CHAPTER 2

LITERATURE REVIEW

2.1 Concepts of Tetanus

2.1.1 Definition of Tetanus

Tetanus is an acute infectious disease caused by anaerobic gram-positive bacteria *Clostridium tetani*. These bacteria form spores that are highly resistant to environmental conditions and can survive for long periods of time in soil, dust, and animal feces. Tetanus is not transmitted from person to person, but rather occurs when bacterial spores enter the body through open wounds, especially deep, contaminated puncture wounds, burns, or wounds with necrotic tissue that create an anaerobic environment that allows bacteria to multiply (Sudarshans et al., 2025).

Once inside the body, *Clostridium tetani* multiplies in low-oxygen conditions and produces a powerful toxin called tetanospasmin. This toxin is a powerful neurotoxin and is the main cause of clinical manifestations of tetanus. Tetanospasmin spreads through the peripheral nervous system to the central nervous system, where it inhibits the release of inhibitory neurotransmitters such as gamma-aminobutyric acid (GABA) and glycine at synapses. As a result, uncontrolled activity of motor neurons occurs, which leads to characteristic muscle stiffness and spasms.

Clinically, tetanus is characterized by trismus (lockjaw), sardonic rhiscism (sardonic smile caused by facial muscle spasms), and stiffness of the neck and back muscles. In severe cases, opisthotonus, a condition in which the body

curves backwards due to paraspinal muscle spasms, can occur. Muscle spasms in tetanus are usually painful and can be triggered by small stimuli such as sound, light, or touch. In addition to motor disorders, tetanus can also affect the autonomic nervous system, causing blood pressure instability, tachycardia, arrhythmias, and respiratory distress that can lead to respiratory failure (P. H. Putri et al., 2023).

Pathophysiologically, the incubation period of tetanus ranges from 3 to 21 days, with an average of 7 – 10 days. Shorter incubation periods are generally associated with a poorer prognosis. The diagnosis of tetanus is primarily clinical, as there are no specific laboratory tests that can confirm the diagnosis definitively. Prevention is a key strategy and involves active immunization with the tetanus toxoid vaccine as well as appropriate wound prophylaxis for high-risk injuries. Management includes wound care, administration of tetanus immunoglobulin, antibiotics such as metronidazole, control of muscle spasms with sedatives or muscle relaxants, and respiratory assistance in the intensive care unit if needed.

2.1.2 Classification of Tetanus

Based on its clinical presentation, tetanus is classified into several types:

1. Generalized Tetanus

   Tetanus generalized is the most common and most severe form because the muscles throughout the body are affected. The muscles of the head and neck are usually disturbed for the first time with the progressive spread of stiffness and spasm in the caudal direction until it affects the entire body.

2. Local Tetanus

   At lower toxin loads and peripheral injuries, local tetanus will occur. Spasms and stiffness are limited to a limited area of the body, so the mortality rate is much lower.

3. Cephalic Tetanus

   The exception to local tetanus is cephalic tetanus, which is when local tetanus due to a head injury affects the cranial nerves. In this presentation, paralysis dominates more than spasm.

4. Neonatal Tetanus

   Neonatal tetanus occurs in newborns, usually as a result of cutting the umbilical cord with non-sterile tools or unhygienic labor practices. In neonatal tetanus, symptoms appear in the first 2 weeks after infection and include difficulty breastfeeding, dysphagia, as well as stiffness and generalized muscle spasms triggered by minimal stimulation.

2.1.3 Classification of Tetanus Severity

The degree of clinical severity in patients with generalized tetanus can vary from mild to very severe and life-threatening conditions. To determine such severity, the most widely used classification in clinical practice and research is the Ablett Classification.

Table 2. 1 Ablett Classification

Degrees	Clinical manifestations
Grade I	Trismus is mild to moderate, overall muscle rigidity (stiffness), no respiratory distress, no paroxysmal muscle spasms, and no difficulty swallowing (dysphagia)
Grade II	Clear trismus, pronounced muscle rigidity, brief (mild to moderate) paroxysmal muscle spasms, tachypnea (increased breathing frequency), and initial difficulty swallowing
Grade III	Severe trismus , very great all-round muscle rigidity, frequent, long-lasting, and spontaneous attacks of paroxysmal spasms, acute respiratory distress or apnea due to spasms of the muscles of the chest wall, as well as severe swallowing difficulties
Grade IV	Have all clinical criteria at Grade III, which is accompanied by severe autonomic dysfunction. Its manifestations include extreme blood pressure fluctuations (hypertension/severe hypotension), severe tachycardia, arrhythmias, hyperthermia, and severe diaphoresis.

2.1.4 Etiology of Tetanus

The main cause of this disease is a bacterial infection *Clostridium tetani*, which is a Gram-positive bacilli, is obligate anaerobic, and has the ability to produce spores. These bacterial spores are highly resistant to exposure to heat, drought, and conventional antiseptic agents, so they are able to survive for a very long period of time in the outside environment such as soil, street dust, and animal and human feces (Yabes, 2025). These spores enter the human body through damage to the integrity of the skin or tissues (wounds). Some types of wounds that have a high risk of spore entry include deep puncture wounds (such

as punctured by rusty nails), lacerations or burns contaminated by soil or dirt, chronic wounds such as gangrene ulcers, and the use of non-sterile cutting tools on the umbilical cord of newborns that trigger the occurrence of tetanus neonatorum.

2.1.5 Signs and Symptoms of Tetanus

Clinical manifestations of tetanus generalized develops gradually after passing an incubation period that ranges from 3 to 21 days. The initial symptoms that patients most often complain about are trismus, that is, the inability to open the mouth due to spasms in the masseter muscles. This rigidity was soon followed by the emergence of risus sardonicus, a facial expression resembling a constant grin due to the contraction of the facial muscles. As the toxin spreads in the central nervous system, the stiffness will spread to the axial muscles, causing stiffness in the neck and back so intense that the patient's body curves backwards like an arc, a condition known as opisthotonus (Sudarshans et al., 2025).

In addition to the persistent stiffness, the patient will also experience a very painful paroxysmal spasm, where during the attack the patient is at high risk of developing life-threatening laryngospasm or apnea. In advanced stages, loss of control of inhibitory circuits also triggers autonomic dysfunction characterized by extreme blood pressure fluctuations, tachycardia, hyperthermia, and severe diaphoresis (Sudarshans et al., 2025).

2.1.6 Pathophysiology of Tetanus

The process of disease begins when spores *Clostridium tetani* It enters wounds that have anaerobic environmental conditions, such as in necrosis tissues or tissues with poor blood supply. In these conditions without oxygen, the spores will germinate into a vegetative form and begin to divide rapidly. These bacteria in their vegetative form then produce two main types of exotoxins, namely tetanolysin that play a role in local network damage, and tetanospasmin which is a potent neurotoxin responsible for all systemic clinical manifestations in patients (Xu et al., 2020).

Tetanospasmin will bind to receptors in motor end-plate peripheral nerves, then transported retrogradely through axons to nerve cell bodies in the spinal cord and brainstem. In this location, tetanospasmin works by splitting proteins synaptobrevin, an essential component required in the process of neurotransmitter exocytosis. As a result of the breakdown of these proteins, the release of the body's main inhibitory neurotransmitters, namely Gamma-Aminobutyric Acid (GABA) and glycine, becoming inhibited. This loss of inhibitory signals causes motor neurons to constantly release electrical charges in the absence of control (Sudarshans et al., 2025).

Systemically, the uncontrolled release of electrical charges of motor neurons triggers a series of specific muscle spasms in various organs of the body that underlie the appearance of various nursing problems. In the respiratory system, the occurrence of laryngeal muscle spasms triggers the accumulation of secretions that result in disruption of airway clearance and

breathing patterns. Meanwhile, in the digestive and cranial systems, neurotoxins trigger masticatory muscle spasms (chewing muscles) that manifest clinically as trismus or locked jaws, which limits oral intake and poses a risk of nutrient deficits.

In the musculoskeletal system, which is the main focus, the impact of the release of motor charges causes muscle spasm. This condition is a condition in which muscle tone becomes stiff, the body becomes difficult to move and move, thus causing problems with impaired physical mobility. Furthermore, this spasm also spreads to the lower pelvic area in the form of muscle spasm Erector Ani that correlates with the occurrence of spasm of the urethra, so that the patient experiences elimination obstacles in the form of Urine retention. When conditions extend to muscle spasm General, the patient will experience a full-blown seizure attack of a convulsive. This strong and sudden seizure attack triggers an overwhelming sensation of pain while placing the patient on Risk of injury physical. Finally, a deeper involvement of the central nervous system triggers autonomic dysfunction which is marked with Tachycardia and blood pressure fluctuations during seizures, where this circulatory instability increases the workload of the heart and gives rise to a diagnosis Risk of ineffective myocardial perfusion (Dian, 2020).

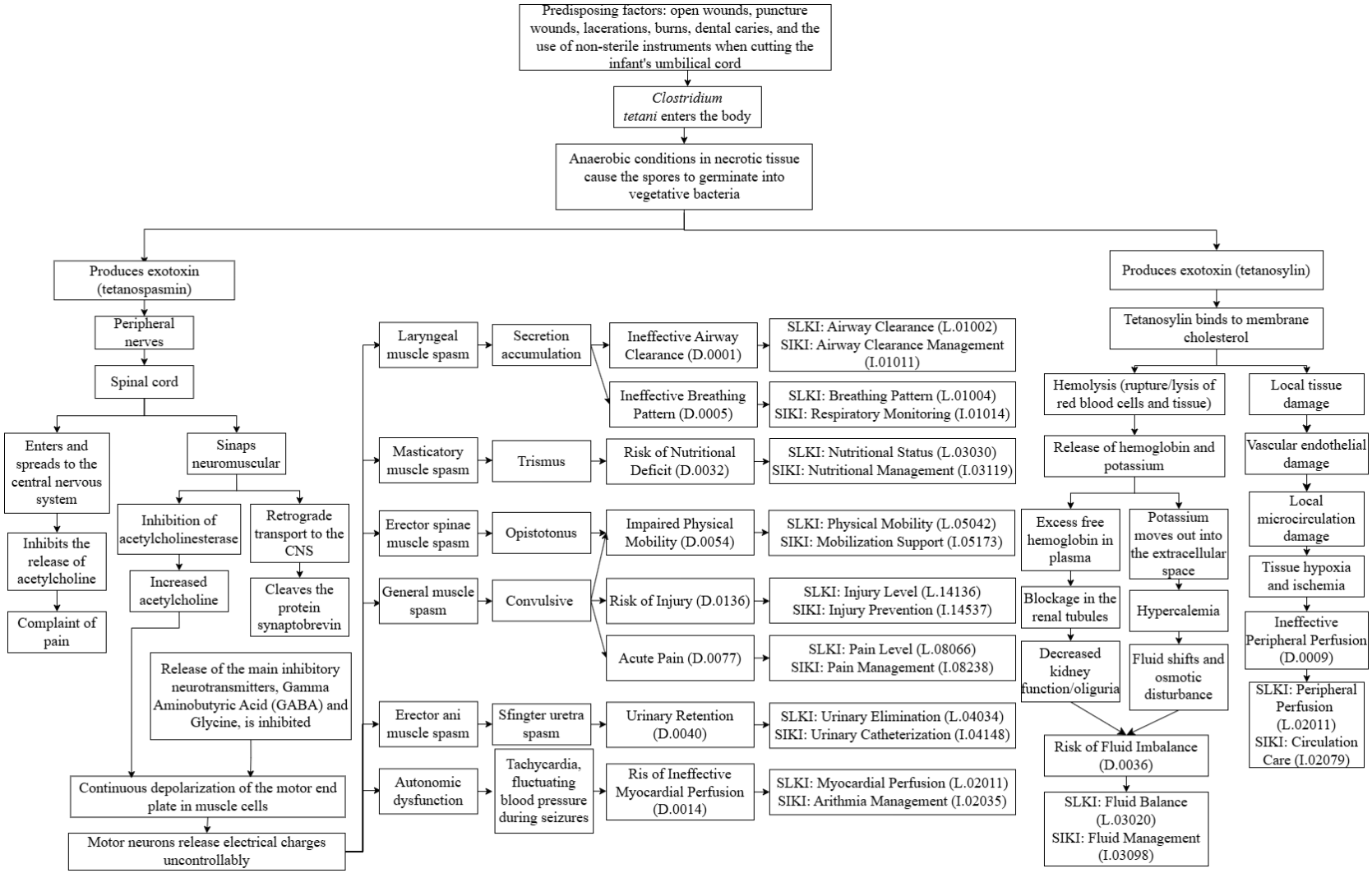


Figure 2. 1 Pathway Tetanus

2.1.7 Management of Tetanus

Tetanus management aims to stop toxin production, neutralize unbound toxins, control muscle spasms, and maintain the patient's vital functions. The disease is caused by the neurotoxin tetanospasmin produced by the bacterium Clostridium tetani. Since its clinical manifestations mainly arise as a result of the effects of toxins on the nervous system, treatment is more focused on the management of toxins and systemic complications rather than simply eradicating bacteria (Saputera et al., 2024).

1. Wound Care

   Wound care is a crucial first step in managing tetanus. Any wounds suspected of being the entrance of infection should be thoroughly cleaned through extensive irrigation and debridement of necrotic tissues. These interventions aim to eliminate the anaerobic environment that favors bacterial growth and stop further toxin production. The removal of foreign bodies and dead tissue helps reduce the bacterial load as well as increase tissue oxygenation.

2. Toxin Neutralization

   Neutralization of toxins is achieved through the administration of Human Tetanus Immune Globulin (HTIG) through intramuscular injection. These immunoglobulins bind to circulating tetanospasmin toxins before attaching to the nerve tissue. HTIG should be given as early as possible because toxins already bound to nerve endings cannot be neutralized. It is important to know that tetanus infection does not provide natural immunity, therefore,

patients still need active immunization with the tetanus toxoid vaccine during treatment.

3. Therapy Antibiotics

   Antibiotic therapy is given to stop the production of toxins by eradicating the bacteria that cause it. Metronidazole is the antibiotic of choice due to its effectiveness against anaerobic bacteria and its better side effect profile compared to penicillin. Antibiotics are generally given for 7–10 days. Although antibiotics are essential for bacterial eradication, clinical improvement largely depends on addressing the effects of circulating toxins.

4. Controlling Muscle Spasms

   Controlling muscle spasms is a critical aspect of tetanus management because spasms can cause severe pain, respiratory distress, and even fractures. Benzodiazepines such as diazepam are first-line therapies that provide sedative effects as well as muscle relaxants. In severe cases, additional muscle relaxants or even neuromuscular blockades with mechanical ventilation may be required. The environment where the treatment is being treated should be kept calm, with dim lighting and minimal stimulation, as light sounds or touches can trigger severe spasms.

5. Respiratory System Support

   Respiratory support is a priority in severe cases of tetanus, especially when respiratory muscle spasms or laryngospasm occur. Patients may require

supplemental oxygen, endotracheal intubation, and mechanical ventilation to maintain adequate oxygenation and ventilation.

6. Control of Autonomic Nerve Disorders

   Autonomic nervous system disorders such as blood pressure fluctuations, tachycardia, and arrhythmias should be closely monitored. Magnesium sulfate can be administered to help control autonomic instability as well as reduce the frequency and severity of spasms.

Overall, tetanus management requires a multidisciplinary approach that includes wound care, immunotherapy, antibiotics, spasm control, and comprehensive vital function support. With adequate intensive therapy and close monitoring, mortality can be significantly reduced.

2.2 Concepts of Impaired Physical Mobility

2.2.1 Definition

Impaired physical mobility is one of the nursing diagnoses that is often found in patients with neurological conditions, musculoskeletal, or severe infections such as tetanus. Based on the book Indonesian Nursing Diagnosis Standards (PPNI, 2017), physical mobility impairment is defined as a limitation in the physical movement of one or more extremities independently. This diagnosis is recorded with the code D.0054 in the Indonesian nursing classification.

Physical mobility is the ability of individuals to move freely, easily, and regularly with the aim of meeting the needs of a healthy life. Mobility is an essential component in human life because it is closely related to a person's

ability to carry out daily activities, maintain independence, and maintain physical and psychological health. When mobility is impaired, patients are at risk of various complications such as contractures, decubitus, deep vein thrombosis, hypostatic pneumonia, and decreased quality of life.

2.2.2 Symptoms and Signs

Based on the book Indonesian Nursing Diagnosis Standards (PPNI, 2017), the signs and symptoms of impaired physical mobility are divided into major and minor symptoms, both subjective and objective as follows:

1. Major Symptoms and Signs

   Major symptoms are signs and symptoms that must be present to establish a diagnosis of impaired physical mobility:

   a. Subjective: The patient complains of difficulty moving the extremities.

   b. Objectives:

      1) Decreased muscle strength

      2) Decreased Range of Motion (ROM)

2. Minor Symptoms and Signs

   Minor symptoms are signs and symptoms that do not have to be present but can strengthen the enforcement of the diagnosis:

   a. Subjective:

      1) Pain when moving

      2) Refusing to make movements

      3) Feeling anxious when moving

b. Objectives:

1) Stiff joints

2) Uncoordinated movement

3) Limited movement

4) Physically weak

2.2.3 Causal Factors

According to the book Indonesian Nursing Diagnosis Standards (PPNI, 2017), the cause (etiology) of impaired physical mobility can be derived from various factors, including:

1. Damage to the integrity of bone structure
2. Metabolic changes
3. Physical unfitness
4. Decreased muscle control
5. Decreased muscle mass
6. Decreased muscle strength
7. Developmental delays
8. Joint stiffness
9. Contracture
10. Malnutrition
11. Musculoskeletal disorder
12. Neuromuscular disorder
13. Body mass index above the 75th percentile
14. Effects of pharmacological agents

15. Motion restriction program
16. Pain
17. Less exposure to information about physical activity
18. Anxiety
19. Cognitive impairment
20. Refusal to make movements
21. Sensory perceptual disorders

Tetanus is also one of the causes of impaired physical mobility. Symptoms of tetanus are characterized by the presence of rigidity or muscle stiffness, the presence of trismus, opisthotonus or stiffness in the neck and back so intense that the patient's body curves backwards like a bow. Some of these conditions cause the body to be unable to carry out activities or physical mobility is disrupted. From this problem arises the problem of impaired physical mobility (Sudarshans et al., 2025).

2.2.4 Related Clinical Conditions

According to the book Indonesian Nursing Diagnosis Standards (PPNI, 2017), clinical conditions related to the occurrence of impaired physical mobility, including:

1. CVA
2. Spinal cord injury
3. Trauma
4. Fracture
5. Osteoarthritis

6. Ostemalacia
7. Violence

2.3 Concept of Range of Motion (ROM)

2.3.1 Definition of Range of Motion (ROM)

Range of Motion (ROM) is defined as the degree or maximum distance that a joint or group of joints can achieve when it is moved through its normal anatomical plane (Gustina, 2026). Biomechanically, ROM serves as a key indicator for measuring the flexibility, functional capacity, and health of a person's musculoskeletal system (Gustina, 2026). The magnitude of this Range of Motion is generally quantified in units of degree using a special measuring instrument called a goniometer (Afonso et al., 2026). In clinical and sports practice, ROM is influenced by two major factors: irreversible factors such as bone structure and congenital joint anatomy, as well as trainable factors such as soft tissue elasticity (muscles, tendons, ligaments) and neuromuscular control (the nervous system that regulates muscles).

In its application, the level of sufficiency of ROM is crucial in determining an individual's ability to carry out daily activities independently without physical barriers. Disorders or limitations in Range of Motion are usually triggered by swelling, chronic inflammation, muscle spasms, aging, or immobilization due to injuries and diseases such as stroke (Gustina, 2026). When the ROM decreases, the risk of contracture (shortening of the connective tissue that makes the joints permanently stiff) and muscle atrophy increases considerably. Therefore, periodic evaluation of ROM through active methods

(independent movement by the patient) and passive methods (movements fully assisted by medical personnel) is the main foundation in designing physiotherapy programs, measuring the progress of post-operative rehabilitation, and minimizing the risk of injury to athletes (Afonso et al., 2026).

2.3.2 Type of Range of Motion (ROM)

Based on the patient's ability to move independently, ROM exercises are differentiated into several types (V. Putri et al., 2023):

1. Active ROM

   Active ROM is joint movement exercises performed independently by the patient without assistance. The energy expended for the exercise comes from the patient himself. Active ROM is carried out when the patient still has minimal muscle strength to move independently. This type is useful for increasing muscle strength more optimally than passive ROM.

2. Passive ROM

   Passive ROM is a joint movement exercise performed by another person (nurse, physiotherapist, or family) because the patient is unable to do it independently. The energy expended for the exercise comes from the person providing the help. Passive ROM is performed in patients with severe muscle weakness, decreased consciousness, or conditions that require immobilization, as in the case of tetanus generalized. Movements are carried out slowly, gently, and do not exceed the limits of joint ability.

3. Active-Assistive ROM

   Active-assistive ROM is a combination of active and passive ROM, i.e. the patient performs movements with the help of a part of another person or assistive device. This type is suitable for patients who have little muscle strength but are not able to move fully independently.

2.3.3 Objective of Range of Motion (ROM)

ROM exercises aim to maintain and improve joint movement function and prevent various complications due to immobilization. The objectives of the ROM training include:

1. Maintain or maintain flexibility and muscle strength.
2. Maintains joint mobility.
3. Stimulates blood circulation thus preventing venous stasis and thrombosis.
4. Prevents deformities, stiffness, and joint contractures.
5. Maintains heart and respiratory function.
6. Improves muscle tone.
7. Improves joint mobilization.
8. Improves muscle tolerance for exercise.
9. Increase muscle mass.
10. Reduced bone loss (osteoporosis due to inactivity).

In the context of generalized tetanus patients, the main objectives of ROM training include:

1. Prevents permanent contracture due to severe spasms

   In tetanus generalized, the muscles experience extreme stiffness over a long period of time. If the joint is not moved at all, the connective tissue and muscles will be permanently shortened (contracture). ROM aims to maintain the length of muscle fibers and tendon elasticity so that the joint does not lock permanently after a tetanus infection has been successfully cured.

2. Helps muscle relaxation during the recovery phase

   When the acute phase of the seizure begins to be controlled by medications (such as anticonvulsants and muscle relaxants), passive ROM with a gentle *stretching* technique helps to reduce residual tension in stiff muscles, stimulates local blood circulation, and helps muscles return to a relaxed state.

3. Prevent complications due to prolonged lying down

   Patients with generalized tetanus are usually treated in a state of isolation from stimulation (because sound or rough touch can trigger seizures). This prolonged lying down is at high risk of causing Deep Vein Thrombosytes (DVT), muscle atrophy, and decubitus ulcers.

4. Restores jaw function (trismus) and swallowing ability

   One of the specific goals of ROM (orofacial) in tetanus patients is to restore the ability to open the mouth. Gradual Range of Motion exercises in the masseter (jaw) muscles are essential so that the patient can return to

chewing, swallowing safely (minimizing the risk of choking/aspiration), and speaking after the feeding tube (nasogastric tube) is removed

5. Accelerating physical condition and walking ability

   After the tetanus toxin has been successfully neutralized and the stiffness has subsided, the active-assisted ROM movement is aimed at retraining nerve-muscle coordination, rebuilding the strength of the upper and lower extremity joints, so that the patient can immediately stand and walk independently without physical disability

The implementation of ROM in generalized tetanus patients is not carried out carelessly during the acute phase (when spontaneous seizures are still frequent). Sudden touch or movement can actually trigger severe and life-threatening muscle spasms (such as laryngeal spasms that block the airway).

2.3.4 Indications and Contraindications

ROM exercises are indicated in patients who experience or are at risk of physical mobility impairments due to various medical conditions. Based on the nursing literature, indications for ROM training include:

1. Stroke or decreased level of consciousness that causes weakness on one side of the body (hemiparesis/hemiplegia).
2. Muscle weakness due to neurological disease, infection, or prolonged immobilization.
3. Physical rehabilitation phase after trauma, surgery, or acute conditions.
4. Clients with long bedrests who are at risk of joint stiffness and contracture.
5. Fractures that have been immobilized and entered the rehabilitation phase.

6. Brachial plexus or spinal injury.
7. Autoimmune diseases such as rheumatoid arthritis and multiple sclerosis.
8. Infectious disease conditions that cause muscle and joint stiffness, including tetanus generalized.
9. The aging process (elderly) with a physiological decrease in joint Range of Motion.

In patients with generalized tetanus, passive ROM exercises are indicated when they are stable, i.e. when muscle spasms can be controlled with mediamentosa (sedation and muscle relaxation). This intervention is important to prevent permanent contractures that can be a source of long-term disability due to immobilization during treatment.

Although ROM provides many benefits, there are several conditions that are contraindicated or require special precautions in its implementation, including:

1. Thrombus or embolism of the blood vessels, as well as inflammation (inflammation) of the blood vessels, movement can mobilize blood clots and cause pulmonary embolism.
2. Unstable joint or bone abnormalities, including non-union fractures and joint dislocations, are at risk of aggravating tissue damage.
3. Post-surgical procedures where movement is known to interfere with the healing process of surgical wounds.
4. Severe osteoporosis, in which movement can lead to iatrogenic injuries in the form of pathological fractures.

5. Clients in the immobilization phase due to critical conditions such as acute myocardial infarction, ROM should not be performed until the hemodynamic condition is stable.
6. Infections or active inflammation around the joints (e.g. septic arthritis), it is necessary to consider the risk of spreading infection.
7. Severe pain that worsens with movement, exercises should be stopped or postponed until pain is controlled.
8. Hypermobility or instability of existing joints, excessive movement can aggravate the condition.

ROM should not be done if there is a risk of hindering recovery or if the patient's condition threatens his or her safety. It is important for nurses to always monitor the patient's general condition, vital signs, and responses before, during, and after the implementation of the ROM exercise (P. Putri et al., 2023).

2.3.5 Previous Research

The following is a summary table of scientific evidence supporting the application of ROM in generalized tetanus patients with impaired physical mobility:

Table 2. 2 Previous Research

No	Author	Title	Method	Results
1.	Vadissa Nadia Putri, Maria Komariah, Henny Yulianita	Application of Range of Motion Exercises in Tetanus Patients	Descriptive case study. Subject: Mrs. I, 67 years old, diagnosis of tetanus with muscle stiffness	Muscle strength increases from degrees 3 → 4 in the lower right and left extremities, as well as from degrees 4 → 5 in

No	Author	Title	Method	Results
	(V. Putri et al., 2023)	Experiencing Muscle Stiffness in the High Care Unit: A Case Study	in the HCU room. Intervention: 2x/day passive ROM for 4 days on all extremities.	the upper right and left extremities. It was concluded that ROM is effective in helping the development of muscle mass in tetanus patients. Families are encouraged to help passive ROMs between workout schedules.
2.	Masayoshi Seki, Mizuki Sugiyama, Takuya Maeda, Fumihito Kasai (Seki et al., 2024)	Challenges in Rehabilitation of a Tetanus Patient With Severe Complications	Case report. Subject: an 81-year-old male severe tetanus patient in the ICU for 80 days. Intervention: PROM 2x/day (15 reps/session) starting on day 10 of ICU admission (24–48 hours after hemodynamic stabilization), focusing on hip and knee flexions-extensions.	Muscle tone improves (Adductor Tone Rating 2 → 1). The Barthel Index increased to 10 points. Contractures can be prevented. Disuse syndrome is reduced. Early rehabilitation has been shown to reduce long-term functional complications in severe tetanus. Nurses play a key role in maintaining the continuity of PROM outside of the physiotherapist's schedule.
3.	Lilis Setrowati, Elma, Erma Wahyu Mashfufa, Ollyvia Freeska Dwi Marta, Nur Aini	The Effect of Nursing Range of Motion on the Motor Function of Patients with Impaired	Quasi-experimental. Subject: CVA/stroke patients with physical mobility impairments. Intervention: ROM training	ROM exercises performed by nurses have been shown to significantly improve motor function in patients with impaired physical mobility. ROM is a standardized independent nursing

No	Author	Title	Method	Results
	(Setyowati et al., 2023)	Physical Mobility	(active and passive) by nurses. Measurement of motor function before and after the intervention.	intervention whose principles apply to various immobilization conditions including tetanus.
4.	Ratna Fithriyah Sholihany, Agung Waluyo, Diana Irawati (Sholly, Ratna et al., 2021)	Unilateral and Bilateral Passive ROM Training on Increased Muscle Strength Due to Ischemic Stroke	Quasi-experimental with pre-post test. Subject: ischemic stroke patients with unilateral and bilateral motor weakness. Interventions: Unilateral vs. bilateral passive ROMs, performed in a structured manner.	Unilateral and bilateral passive ROMs both significantly increased muscle strength ($p < 0.05$) in patients with motor weakness due to neurological conditions. Provides the basis that passive ROM is effective in neurogenic immobilization conditions, including tetanus generalized.
5.	Vitri Dyah Herawati, Indriyati (Herawati & Indriyati, 2023)	Effect of Active ROM Exercise in Postoperative Lower Extremity Fracture Patients on the Length of Treatment Day	Experimental research. Subject: a postoperative patient with a lower extremity fracture who was immobilized. Intervention: Active ROM that starts as early as possible after immobilization. Measurement: length of days of hospitalization.	Active ROM that starts as early as possible significantly shortens the length of the treatment day. ROMs prevent immobilization complications and accelerate functional recovery. This principle is relevant for tetanus: the initiation of ROM immediately after the controlled spasm phase has a direct impact on the duration of treatment and the quality of the patient's recovery.

Based on the synthesis of various existing scientific evidence, the application of ROM exercises, especially passive ROM in generalized tetanus patients with impaired physical mobility is supported by a strong foundation of evidence. Research (V. Putri et al., 2023) Specifically performed on tetanus patients with muscle stiffness in the HCU chamber proved that the 4-day ROM exercise was able to increase muscle strength from degree 3 to 4 in the lower extremities and from degree 4 to 5 in the upper extremities, so that this exercise can be established as a valid evidence-based nursing intervention for the tetanus patient population.

International case studies by Seki et al. (2024) from Japan further strengthens this evidence by showing that early initiation of PROM in severe tetanus patients in the ICU, despite facing various clinical challenges, is successful in preventing contracture, improving muscle tone, and improving the patient's functional index. This research also confirms the importance of active involvement of nurses in maintaining the continuity of ROM practice outside of structured rehabilitation hours.

Thus, passive ROM training carried out in a planned, standardized, and continuous manner by nurses is an evidence-based nursing intervention that is effective in overcoming the nursing problem of impaired physical mobility in generalized tetanus patients, and is able to prevent long-term immobilization complications that can lead to permanent disability.

2.3.6 ROM Procedure in Generalized Tetanus Patients

The following is the procedure for implementing a passive ROM from head to toe that has been modified to be safe for tetanus patients according to (Seki et al., 2024):

1. Head and neck
    a. Rotation: slowly rotate the patient's head to the right, back to the center, and then turn it to the left
    b. Flexion/extension: slowly lift the patient's head closer to the chest (flexion), then return it to its original position (extension)
2. Upper Extremity
    a. Shoulder
        1) Flexion/extension: the patient's elbow and wrist joints. Slowly raise the patient's arms up parallel to the head, then lower them back down
        2) Abduction/Adduction: move the patient's arm away from the body to the side (abduction), then bring it back closer to the side of the body (adduction)
    b. Elbow
        1) Flexion/extension: support the upper arm and hold the patient's wrist. Bend your elbows until your hands are close to your shoulders (flexion), then straighten them back (extensions)
    c. Wrist
        1) Flexion/extension: hold the patient's hand, move the wrist bending forward (flexion) and bending backwards (extension)

d. Fingers

1) Bend your fingers toward your palms (clench), then slowly straighten them back one at a time to prevent the flexion contractures that often occur in tetanus.

3. Lower Extremity

a. Pelvis and knees

1) Place one hand under the patient's knee and the other hand under the heel.

2) Lift and bend the knees toward the chest (pelvic and knee flexion) as far as is tolerable without triggering the spasm, then straighten them again.

b. Ankle

1) Dorsoflexion & Plantarflexion: hold the patient's heel, place the nurse's forearm on the patient's soles of the feet. Push the soles of the feet upwards (dorsoflexion) to stretch the calf muscles (gastrocnemius) that are often stiff, then move them downwards (plantarflexion).

2) Inversion & Eversion: rotate the sole of the foot inward, then gently rotate outward

c. Toes

1) Bend your toes toward the soles of your feet, then straighten them again.

2.3.7 Implementation of ROM in Generalized Tetanus Patients

Based on the available scientific evidence, the initiation time of ROM in tetanus patients is critical and has a direct impact on long-term functional outcomes. Seki et al. (2024) prove that early rehabilitation, including PROM exercises that begin on day 10 of ICU admission (within 24 – 48 hours after stable hemodynamic conditions), has been shown to prevent further complications and improve muscle tone and functional index in severe tetanus patients.

Putri, Vadissa et al. (2023) It also emphasizes that physical therapy in tetanus patients should be started as soon as the seizures stop, as tetanus patients who do not get range exercise early are at high risk of prolonged muscle shrinkage and contracture. Therefore, the application of ROM in generalized tetanus patients needs to consider the following stages:

1. Active spasm phase (acute spasm phase): The phase from which tetanospasmin toxin begins to cause clinical symptoms (muscle stiffness, trismus, spasm) until the spasm reaches peak intensity. This is the most dangerous phase due to the risk of respiratory failure, severe spasms and the onset of autonomic disorders. The active spasm phase is from the 1st to 7th days. The ROM is not done. The acute spasm phase occurs at the beginning of the onset of symptoms The priority is the control of the spasm with sedation and muscle relaxation. Stimuli that can trigger spasms should be minimized.

2. Stabilization phase (after adequately controlled spasm): The phase after spasm begins to be controlled with therapy (diazepam/*muscle relaxant*, ventilator if necessary), where the focus of treatment is to maintain stable vital functions while waiting for toxins that have bound in the tissues to be metabolized by the body. This phase can occur on the 8th to the 28th day. Passive ROMs began to be introduced gradually and carefully, starting with minimal, gentle movements of the extremity joints.
3. Rehabilitation phase: The phase after the patient's condition is hemodynamically stable and the spasm is controlled, the focus shifts to the restoration of physical function to prevent contractures, restore muscle strength, and train the functional independence of patients who have been immobilized for a long time. The ROM is progressed to a wider range of movements according to the patient's tolerance. If conditions allow, active-assist ROM and active ROM can be initiated.

In terms of frequency, exercises are carried out 2 times per day (morning and evening). The recommended intensity per session is 15 reps per movement/joint, or adjusted to the patient's tolerance, with the duration of each session ranging from 15–20 minutes to cover the entire upper and lower extremity joints. The principle of movement that must be applied is gentle, slow, non-forceful, and does not exceed the patient's pain limit, while remaining within the limits of the physiological Range of Motion of the joint (V. Putri et al., 2023; Seki et al., 2024).

2.4 Concepts of Nursing Care

2.4.1 Focus of Assessment

At this stage, it is an activity in collecting information from patients which includes bio-psycho-social-spiritual elements that are comprehensive, complete and relevant to get to know the patient in order to give direction to nursing actions.

1. Identity

   Patient identity includes name, age, gender, ethnicity/nation, religion, education, occupation, address, date of hospital admission, date of study, and medical diagnosis.

2. Main complaints

   The main complaints that are most often felt and cause patients or families to take patients to the hospital are the inability to open their mouths normally due to jaw stiffness (trismus or lockjaw), the presence of stiffness that spreads to the neck and back muscles, difficulty swallowing food or fluids (dysphagia), and the presence of sudden seizures or muscle spasms that are thorough and very painful.

3. Current disease history

   This study explores the chronology of the disease in detail from the first complaint to the patient's treatment. The nurse examines the onset and duration of jaw stiffness, the speed at which the stiffness spreads to other muscle areas (neck, abdomen, back, extremities), and the characteristics of the spasm (frequency, duration, and triggering factors such as sound or

light). Nurses should also ask specifically about any history of injuries in the past few weeks (e.g., nail punctures, contaminated tears, burns, or post-non-sterile surgical procedures) that have not received adequate medical attention.

4. History of previous illness

   The main focus of this study is the patient's tetanus immunization status, including when the patient last received the DPT, TT (*Tetanus Toxoid*), or Td vaccination, as well as the completeness of the vaccine doses received during his or her lifetime. In addition, it is also studied whether the patient has a history of chronic diseases that can aggravate the condition or lower the body's immunity, such as Diabetes Mellitus (which is often associated with chronic ulcers as a germ port d'entree), peripheral vascular disorders, or a history of allergy to certain sedative drugs and antibiotics.

5. Family history of illness

   Although tetanus is not a hereditary disease or a direct human-transmitted disease, a family history study is carried out to determine the condition of the living environment, family sanitation habits, and the level of family knowledge about infection prevention and the importance of immunization. It is important to identify whether or not other family members are at risk of similar exposure in the home environment.

6. Physical examination

    a. General conditions and vital signs

    Patients generally appear to be seriously ill, experiencing physical distress due to spasms, and have various intensive monitoring devices installed. The patient's consciousness usually remains fully conscious (compos mentis), unless severe hypoxia occurs due to airway spasm or the patient is under the influence of deep sedation. Monitoring of vital signs shows manifestations of autonomic dysfunction, including fluctuations in blood pressure (rapidly changing hypertension or hypotension), tachycardia, hyperthermia (body temperature increases > 38°C), as well as diaphoresis (excessive sweat production).

    b. Respiratory System (B1: Breathing)

    Inspection shows the presence of tachypnea, use of the respiratory support muscles, or asymmetrical movement of the chest wall due to stiffness of the intercostal muscles. In the acute phase, an attack of laryngospasm can be observed characterized by cyanosis and apnea. Pulmonary auscultation may show additional breathing sounds such as wet ronki or ronkhi if there is a buildup of secretions due to decreased cough reflexes and dysphagia.

    c. Cardiovascular System (B2: Blood)

    The main manifestations studied are signs of autonomic instability. Pulse palpation often indicates tachycardia that turns into abrupt bradycardia. Auscultation of heart sounds is generally normal (S1 and

S2 single) without murmurs, but blood pressure can fluctuate extremely within minutes, especially when the patient is experiencing stimulation or attacks of muscle spasms. Capillary Refill Time (CRT) may slow down > 2 seconds when autonomic peripheral vasoconstriction occurs.

d. Neuromuscular System (B3: Brain)

The patient's level of consciousness was assessed using the Glasgow Coma Scale (GCS) which is generally valued at 15 (E4M6V5) if it has not been given deep sedation. Cranial nerve studies (N. V and N. VII) showed the presence of trismus (the distance between the mouth is reduced, often < 2 cm) and the sardonic risus (contraction of the facial muscles that settle to form a grin). The pupil is usually isocoric with a positive light reflex. Evaluation of external stimuli shows that the patient's protective reflexes become highly sensitive, where minimal tactile, auditory, or visual stimuli can trigger generalized seizures.

e. Urinary System (B4: Bladder)

Inspection shows that generalized tetanus patients are almost always fitted with an indwelling urinary catheter to monitor urine output closely. The nurse needs to study the volume, color, and clarity of the urine. Urine retention can occur as a result of spasms in the urethral sphincter. In the event of a complication in the form of rhabdomyolysis (massive muscle tissue damage due to persistent seizures), the urine can be dark as tea (myoglobinuria), which is at risk of triggering acute kidney failure.

f. Digestive System (B5: Bowel)

An inspection of the abdominal area showed a board-like hard abdominal visualization due to spasms of the abdominal wall muscles. The patient experiences a significant decrease in swallowing ability (dysphagia) due to impaired pharyngeal muscle coordination, so nutrition is usually provided through the Nasogastric Tube (NGT). Intestinal noise auscultation may decrease (hypoactivity) due to the influence of opioid sedative drugs or prolonged immobilization. Patients are also at high risk of constipation.

g. Musculoskeletal System (B6: Bone)

Inspection showed a typical posture in the form of opisthotonus, in which the back muscles tightened violently causing the body to curve backwards with the head and heels as a focus. There is a total rigidity in all four extremities which causes a limitation of the Range of Motion. Assessment of muscle strength is often difficult to do voluntarily because the patient's muscles undergo involuntary tonic contractions (hypertonia), the palpable muscles are very hard and tense when palpated. In addition to measuring muscle strength, in tetanus patients it is also necessary to measure the level of muscle stiffness (muscle tone) generally measured using Modified Ashworth Scale (MAS). This scale is used to measure how much muscle resistance is when the limb is moved (Harb et al., 2025). The MAS scale can be seen in the following table:

Table 2. 3 Muscle Tone Rating Scale

Value	Remarks
0	No increase in muscle tone (normal)
1	A slight increase in muscle tone, marked by minimal resistance at the end of the Range of Motion (when the joint is maximally moved), followed by release or minimal resistance at the end
1+	Slight improvement in muscle tone, characterized by resistance followed by a felt release (*catch*) for less than half of the remaining Range of Motion
2	A more noticeable increase in muscle tone throughout most ranges of motion, but the affected part of the body is still easy to move
3	A very noticeable increase in muscle tone, passive movements become difficult to perform
4	The affected part of the body is rigid in a flexion or extension position, so it cannot be moved at all

2.4.2 Nursing Diagnosis

Nursing diagnoses that may appear in patients with generalized tetanus based on the book Indonesian Nursing Diagnosis Standards (PPNI, 2017) Among others:

1. Ineffective airway clearance related to airway spasm (laryngospasm) (D.0001)
2. Ineffective breathing patterns related to obstruction of breathing effort (D.0005)
3. Impaired physical mobility related to neuromuscular disorders (D.0054)

4. Acute pain related to physiological inhibitory agents in the form of muscle spasms (D.0077)
5. Urinary retention related to spasm in the urethral sphincter muscle (D.0040)
6. Ineffective peripheral perfusion related to decreased blood flow (D.0009)
7. Risk of injury evidenced by muscle spasm/spasm (D.0136)
8. Risk of nutritional deficit evidenced by inability to swallow food (D.0032)
9. Risk of ineffective myocardial perfusion is evidenced by autonomic dysfunction, fluctuations in blood pressure that increase the workload of the heart suddenly during seizures (D.0014)
10. Risk of fluid imbalance evidenced by fluid loss (D.0036)

2.4.3 Nursing Planning

In making a nursing plan, it is necessary to determine the goals and criteria for results according to the book Indonesian Nursing Output Standards (PPNI, 2019) after that, determine nursing interventions according to the Indonesian Nursing Intervention Standards book (PPNI, 2018). The following is a list of nursing plans based on diagnoses that may appear in patients with tetanus generalized, including:

Table 2. 4 Nursing Outcomes and Intervention Criteria

Diagnosis	Objectives and Outcome Criteria	Intervention
Ineffective Airway Clearance (D.0001)	**Airway Clearance (L.01002)** After nursing actions for 3x24 hours, it is expected that airway clearance increases with the following outcome criteria: 1. Effective cough increases 2. Decreased sputum production 3. Decreased wheezing	**Respiratory Pathway Management (I.01011)** <u>Observations</u> 1. Monitor breathing patterns (frequency, depth, breathing effort) 2. Additional breath sound monitors (e.g.: gurgling, wheezing, wheezing, dry ronchi) 3. Sputum monitor (amount, color, aroma) <u>Therapeutic</u> 4. Maintain airway superiority with head-tilt and chin-lift (jaw thrust if cervical fracture trauma is suspected) 5. Position a semi-fowler or fowler 6. Give warm drinks 7. Perform chest physiotherapy, if necessary 8. Perform mucus suction in less than 15 seconds 9. Perform hyperoxygenation before endotracheal suction 10. Remove solid object blockages with McGill forceps

Diagnosis	Objectives and Outcome Criteria	Intervention
		11. Provide oxygen, if necessary Education 12. Recommend a fluid intake of 2000 ml/day, if there are no contraindications 13. Teach effective coughing techniques Collaboration 14. Collaboration in the provision of bronchodilators, expectorants, mucolytics, etc.
Ineffective Breathing Patterns (D.0005)	**Breath Pattern (L.01004)** After nursing action for 3x24 hours, it is expected that the breathing pattern will improve with the following outcome criteria: 1. Decreased dyspnea 2. Decreased use of the respiratory support muscles 3. Elongation of the expiratory phase decreases 4. Breathing frequency improves 5. Breathing depth improves	**Respiratory Monitoring (I.01014)** Observations 1. Monitor the frequency, rhythm, depth and ability of the breath 2. Monitor breathing patterns (such as bradypnea, tachypnea, hyperventilation, kussmaul, Cheyne-stokes, biot, ataxi) 3. Effective cough ability monitor 4. Monitor the presence of sputum production 5. Monitor for airway obstruction 6. Palpation of symmetry of pulmonary expansion 7. Auscultation of breathing sounds 8. Oxygen Saturation Monitor 9. Monitor the value of blood gas analysis 10. Thoracic x-ray results monitor Therapeutic 11. Set respiration monitoring intervals according to the patient's condition 12. Document monitoring results Education 13. Explain the purpose and procedure of monitoring

Diagnosis	Objectives and Outcome Criteria	Intervention
		14. Inform the results of monitoring, if necessary.
Physical Mobility Disorder (D.0054)	**Physical Mobility (L.05042)** After nursing action for 3x24 hours, it is expected that physical mobility will increase with the following outcome criteria: 1. Increased limb movement 2. Increased muscle strength 3. Increased Range of Motion	**Mobilization Support (I.05173)** Observations 1. Identify any pain or other physical complaints 2. Identification of physical tolerance for movement 3. Monitor heart rate and blood pressure before starting mobilization 4. Monitor general conditions during mobilization Therapeutic 5. Facilitate mobilization activities with aids (e.g. bed railing) 6. Facilitate movements, if necessary 7. Involve families to assist patients in improving movement Education 8. Explain the purpose and procedure of the mobilization 9. Encourage early mobilization 10. Teach simple mobilizations to do (ex: sitting in bed, sitting on the side of the bed, moving from bed to chair)
Acute Pain (D.0077)	**Pain Level (L.08066)** After nursing for 3x24 hours, it is expected that the level of pain decreases with the following outcome criteria: 1. Decreased pain complaints 2. Grimaces decrease 3. Decreased protective attitude 4. Decreased restlessness 5. Decreased sleep difficulties 6. Pulse frequency improves	**Pain Management (I.08238)** Observations 1. Identification of the location, characteristics, duration, frequency, quality, intensity of pain 2. Identification of pain scale 3. Identification of nonverbal pain response 4. Identify factors that aggravate and reduce pain 5. Identify knowledge and beliefs about pain 6. Identify cultural influences on pain response 7. Identify the effect of pain on quality of life

Diagnosis	Objectives and Outcome Criteria	Intervention
		8. Monitor the success of complementary therapies that have been given 9. Monitor the side effects of analgesic use <u>Therapeutic</u> 10. Provide nonpharmacological techniques to reduce pain (ex: TENS, hypnosis, acupressure, music therapy, biofeedback, massage therapy, aromatherapy, guided imagination techniques, warm/cold compresses, play therapy) 11. Environmental controls that aggravate pain (ex: room temperature, lighting, noise) 12. Facilitation of rest and sleep 13. Consider the type and source of pain in choosing a pain relief strategy <u>Education</u> 14. Describe the causes, periods, and triggers of pain 15. Explain pain relief strategies 16. Recommend self-monitoring of pain 17. Recommend the appropriate use of analgesics 18. Teach pharmacological techniques to reduce pain <u>Collaboration</u> 19. Collaboration with the administration of analgesics, if necessary
Urinary Retention (D.0040)	**Urinary Elimination (L.04034)** After nursing action for 3x24 hours, it is expected that urine elimination will improve with the following outcome criteria: 1. Urinary sensation increases	**Urinary Catheterization (I.04148)** <u>Observations</u> 1. Check the patient's condition (ex: consciousness, vital signs, perineal area, bladder distension, urinary incontinence, urinary reflex) <u>Therapeutic</u>

Diagnosis	Objectives and Outcome Criteria	Intervention
	2. Urinary urge to urinate 3. Urination does not completely decrease 4. The volume of urine residue decreases 5. Nokturia declined 6. Bedwetting decreases 7. Decreased enuresis	2. Set up equipment, materials, and Actions room 3. Prepare the patient: free the underwear and position the dorsal recumbent (for Women) and supine (for men) 4. Put on gloves 5. Clean the perineal or preposium area with NaCl liquid or aquades 6. Perform urinary catheter insertion by applying the aseptic principle 7. Connect the urinary catheter with the urine bag 8. Fill the balloon with NaCl 0.9% as recommended by the manufacturer 9. Catheter tube fixation above the symptomatis or in the thigh 10. Make sure the urine bag is placed lower than the bladder 11. Provide a time label for installation Education 12. Explain the purpose and procedure of urinary catheter insertion 13. Encourage breathing during catheter tube insertion
Ineffective Peripheral Perfusion (D.0009)	**Peripheral Perfusion (L.02011)** After nursing action for 3x24 hours, it is expected that peripheral perfusion increases with the following outcome criteria: 1. Capillary filling improves 2. Acral improves 3. Turgor skin improves 4. Decreased pale skin tone	**Circulation Treatment (I.02079)** Observations 1. Check peripheral circulation 2. Identification of risk factors for circulatory disorders 3. Monitor heat, redness, pain, or swelling in the extremities Therapeutic 4. Avoid IV insertion, or blood collection in areas of perfusion limitation 5. Avoid blood pressure measurements on extremities with limited perfusion

Diagnosis	Objectives and Outcome Criteria	Intervention
		6. Avoid pressing and applying the tourniquet to the injured area 7. Practice infection prevention 8. Do foot and nail care 9. Hydrate <u>Education</u> 10. Advocate quitting smoking 11. Encourage regular exercise 12. Recommend checking the bath water to avoid burning skin 13. Recommend using blood pressure-lowering, anticoagulant, and cholesterol-lowering medications, if necessary 14. Recommend taking blood pressure control medications regularly 15. Recommend avoiding the use of beta-blockers 16. Recommend proper skin care 17. Organize a vascular rehabilitation program 18. Teach a diet program to improve circulation 19. Inform the signs and symptoms of an emergency to report
Risk of Injury (D.0136)	**Injury Rate (L.14136)** After nursing action for 3x24 hours, it is expected that the injury rate decreases with the following outcome criteria: 1. Decreased incidence of injuries 2. Decreased wounds/abrasions	**Injury Prevention (I.14537)** <u>Observations</u> 1. Identify areas of the environment that could potentially cause injury 2. Identification of drugs that have the potential to cause injury 3. Identify the fit of the elastic footwear or stockings on the lower extremities <u>Therapeutic</u> 4. Make sure your calling or phone rings are within reach 5. Make sure personal belongings are within easy reach

Diagnosis	Objectives and Outcome Criteria	Intervention
		6. Keep the bed position at the lowest position when in use 7. Use a bed safety in accordance with the health care facility's policy 8. Consider using a personal electronic alarm or sensor alarm on a bed or chair 9. Discuss the necessary exercises and physical therapy 10. Discuss appropriate mobility aids (ex: canes or walkers) 11. Increase the frequency of patient observation and supervision, as needed Education 12. Explain why fall prevention interventions to patients and families 13. Recommend slowly changing positions and sitting for a few minutes before standing up
Risk of Nutrient Deficit (D.0032)	**Nutritional Status (L.03030)** After nursing action for 3x24 hours, it is expected that the nutritional status with the following outcome criteria: 1. Increased portions of meals 2. Weight improves 3. Body Mass Index (BMI) improves	**Nutrition Management (I.03119)** Observations 1. Identify nutritional status 2. Identification of food allergies and intolerances 3. Identify preferred foods 4. Identify calorie needs and types of nutrients 5. Identification of the need for the use of a nasogastric hose 6. Food intake monitor 7. Weight monitor 8. Monitor laboratory test results Therapeutic 9. Perform oral hygiene before eating, if necessary 10. Facilitation of determining dietary guidelines (ex: food pyramids)

Diagnosis	Objectives and Outcome Criteria	Intervention
		11. Serve food attractively and at the right temperature 12. Provide high-fiber foods to prevent constipation 13. Provide high-calorie, high-protein foods 14. Provide dietary supplements, if necessary 15. Stop feeding through the nasogastric tube if oral intake is tolerable <u>Education</u> 16. Teach sitting positions, if possible 17. Teach a programmed diet <u>Collaboration</u> 18. Collaborative administration of medication before meals (e.g., pain relief, antiemetic), if necessary 19. Collaborate with a nutritionist to determine the number of calories and type of nutrients needed, if necessary
Risk of Ineffective Myocardial Perfusion (D.0014)	**Myocardial Perfusion (L.02011)** After nursing for 3x24 hours, it is expected that myocardial perfusion increases with the following outcome criteria: 1. Overview of ECG ischemia/incest/infarction decreased 2. The pain is decreasing 3. MAP improves 4. Tachycardia improves 5. Bradycadia improves	**Arrhythmia Management (I.02035)** <u>Observations</u> 1. Check the onset and triggers of arrhythmias 2. Identify the type of arrhythmia 3. Monitor the frequency and duration of arrhythmias 4. Monitor chest pain complaints (intensity, location, triggering factors, and debilitating factors) 5. Monitoring of hemodynamic response due to arrhythmias 6. Oxygen Saturation Monitor 7. Monitor up electrolyte <u>Therapeutic</u> 8. Provide a calm environment 9. Install artificial breathing pathways (e.g. OPA, NPA, LMA, ETT), if necessary

Diagnosis	Objectives and Outcome Criteria	Intervention
		10. Install intravenous access 11. Install a Heart Monitor 12. Record 12 lead ECG 13. Check the QT interval before and after the administration of medications that may prolong the QT interval 14. Perform a valsava maneuver 15. Perform a unilateral carotid massage 16. Give oxygen, as directed 17. Prepare for the installation of an ICD (implantable cardioverter defibrillator) <u>Collaboration</u> 18. Collaboration in administering antiarrhythmias, if necessary 19. Collaboration of cardiology giving, if necessary 20. Collaborative provision of defibrillation, if necessary
Risk of Fluid Imbalance (D.0036)	**Fluid Balance (L.03020)** After nursing action for 3x24 hours, it is expected that fluid balance will improve with the following outcome criteria: 1. Dehydration decreases 2. Increased fluid intake 3. Decreased edema 4. Dehydration decreases 5. Increased urine output	**Fluid Management (I.03098)** <u>Observations</u> 1. Monitor hydration status (ex: pulse frequency, pulse strength, acral, capillary replenishment, mucosal moisture, skin turgor, blood pressure) 2. Daily weight monitor 3. Monitor your weight before and after dialysis 4. Monitor laboratory test results (ex: hematocrit, Na, K, Cl, urine specific gravity, BUN) 5. Hemodynamic status monitor (ex: MAP, CVP, PAP, PCWP, if available) <u>Therapeutic</u> 6. Record intake-output and calculate 24-hour fluid balance 7. Provide fluid intake, as needed

Diagnosis	Objectives and Outcome Criteria	Intervention
		8. Administer intravenous fluids, if necessary Collaboration 9. Collaboration of diuretic administration, if necessary

2.4.4 Nursing Implementation

The implementation of nursing in generalized tetanus patients is carried out in an integrated manner by prioritizing the maintenance of airway patency and minimizing environmental stimulation that can trigger spasms. The nurse positions the patient's head appropriately, performs regular suction of mucus, and strictly monitors the autonomic stability of circulation. Furthermore, the intervention focused on the management of the nervous and musculoskeletal system through the administration of the sedative drug Diazepam in accordance with medical collaboration, followed by passive range of motion (ROM) exercises slowly when the patient's muscles are in the relaxation phase to overcome impaired physical mobility and prevent joint contractures. In addition, nurses also carry out integument care to prevent pressure sores, manage nutrient fulfillment via NGT, and monitor urine output through a sedentary urinary catheter to detect early risk of retention due to sphincter spasms.

2.4.5 Nursing Evaluation

Nursing evaluations formulated using the SOAP method showed varying results in each organ system after intensive nursing care. In the aspects of respiration and circulation, airway clearance can be maintained effectively characterized by the absence of laryngospasm, although fluctuations in vital signs due to autonomic dysfunction still require close monitoring. Meanwhile, an evaluation of the main problem of impaired physical mobility showed that the results were partially resolved, after a combination of sedation and passive

ROM exercises, the patient's level of muscle stiffness (rigidity) began to experience a subjective decrease and the Range of Motion of the joints experienced a functional improvement even though the strength of the voluntary muscles had not fully recovered. Elimination and nutrition problems were recorded to be maintained within adequate limits with the help of tools, and no signs of secondary physical injury or new pressure wounds were found during the case management period.