Tumor cancer starting from the mutation in a proto-oncogene that turns it into an oncogene, so that the cell gains the urge to continue growing and dividing uncontrollably. Along with that, damage to tumor suppressor genes deactivates the function of the controller that is supposed to stop cell proliferation, while abnormalities in the *DNA* repair genes reduce the ability to repair genetic damage, so that mutations accumulate. This combination of genetic changes makes abnormal cells able to evade the mechanism of apoptosis and survive longer than normal cells (Singh et al., 2025).

To sustain its survival, the cell cancer stimulates the process of angiogenesis, which is the formation of new blood vessels that supply oxygen and nutrients to the tumor tissue. This condition not only strengthens growth, but also opens up cell proliferation pathways for cancer through the blood and lymphatic system. Over time, the accumulation of additional mutations increases the invasive properties, allowing the cells to penetrate the basal membrane, invade surrounding tissues, and metastasize to other organs. This flow illustrates how integrated molecular changes transform normal cells into aggressive and difficult-to-control malignant cells (Roger J. B. King, 2021).

In patients with cancer who underwent chemotherapy, a series of physical and psychological stressors such as pain, nausea, fatigue, changes in body image, and uncertainty about treatment results encourage the brain to interpret the situation as an ongoing threat. This information is processed by the amygdala and hypothalamus as the stress response control centers, so that the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis are overactivated. The release of catecholamines and cortisol increases, resulting in physiological changes in the form of heart palpitations, rapid breathing, difficulty sleeping, and uncontrollable anxiety. Excessive sympathetic activation also causes tension in skeletal muscles such as the shoulder-to-neck area, upper arms, and face. This constant tension sends an impulse to the central nervous system that the body is still in a dangerous situation, so the cycle of anxiety continues endlessly (Francesco *et al.*, 2021).

Jacobson's Progressive Muscle Relaxation (JPMR) breaks the cycle through a physiological approach that focuses on changes in muscle tension. By systematically tensing and relaxing muscle groups, sensory receptors send new signals to the brain that the body is becoming calmer and safer. This response suppresses sympathetic nerve activity while strengthening parasympathetic nerve function through the dominance of the vagus nerve, so that heart rate slows down, breathing is more stable, and muscle tension decreases. Decreased sympathetic activity plays a role in suppressing amygdala hyperactivity and controlling the HPA axis, resulting in a decrease in cortisol secretion and an improvement in the regulation of neurotransmitters that regulate emotional stability. These physiological changes were reflected in increased sense of relaxation, reduced fear response, and decreased anxiety levels in cancer patients undergoing chemotherapy after being given structured JPMR intervention (Torales & Higgins, 2020).

4. Klasifikasi

Based on the origin of the tissue and the cell type that underwent the transformation, cancer can be classified into several main groups, each of which has different growth characteristics, distribution patterns, and responses to therapy. The most common type of cancer is carcinoma, which originates from the epithelial cells that line the surface of the body and organs, with subtypes including adenocarcinoma, basal cell carcinoma, squamous cell carcinoma, and transitional cell carcinoma. In addition, there are sarcomas that develop from the body's supporting tissues such as bones, muscles, fat, blood vessels, and fibrous tissues, including osteosarcoma and leiomyosarcoma. Leukemia is Cancer which originates in the bone marrow and is characterized by the proliferation of abnormal white blood cells without the formation of dense tumors, thus interfering with the functioning of the hematopoietic system. Lymphoma grows from lymphocytes in the lymphatic system, consisting of Hodgkin lymphoma with Reed–Sternberg cell features and non-Hodgkin lymphoma with wide clinical variations.

Another type of cancer is multiple myeloma, which originates from plasma cells in the bone marrow and is characterized by a buildup of myeloma cells that form lesions on the bones. Melanoma originates from melanocytes, skin pigment-producing cells, and generally occurs on the skin, although it can appear in other pigmented tissues such as the eyes. In addition, there are brain and spinal cord tumors that are classified based on the type of nerve cells of origin, such as astrocytomas, and can be benign or malignant. Germ cell tumors originate from sperm-forming cells or ova and can appear in various locations of the body with benign or malignant properties. Neuroendocrine tumors develop from hormone-producing cells controlled by the nervous system and often cause symptoms due to excessive hormone production, whereas carcinoid tumors are a special form of slow-growing neuroendocrine tumors, generally occurring in the gastrointestinal tract, and can cause carcinoid syndrome (Institute, 2021).

5. Clinical Manifestations

In general, Cancer It causes manifestations due to the growth of malignant cells, invasion of surrounding tissues, impaired organ function, and the body's inflammatory response. The symptoms are often progressive and non-specific, so in many cases it is only noticed when the disease has entered an advanced stage (Pandey et al., 2024)

1) Anxiety

Anxiety is a psychological manifestation that often appears after a person is diagnosed with cancer. Information about the presence of malignant cells, disease uncertainty, and threats to survival triggers strong emotional distress. At this stage, the patient's mind is filled with worries about the future and changes in the condition of the body.

In addition to psychological factors, the biological process of cancer also gives rise to anxiety. Prolonged activation of the stress system increases stress hormones and makes the patient more sensitive to threats. This condition amplifies emotional turmoil so that anxiety becomes part of the body's biopsychological response to cancer.

Clinically, anxiety arises as a fear of the progression of the disease and uncertainty about the final outcome. Concerns about recurrence, the spread of cancer, and its impact on social roles weigh on the emotional burden. This can interfere with sleep, concentration, and the patient's readiness to undergo the disease process.

Anxiety due to cancer is also affected by changes in the way patients see themselves. Shifting roles in the family and increased dependence on others can trigger emotional discomfort.

2) Weight loss and appetite

It occurs without a clear cause and does not improve even though food intake has been attempted. Cancer cells use large amounts of energy and interfere with metabolic regulation, so fat reserves and muscle mass decrease rapidly, making patients appear thin in a relatively short time.

3) Fatigue settles in and is pale

Patients feel tired quickly, weak, and lack energy even though they do only light activities. This condition is often related to anemia, chronic inflammation, and a decrease in the body's capacity to carry oxygen, so that daily activities feel heavier and the quality of life decreases.

4) Recurrent fever without a clear focus

Body temperature can go up and down or stay slightly above normal for a long period of time. This fever arises as a result of the release of endogenous pyrogens from tumor cells and the immune response to malignancy, so it often appears as an unclear fever because even an examination of the infection does not indicate a definite source.

5) Progressive pain

Pain occurs when a tumor presses on a specific nerve, bone, or organ, and usually gets heavier as the mass increases. In some cases, the pain is more pronounced at night or during activity, interfering with the patient's overall sleep, mobility, and comfort.

6) Lumps or disorders of specific organ function

It is characterized by the presence of a hard, fixed, and non-disappearing lump, for example in the breast, neck, armpits, or testicles. In addition, organ function disorders may appear, such as nausea, vomiting, difficulty swallowing, changes in bowel patterns, long or bloody coughs, shortness of breath, and abnormal bleeding (e.g., irregular periods, recurrent nosebleeds, hematuria, or rectal bleeding).

6. Diagnostic Examination

Cancer diagnostic examination generally consists of three main stages, namely physical examination, supporting examination, and pathological examination.

a. Physical Examination

A physical examination is performed to identify clinical signs that lead to suspected malignancy. The assessment focused on the presence of petechiae, bruising without an apparent cause, spontaneous bleeding, and changes in vital signs. In addition, anemia, chest pain, shortness of breath, paleness, general weakness, glossitis, decreased appetite, indigestion, recurrent infections, and wounds that are difficult to heal can be found. The examination also includes an evaluation of the condition of the skin, mucous membranes, and neurological functions such as headaches or disorientation (Wilkinson, 2021).

b. Supporting Examinations

Supporting examinations play a role in strengthening clinical findings through laboratory and radiological examinations. This procedure includes a complete blood test, chest photo, ultrasound (USG), magnetic resonance imaging (MRI), computed tomography (CT) scans, mammography, endoscopy, laparoscopy, tumor marker assessment, and histopathological analysis (Das et al., 2024).

c. Pathology Examination

Pathological examination is a confirmation stage to establish a definitive diagnosis of cancer. This procedure is performed by

macroscopic and microscopic analysis of the biopsy results, either through fine, incisional, excisional, or biopsy techniques with the help of endoscopy or laparoscopy (Oklahoma, 2023).

7. Governance

Wolfgang Link. (2019) explained that cancer management involves various therapy modalities used according to the type and stage of the disease. In clinical practice, these methods include:

a. Chemotherapy

Chemotherapy is the main therapeutic modality in cancer, which is carried out through the administration of cytotoxic drugs specifically designed to destroy cancer cells or inhibit their division process. Chemotherapy drugs work by damaging abnormal cell RNA, disrupting the mitotic process, and preventing cancer cells from regenerating, so that tumor growth can be suppressed. This therapy is usually given in certain cycles so that the body has an optimal recovery time and drug effectiveness. Although proven to be effective, chemotherapy can cause side effects because it also affects healthy cells that divide rapidly, so regular monitoring of the patient's condition is necessary to maintain the safety and sustainability of therapy.

b. Operation

The surgery aims to remove cancer tissue by cutting and removing parts of the body that contain malignant cells.

c. Radiotherapy

Radiotherapy uses radiation exposure to kill cancer cells. This therapy can be given through a machine outside the body (external radiation therapy) or through a radiation implant placed inside the body (brachytherapy).

d. Immunotherapy

Immunotherapy, or biological therapy, aims to stimulate and strengthen the immune system to be able to attack and destroy cancer cells.

e. Targeted Treatment

This treatment is given to inhibit genetic mutations in cancer cells. Although effective, this therapy can cause side effects, one of which is a decrease in white blood cells that makes patients more susceptible to infection.

B. Concept of Chemotherapy

1. Definition

Chemotherapy is a form of treatment for cancer that uses antineoplastic drugs to stop the growth of malignant cells in the body. These drugs work by damaging the cell division mechanism, so that cells lose the ability to live and replicate. Due to its systemic nature, chemotherapy not only works on primary tumors, but is also capable of reaching cells that have spread to other networks. Chemotherapy can be given alone or in combination with other therapies, such as surgery or radiotherapy, to improve the success of treatment (Tilsed et al., 2022).

In clinical practice, chemotherapy is one of the main modalities in the treatment of various types of cancer. This therapy is given through the oral route as well as intravenously, depending on the type of medication and the patient's medical condition. Despite the potential for side effects, the benefits of chemotherapy remain significant in reducing the number of malignant cells, slowing the progression of the disease, and providing better therapeutic opportunities for patients (Anand et al., 2023)

2. Objectives of Chemotherapy

Based on an explanation from the National Cancer Institute. (2025), chemotherapy is given with several main objectives, including:

a. Healing (curative)

Chemotherapy can be used to destroy cancer cells until the disease is no longer detected. A cure can be achieved through one type of drug or a combination of several types of chemotherapy, depending on the body's response and the type of cancer.

b. Disease control

If the cancer cannot be completely cured, chemotherapy plays a role in preventing malignant cell growth from continuing to grow or spread to other parts of the body. With good control, the patient's condition becomes more stable, and organ function can still be maintained.

c. Reduce symptoms (palliative)

In advanced cancer, chemotherapy is given to shrink the tumor mass or reduce the burden of the disease. This therapy can help reduce pain, tightness, bleeding, or other bothersome complaints, so that patients feel more comfortable and quality of life is maintained.

3. Chemotherapy Indications

Chemotherapy is given to a variety of clinical conditions that require systemic treatment of cancer cells. This therapy is not only used as the main therapy, but also as a companion option before and after surgery, as well as in the advanced phase when Cancer has spread to other organs (Anand et al., 2023).

a. As primary chemotherapy

It is used when surgery or radiotherapy is not possible, either because the cancer has spread widely or is in a location that cannot be operated on.

b. Before surgery (neoadjuvant chemotherapy)

Chemotherapy is given to shrink the size of the tumor so that the surgical procedure is easier to perform and the risk of cancer cells spreading can be reduced.

c. After surgery (adjuvant chemotherapy)

Therapy is given to kill the remaining microscopic cancer cells that may still be left behind after surgery, so that the chance of recurrence is smaller.

d. In metastatic or advanced cancer.

Chemotherapy drugs are used to slow the progression of the disease, lower the tumor load, and maintain the stability of clinical conditions.

e. As a palliative measure

In certain conditions, chemotherapy functions to reduce the stiffness caused by cancer growth, such as pain or tightness, so that patients can feel comfortable and have a better quality of life.

4. Contraindications to Chemotherapy

Although chemotherapy is the main option in cancer management, there are certain conditions that make this therapy not recommended or should be postponed, because the risks are greater than the benefits. Some of the contraindications that are generally considered include:

a. Very poor general state of the patient

Chemotherapy may be contraindicated in patients with low functional status (e.g., ECOG 3-4), weak conditions, or inability to perform basic activities, as the body is not strong enough to tolerate the side effects of the drug (Xi et al., 2024).

b. Age

In elderly patients, chemotherapy is a relative contraindication because the function of the liver, kidneys, and immune system has declined, making the drug more difficult to eliminate and the risk of toxicity increases. In addition, the presence of comorbidities such as diabetes, hypertension, or heart failure can worsen side effects, so medication choice and dosage need to be considered more carefully (Loh et al., 2024).

c. Bone marrow disorders

Patients with severe anemia, neutropenia, or thrombocytopenia are at high risk of infection, bleeding, or other serious complications, so chemotherapy needs to be postponed until conditions improve (Gaumond et al., 2025).

d. Severe active infections

In serious infectious conditions, such as sepsis, chemotherapy can worsen immunosuppression and increase the risk of mortality (Nates) et al., 2024).

e. Early trimester pregnancy

Some chemotherapy drugs are teratogenic and can cause fetal abnormalities. Therefore, giving in the first trimester is generally avoided and only considered in the next trimester when the benefits are greater (Refuse) et al., 2025).

5. Manifestations of Chemotherapy Patients

Chemotherapy produces a wide impact on the body's systems due to the drug's cytotoxic properties on rapidly dividing cells. This effect affects the function of hematology, digestion, oral mucosa, and the peripheral nervous system, thereby lowering physical capacity and increasing the risk of complications. In addition, the treatment process that takes a long time, repeated medical procedures, and body changes due to therapy create emotional stress. This condition makes psychological manifestations, especially anxiety, an important aspect that needs to be considered in the treatment of chemotherapy patients (Choi et al., 2024).

a. Hematological disorders

Chemotherapy can lead to decreased bone marrow function, triggering anemia, leukopenia, and thrombocytopenia. This state reduces the body's capacity to transport oxygen, lowers immune defenses, and increases the risk of bleeding.

b. Gastrointestinal Problems

Chemotherapy drugs can damage the epithelial cells of the gastrointestinal tract, causing nausea, vomiting, anorexia, and diarrhea. These manifestations interfere with nutritional status and can lead to fluid and electrolyte imbalances if they persist.

c. Stomatitis and Disorders of the Oral Mucosa

The toxic effects of chemotherapy on mucosal tissue can lead to inflammation and ulceration in the oral cavity. This condition causes pain, difficulty eating, and increases the risk of oral infections, requiring intensive oral care.

d. Peripheral neuropathy

Some chemotherapy agents affect peripheral nerve function and give rise to sensory symptoms such as tingling, numbness, or neuropathic pain. This disorder can inhibit daily activities, decrease sleep quality, and affect motor function.

e. Anxiety

In addition to physical changes, chemotherapy also greatly affects the psychological state of patients. The long treatment process, the atmosphere of the treatment room, and repeated medical procedures can cause tension and discomfort. In circumstances like this, the appearance of anxiety is a frequent occurrence and is part of the patient's emotional response during chemotherapy.

Anxiety is a major psychological manifestation in chemotherapy patients and arises in response to a series of physical changes, therapeutic uncertainties, and emotional distress experienced during the treatment process. Physical symptoms such as nausea, hair loss, body weakness, and decreased appetite cause ongoing discomfort. Patients often feel a loss of control over their body condition, resulting in fear, worry, and emotional tension during therapy (Baker et al., 2024).

Changes in body image are also a factor that plays a big role in the formation of Anxiety. Hair loss, weight changes, or skin discoloration can lower self-confidence and cause feelings of discomfort with self-identity. Some patients feel less able to interact optimally with the social environment because these physical changes are considered to interfere with appearance and decrease a sense of psychological security. This affects the emotional well-being of patients as well as their ability to maintain motivation in undergoing therapy (Torales & Higgins, 2020).

Uncertainty about treatment outcomes further strengthens anxiety experienced. Patients often think about the possibility of therapy success, disease progression, and the risk of future recurrence. The thought of the possibility of conditions not improving and the risk of death adds to the

psychological burden. This accumulation of worries makes anxiety one of the most significant manifestations during chemotherapy, which can ultimately affect the patient's quality of life, adaptability, as well as adherence to the therapy plan (Shalata & Gothelf, 2024).

6. Complications and Side Effects of Chemotherapy

Complications and side effects of chemotherapy generally consist of physical and psychological side effects.

1) Physical side effects

a) Blood disorders (myelosuppression)

Chemotherapy drugs can suppress the work of the bone marrow so that the number of blood cells decreases. When neutrophils drop, the patient is more susceptible to infection; when hemoglobin is low, fatigue arises, and when platelets drop, the risk of bleeding increases (Gaumond et al., 2025).

b) Disorders of the gastrointestinal tract

The oral and intestinal membranes are very sensitive to cytotoxic drugs, so some patients experience canker sores, nausea, vomiting, or diarrhea. This condition decreases appetite decrease and weight decrease (Lopes-júnior et al., 2025).

c) Hair loss (alopecia)

Hair follicles are cells that divide quickly, so chemotherapy can cause hair loss on the head or eyebrows. This condition is temporary, and hair generally grows back after therapy is complete (Baker et al., 2024).

d) Peripheral nerve damage

Some medications such as cisplatin or paclitaxel can cause tingling, pain, or burning pain in the hands and feet. Complaints arise because the peripheral nerves become more sensitive or irritated (Preti & Davis, 2024).

e) Damage to certain organs

The kidneys, liver, and heart can be impaired when the drug is given in high doses or in patients with weakened organ function. Therefore, blood tests and organ function need to be monitored during therapy (Famureva et al., 2025).

2) Psychological Side Effects

a) Affective symptoms (anxiety & depression)

Affective symptoms in the form of anxiety and depression are one of the most common psychological side effects in patients with cancer who are undergoing chemotherapy. The repetitive treatment process, accompanied by a long cycle schedule and evaluation results that are not always predictable, creates a constant sense of uncertainty. Uncertainty about the effectiveness of therapy, possible disease progression, and the risk of drug toxicity (e.g., severe nausea, fatigue, hair loss) are perceived as threats by patients, triggering emotional responses such as anxiety, tension, excessive worry, and persistent feelings of sadness. Over time, some patients experience a decrease in interest and enjoyment of activities that were previously considered meaningful (anhedonia), feel hopeless, and exhibit symptoms of clinical depression that require special treatment by the health team (Almeida et al., 2023).

These affective changes not only have an impact on emotional states, but also have a direct effect on health behavior. Anxiety and depression can interfere with concentration, lower motivation, and cause psychological fatigue so that patients tend to ignore nutritional intake, experience dietary disorders, and show unwanted weight changes. In addition, high anxiety is often followed by difficulty falling asleep, frequent awakenings at night, or unrefreshing sleep quality, which ultimately worsens physical and emotional exhaustion. A combination of physical discomfort, sleep disturbances, and feelings of hopelessness can decrease adherence to a therapeutic

regimen, such as delays in coming to the next chemotherapy schedule, reluctance to continue the cycle, or lack of adherence to supportive home medications (Amiri, 2024).

b) Neurocognitive & sleep disorders

Insomnia or difficulty maintaining sleep and non-restorative sleep, and chemo brain with a decrease in focus, memory, and speed of thought processes that inhibit learning, work, and daily activity functions (Cooper et al., 2025).

c) Psychosocial distress & self-image

Changes in appearance (alopecia/weight changes) disrupt body image and self-esteem, trigger social withdrawal, financial burdens, and shifts in family roles; also reduce the quality of life, so periodic screening, education, counseling, and psycho-oncology referrals are needed if indicated (Yu et al., 2025).

C. The Concept of Anxiety

1. Definition

Taste anxiety is a form of emotional experience that arises when a person feels insecure, worried, or threatened by something that is considered to have the potential to cause harm, either real or just perceived. These feelings arise as an internal response to uncertain or uncontrollable situations (Rutkowski et al., 2021).

Psychologically, the taste anxiety is related to the mind that constantly focuses on the bad possibilities of the future, so that the individual feels restless and unsettled. Although taste anxiety can appear as a normal reaction, the condition can interfere with comfort if it occurs repeatedly for a long time (Mishra & Varma, 2023).

2. Anxiety Level

In some cases, Glorious. (2024) Anxiety can cause psychological and physiological changes, and even interfere with the course of action. To understand the impact, classify the anxiety. There are several levels:

a. Mild Anxiety

It appears when the patient feels tense, but is able to think clearly and follow instructions during the procedure. The physical changes that appear are usually minimal, such as a slightly increased heart rate or breathing, so the action can still go on without significant obstacles.

b. Moderate Anxiety

Anxiety is characterized by attention that begins to narrow, and anxiety increases. Patients appear restless, more sensitive to stimuli, and physiological signs such as breathing or a faster pulse appear.

c. Severe Anxiety

Severe anxiety occurs when fear dominates the mind so that the patient has difficulty following directions. Physical discomfort becomes more pronounced, and patients tend to withdraw or resist the action being performed.

3. Factors That Affect Anxiety

Anxiety can arise from the interaction of various aspects in the individual as well as the situational influences around him. Having two factors that play a role in strengthening or lowering anxiety in someone (Shin & Park, 2024).

a. Age

Age is one of the factors that can affect the level of anxiety. Age differences are related to emotional maturity, life experiences, and an individual's ability to deal with stressful situations. In patients with cancer, younger ages tend to experience higher anxiety due to concerns about the future, work, and family responsibilities (Goerling et al., 2023)

b. Gender

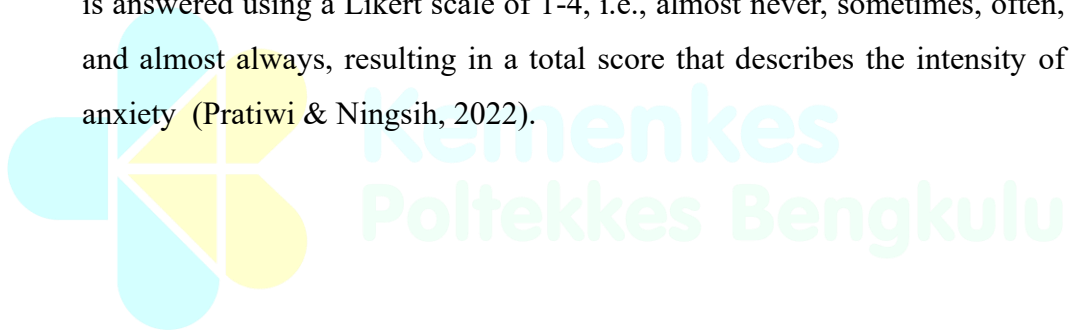
Gender is associated with differences in emotional responses to illness. Female patients tend to experience higher anxiety than men because they are more sensitive to changes in health conditions, social burdens, and hormonal factors that affect emotional regulation. Research shows that women have a chance of experiencing symptoms of anxiety about 2.4 times larger than men in patients with cancer (Paras-bravo et al., 2020).

c. Jobs

Work is one of the factors that can affect the level of anxiety in patients with cancer. Patients who are out of work or experience work disruption due to illness are likely to face greater financial stress and economic uncertainty. This condition can increase concerns about medical costs, family needs, and the future, thus contributing to the emergence of anxiety (Zhang et al., 2024).

4. Anxiety Measurement Instrument

State-Trait Anxiety Inventory-Trait (STAI-T) is an instrument used to measure the level of anxiety through statements that represent an individual's emotional response. In this version, the STAI-T consists of 20 statement items that assess how often anxiety symptoms appear in a person. Each Statement is answered using a Likert scale of 1-4, i.e., almost never, sometimes, often, and almost always, resulting in a total score that describes the intensity of anxiety (Pratiwi & Ningsih, 2022).



Skala anxiety dengan Instrumen State-Trait Anxiety Inventory-Trait(STAI-T)

Table 2. 1 STAI-T Instruments

No	Statement	Never	Sometimes	Frequent	Almost always
1	I feel happy that there is support from my family and health workers during chemotherapy				
2	I feel satisfied with myself in undergoing chemotherapy treatment				
3	I wish I could be as happy as anyone else who didn't have chemotherapy				
4	I felt relieved after undergoing chemotherapy and getting an explanation from the health workers				
5	I am a strong person in the face of cancer and the chemotherapy process				
6	I felt calm and able to control myself while facing the chemotherapy process				
7	I feel happy when I feel the progress in chemotherapy treatment				
8	I feel safe with the care and supervision of healthcare workers during chemotherapy				
9	I make decisions easily regarding medication and chemotherapy				
10	I feel satisfied with my condition and the body's response to chemotherapy				
11	I feel like a failure because of my cancer condition and the chemotherapy treatment I am undergoing				
12	I feel tense when I think about problems related to cancer and chemotherapy				
13	I feel nervous and anxious every time I go to a chemotherapy session				
14	I found the difficulties during chemotherapy to be so much that I couldn't overcome it				
15	I was too worried about something that wasn't really important related to my illness and chemotherapy				
16	I feel like I have disturbing/disturbing thoughts about my cancer and chemotherapy				
17	I feel less confident in my body condition after chemotherapy				
18	I felt not strong enough to deal with the side effects and the chemotherapy process				
19	I think about unimportant things about my illness and they bother me				
20	I responded to the disappointment regarding the results of the examination so that it was difficult to forget it				

Source : (Pratiwi & Ningsih, 2022)

Assessment of anxiety levels in participants using instruments State-Trait Anxiety Inventory (STAI-T). Each statement on the questionnaire has four answer choices, namely never, sometimes, often, and almost always, which are chosen by the participants according to the perceived conditions. Scoring is done on the condition that a score of 1 for the answer is never, a score of 2 for the occasional answer, a score of 3 for the answer frequently, and a score of 4 for the answer almost always. The total score is obtained from the sum of all the items of the Statement that have been filled in by the Participant to describe the level of anxiety experienced. The resulting range of scores is then interpreted to determine the level of anxiety. A score of 20–29 indicates a state of anxiety within normal limits, a score of 30–39 indicates mild anxiety, a score of 40–49 indicates moderate anxiety, while a score of 50–80 indicates severe anxiety that requires further attention. (Pratiwi & Ningsih, 2022).

This instrument is considered sensitive in identifying symptoms anxiety, because it includes emotional aspects such as tension, nervousness, difficulty concentrating, lack of confidence, and the appearance of intrusive thoughts. The questionnaire filling process is relatively short and does not require special tools, making it easy to apply to patients in a variety of clinical conditions. Each statement has a value of 1–4, with some items of inverse value (reverse score) to maintain the objectivity of the assessment. The total score is then used to determine the category of anxiety in participants according to the interpretation table (Toqan, D., 2025).

One approach that can be used is nonpharmacological therapy. Various methods have been developed to support patients with cancer in reducing taste anxiety, among which are music therapy, deep breath relaxation therapy, mindfulness, as well as progressive relaxation therapy or Jacobson's Progressive Muscle Relaxation (Ratnawati & Rosiana, 2020).

D. The Concept of Jacobson's Progressive Muscle Relaxation in Reducing Anxiety

1. Definition

Jacobson's Progressive Muscle Relaxation (JPMR) is a nonpharmacological relaxation technique developed by Edmund Jacobson based on the view that psychological tension is related to muscle tension. With this foundation, JPMR is understood as a relaxation method for those who reduce the physiological response due to stress by reducing nerve-muscle tension (Tapeh, Darvishpour, Besharati, & Gholami-Chaboki, 2024).

In scientific explanations, JPMR is considered to be able to reduce the activity of the sympathetic nervous system so that it gives rise to a sense of calm and comfort. Nursing studies explain that the mechanism drives the decline in anxiety, increased emotional comfort, and support for mental health (Khir, Azam, et al., 2024)

Research by Sahin & Basak, (2020) shows that after the administration of the intervention Progressive Muscle Relaxation (PMR) as many as one single session before surgery, there was a statistically significant decrease in anxiety levels in surgical patients. The average anxiety score decreased from level X before the intervention to level Y after the intervention, and the difference showed significant results ($p < 0.05$). These findings indicate that the administration of PMR only once can have an effect anxiolytic acute immediately after implementation, although the study did not apply repeated sessions for long-term measurement (Cahyanto & Suratih, 2021).

2. Manfaat Terapi Jacobson's Progressive Muscle Relaxation

Technical Jacobson's Progressive Muscle Relaxation Not only does it serve as a regular relaxation exercise, but it also provides a number of benefits that support the patient's physical and emotional comfort during treatment. Some of the benefits that can be felt include (Bucur et al., 2025).

a. Lowers anxiety levels

Lowering the level anxiety is the main purpose of the application Jacobson's Progressive Muscle Relaxation (JPMR) in patients cancer who

are undergoing chemotherapy. Anxiety In this situation, it is generally triggered by thoughts about the possibility of recurrence, concern about the results of the examination, and anticipation of the side effects of therapy. Through JPMR, patients are directed to focus on structured exercise stages and more controlled breathing arrangements. This process helps reduce the flow of negative thoughts and shift focus from anxiety leads to a sense of calm and security, so that the perception of the threat is reduced and the intensity is reduced anxiety gradually decreases (Hamed) et al., 2023).

Psychologically, patients who undergo JPMR regularly usually report reduced anxiety, panic prone, and excessive fear related to chemotherapy procedures. Patients also feel better able to control emotional reactions when facing their next course of action, so they are less dissolved in worries leading up to the day of therapy. This change is generally reflected in the results of measurements using the anxiety standard, with a decrease in the score from the category anxiety moderate or severe to the mild or normal category after the intervention. The findings suggest that JPMR plays an important role as a non-pharmacological intervention to help stabilize the response anxiety and support psychological comfort during the chemotherapy process (Tapeh, Darvishpour, Besharati, Fereshteh, et al., 2024).

b. Reduces muscle tension

When a person experiences anxiety, the brain sends signals through sympathetic nerves so that the muscles automatically tighten and feel stiff. In JPMR, the muscles are deliberately tightened and then released slowly. When the muscles are released, the parasympathetic nerves are active and signal that the body is safe. As a result, muscles become more relaxed, stiffness is reduced, and complaints are anxiety physically decreased (Ahmadinia et al., 2025).

c. Lowers the body's physical reactions

Anxiety It usually appears with physical changes such as rapid heart rate, short breathing, and blood pressure that tends to rise. When JPMR makes the muscles relax, parasympathetic activity takes over and stabilizes the body's functions. The heart rate becomes more regular, breathing returns to comfort, and the body's signals that were previously amplified anxiety gradually decreased. This calmer body response helps lower the level of anxiety (Naser et al., 2024).

d. Creating a more positive medical experience

A more relaxed body, a more stable physical response, and Anxiety which is more controlled makes the patient feel more comfortable during the medical procedure. Patients become more cooperative, less avoidant, and more prepared to undergo the next procedure, so the treatment experience feels more positive (Özyiğit & Sukut, 2025).

3. Prosedur Jacobson's Progressive Muscle Relaxation

Jacobson Progressive Muscle Relaxation (JPMR) is one of the nonpharmacological relaxation therapies that is easy to do, safe, and beneficial to reduce muscle tension, improve circulation, reduce Anxiety, as well as providing a sense of relaxation and comfort to patients. This procedure is done before chemotherapy begins (Mushtaq & Khan, 2025). There are several procedures for implementing JPMR, namely:

- 1) Clients are positioned to sit or lie down as comfortably as possible, then are asked to close their eyes and breathe in slowly three times to create a relaxed atmosphere.



Figure 2. 1 Closing your eyes and taking a breath

- 2) The exercise begins in the hand area. The client is asked to clench his right hand firmly for about 5 seconds, then release it and feel the muscles relax again for approximately 10 seconds. When finished, the same step is performed on the left hand.

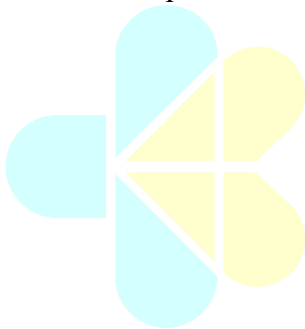


Figure 2. 2 Clenching

- 3) The next movement is done on the arm. The client is asked to bend the elbow until the upper arm is close to the shoulder, then tighten the biceps muscle for 5 seconds and relax it again for 10 seconds. After that, the client straightens the arm and tenses the triceps muscles for 5 seconds, then relaxes again for 10 seconds.



Figure 2. 3 Bending the elbows and tensing the muscles

- 4) After the arm exercise, the focus shifts to the facial muscles. The client is asked to frown vigorously for 5 seconds, then release it until it feels relaxed for 10 seconds. Next, the client closes his eyes tightly for 5 seconds and returns to relax them. The final movement is done by tightening the jaw and pressing the teeth for 5 seconds, then releasing the tension.



Figure 2. 4 Forehead wrinkles, eye closure, and Clench the jaw

- 5) The next exercise is done on the neck and shoulders. The client is asked to slowly lift his head back until he feels a muscle pull for 5 seconds, then relaxes again. After that, the head is lowered until the chin touches the chest for 5 seconds and is relaxed again. Finally, the client raises his shoulders towards the ear for a few seconds, then releases the tension.



Figure 2. 5 Looking up, head bowed and shrugging

- 6) Next, the client is asked to take a deep breath until the chest expands, then hold it for 5 seconds before exhaling slowly. At this stage, the chest and breathing are relaxed for 10 seconds so that the body feels lighter.



Figure 2. 6 Deep breathing

- 7) After that, the client is asked to tighten the abdominal muscles by pulling them inward for 5 seconds and then releasing them again for 10 seconds, while paying attention to the sensation of the muscles relaxing.



Figure 2. 7 Tightening the abdominal muscles

- 8) The following movements are performed on the back. The client is asked to arch his back away from the backrest for a few seconds, then return it and feel relaxed.



Figure 2. 8 Arching the back

- 9) The implementation then continued on the thighs and buttocks. The client is asked to tighten the thigh and buttock muscles at the same time, hold them for 5 seconds, and then release them



Figure 2. 9 Tightening the thigh and buttock muscles

- 10) Finally, the client is directed to point the toes towards the head to tighten the calf muscles for 5 seconds, then relax them. After that, the toes are directed away from the head while tightening the muscles for 5 seconds and then back to being relaxed.



Figure 2. 10 Point toes towards the head

- 11) Once all parts of the body have been done, ask to remain in a relaxed position for 1–2 minutes while breathing slowly. Once the body feels light and comfortable, the client can open his eyes, move his hands and feet slowly, and then return to normal sitting.

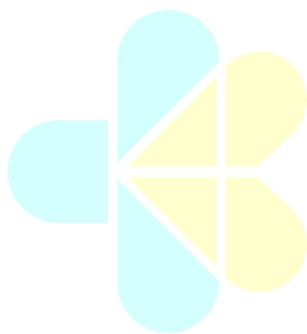


Figure 2. 11 Relaxed position

4. Jacobson's Progressive Muscle Relaxation Therapy Implementation Time

The duration of JPMR therapy is flexible and can be adjusted to the individual's physical and emotional condition, anxiety level, and response during therapy. In general, these relaxation exercises are done in a span of 5 minutes and are done before the chemotherapy action begins. The frequency and total duration of the overall are usually determined through an agreement between the therapist and the patient, taking into account the individual's comfort and readiness.

5. Pengaruh Jacobson's Progressive Muscle Relaxation.

Taste Anxiety It often appears in patients when facing medical procedures, but not all are able to express the discomfort verbally. This situation requires nurses to assess and provide safe and effective nonpharmacological interventions. One of the approaches used is Jacobson's Progressive Muscle Relaxation (JPMR), which is in line with the principles of holistic care because it combines physiological and psychological aspects to improve patient comfort (Toqan et al., 2022).

In patients with cancer who underwent chemotherapy, various physical and psychological stressors such as pain, nausea, fatigue, changes in body image, as well as concerns about the results of therapy and possible recurrence were perceived by the brain as a threat. The information is processed by stress regulatory centers, especially the amygdala as a processor of fear and anxiety emotions, as well as the hypothalamus as a stress response controller and endocrine system. The activation of these two structures stimulates the sympathetic nervous system, so that sympathetic activity increases and the body enters a state of alertness. In this phase, the hypothalamic-pituitary-adrenal (HPA) axis is also activated and triggers the release of stress hormones, especially cortisol and catecholamines, which contribute to the onset of symptoms of anxiety (Francesco et al., 2021).

The increase in sympathetic nerve activity has a direct impact on skeletal muscles, which become more tense and stiff. Tension is especially seen in the large muscles involved in posture and expression, such as the biceps brachii and triceps in the upper arms, the shoulder-to-neck muscles (trapezius), and the facial muscles (frontalis). Persistent muscle tension sends signals through sensory nerve fibers to the central nervous system that the body is still in a threatened state. This feedback maintains the activity of the amygdala and hypothalamus, so that the sympathetic nervous system remains dominant, cortisol secretion remains high, and anxiety complaints such as heart palpitations, rapid breathing, restlessness, and difficulty feeling relaxed persist (Torales & Higgins, 2020).

Jacobson's Progressive Muscle Relaxation (JPMR) works by lowering skeletal muscle tension as an entry point to modulate the stress response. Through structured relaxation contraction exercises, the muscles that are normally tense when anxious are brought to a more optimal relaxation phase. As muscle tension decreases, receptors in the muscles send information through sensory nerves to the brain that the body state becomes calmer and is no longer in high alertness. This feedback suppresses the dominance of the sympathetic nerve and amplifies the activity of the parasympathetic nerve (Purwanti & Khoiriyah, 2024).

These changes in the balance of the autonomic nervous system affect the regulation of the amygdala and hypothalamus, so that the activation of the HPA axis becomes more controlled. This condition is related to a decrease in the secretion of cortisol as the main stress hormone, and is thought to help regulate neurotransmitters such as serotonin, which play a role in calmness and emotional stability. Clinically, the combination of decreased sympathetic nerve activity, increased parasympathetic activity, reduced skeletal muscle tension, decreased cortisol, and improved serotonin regulation was reflected in an increased sense of relaxation and decreased anxiety levels in patients with cancer who are undergoing chemotherapy (Torales & Higgins, 2020).

Research Paolis et al, (2019) Indicates that after the administration of the intervention Progressive Muscle Relaxation (PMR) combined with interactive guided imagery in patients with cancer in the advanced stage, there is a significant decrease in pain intensity and distress. The average pain score based on the Numerical Rating Scale (NRS) in the intervention group decreased from 4.11 before the intervention to 2.28 after the intervention, with a mean difference of 1.83, and the outcome was statistically significant ($p < 0.0001$). In addition, the Total Symptom Distress Score (TSDS) also decreased from 39.04 to 30.22, indicating a 23% decrease in distress after the intervention. These findings show that PMR combined with guided imagery is effective in reducing pain and emotional distress such as anxiety and depression in patients with cancer (Paolis et al., 2019).

Research Ahmadinia et al, (2025) Showed that after the administration of Jacobson's relaxation technique intervention for 12 minutes (given 1 hour before the CAA action), there was a statistically significant decrease in state anxiety. The mean anxiety score decreased from 40.69 before the intervention to 29.63 after the intervention, and the difference showed significant results ($p < 0.001$) (Ahmadinia et al., 2025).

Research by Asgari Tapeh (2024) shows that after the administration of interventions, Jacobson's Progressive Muscle Relaxation (JPMR) for 8 weeks, there was a statistically significant decrease in anxiety levels. The average anxiety score decreased from 10.41 before the intervention to 4.91 after the intervention, and the difference showed significant results ($p < 0.001$). In addition, the Participants' happiness levels also experienced a significant increase after the JPMR intervention, with the average score increasing from 26.59 to 37.18, and the difference was statistically significant ($p < 0.001$) (Tapeh et al., 2024).

Pradhan's research (2020) shows that progressive muscle relaxation therapy has a meaningful effect on reducing anxiety levels in cancer patients who are undergoing treatment in the hospital. In the treatment group, there was a significant decrease in anxiety levels after 15 days of progressive muscle relaxation therapy, with statistical test results showing a very significant difference ($p < 0.001$). In contrast, in the control group that only received conventional treatment, no significant difference in anxiety levels was found ($p = 0.482$). In addition, comparisons between the treatment group and the control group after the intervention showed a statistically significant difference in anxiety levels ($p < 0.001$) (Zulinata & Pradhan, 2020).

Toqan's research (2023) shows that the giving of progressive muscle relaxation exercises for 2 weeks had a significant effect on reducing anxiety levels in nursing students before undergoing clinical practice in the intensive care unit. In the intervention group, the average anxiety score decreased from 2.86 before the intervention to 1.15 after the intervention, and the difference was statistically significant ($p < 0.01$). In addition, after the intervention, the

level of anxiety in the intervention group was shown to be lower than in the control group that did not receive relaxation exercises, with a statistically significant difference ($p < 0.01$) (Toqan & Ayed, 2023).

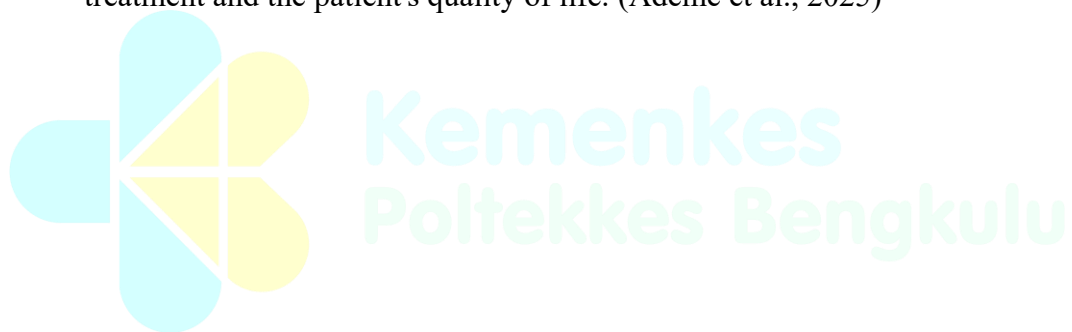
Research by Khir (2024) is consistently effective in reducing stress, anxiety, and depression in adults. A review of 46 experimental studies from 16 countries with a total of more than 3,402 participants found that most studies reported reduced stress (93%), anxiety (82%), and depression (87%) after PMR interventions, either when given as a single therapy or in combination with other interventions. The analysis also shows a range of effect size which varies from small to very large, i.e., for anxiety, confirming that PMR is a strong, measurable, and worthy non-pharmacological intervention in adult mental health promotion programs (Khir, Jonah, et al., 2024).

Self-efficacy: It is an individual's belief in his or her ability to control behavior, emotions, and actions needed to deal with a health condition or problem. In patients with cancer, self-efficacy is an important factor because it is related to the patient's ability to deal with illness, undergo treatment, and manage the side effects of therapy. Patients who have high self-efficacy tend to be more confident in coping with stress, controlling emotional responses, and performing self-care actions during the treatment process. This belief also helps patients to stay motivated in undergoing therapy and be better able to adjust to changes in health conditions experienced. Therefore, self-efficacy can help patients deal with diseases and treatment processes more adaptively (Lyu & Chen, 2022).

Family support is one of the important factors that can affect the patient's health condition with cancer. Family, as the closest people play a role in providing emotional support, assistance in treatment, and motivation during the patient's treatment process, which often takes a long and tiring time. The support provided by the family, such as accompanying during therapy, helping to meet daily needs, as well as providing information and

encouragement, can help patients feel calmer, increase confidence, and reduce anxiety during the treatment process (Gannika et al., 2025).

The patient's level of adherence to treatment is an important factor that affects the success of therapy in patients with cancer. Adherence to therapy, such as following chemotherapy schedules, taking medications as recommended by health professionals, and carrying out all recommended treatment procedures, can help achieve optimal therapy results. On the other hand, non-adherence to treatment can decrease the effectiveness of therapy, increase the risk of treatment failure, increase the likelihood of disease recurrence, and have an impact on decreasing patient life expectancy. Therefore, the level of patient compliance in following the therapy regimen is one of the important factors that plays a role in determining the success of treatment and the patient's quality of life. (Ademe et al., 2025)



E. Theoretical Framework

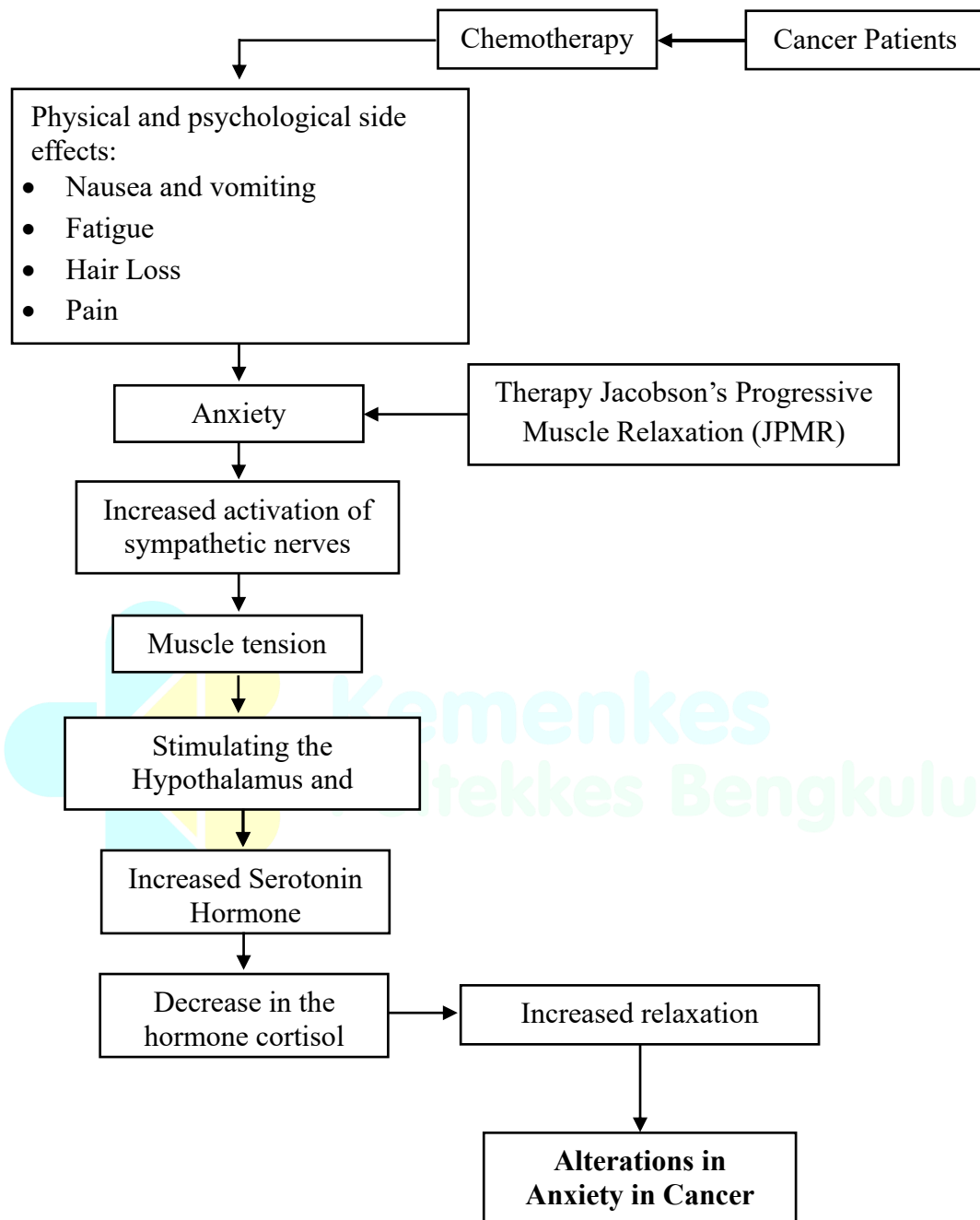


Chart 2. 1 Theoretical Framework

Source : (National Cancer Institute, 2025; Shalata & Gothelf, 2024)