

Nursing Care for Disorders of the Integumental System: Debridement of Cellulitis e.c. Diabetes Mellitus Type II a/r Dextra of the Femur and Fibula

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Abstract: Inflammation of the subcutaneous tissue resulting from *Streptococcus aureus* and *Streptococcus pyogenes* bacteria is known as cellulitis. This research study aims to provide practical experience in assessment, diagnosis, planning, execution, and evaluation of direct and comprehensive nursing care for clients with integumentary system issues. When writing in a case study format, descriptive writing is used. These cases had difficulties with restricted physical mobility, poor skin tissue integrity, acute pain, and dietary inadequacies. The study's tactics are tailored to the specific health concerns of each participant, taking into account the predetermined goals and objectives. Addressing the root causes of the issues with the integumentary system is the goal of nursing care. Mr. S showed improvement in the nursing care process evaluation, with three nursing problems fully treated and one partially fixed. The findings of this scientific study align with previously developed tactics. This is inextricably linked to the family's provision of support, guidance from clinical instructors and academic supervisors, and the entire nursing care implementation process for Mr. S, who has integumentary system difficulties

Keywords: nursing care, diabetes mellitus, cellulitis, debridement

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Introduction

Diabetes Mellitus (DM) is characterized by high blood sugar levels (hyperglycemia) due to impaired insulin synthesis by pancreatic β (beta) cells or diminished insulin receptor sensitivity. Diabetes mellitus (DM) is known as "The Silent Killer" because to its ability to induce difficulties in numerous organs of the body (Lestari et al., 2021; P2ptm Kemenkes, 2024).

The International Diabetes Federation (IDF) reported that 537 million people worldwide have diabetes mellitus, with 95% suffering from type 2 diabetes and only 5% from type 1. Indonesia ranks as the

fifth country with the highest number of diabetics globally, following China, India, Pakistan, and the United States, with 19.5 million cases. The IDF predicts this number will increase to 29 million by 2045. In 2016, the World Health Organization (WHO) reported 422 million cases of diabetes mellitus globally, with a continued rise expected by 2025, primarily due to type 2 diabetes mellitus, accounting for 90% of all diabetes cases worldwide (Saeedi et al., 2019; International Diabetes Federation, 2021; Yan et al., 2022; WHO, 2024).

Diabetes mellitus that is not appropriately treated might result in problems such as microangiopathy and

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macroangiopathy. One of the effects of microangiopathy is diabetic neuropathy in the legs, namely cellulitis. Cellulitis is typically caused by the bacteria *Streptococcus aureus* and *Streptococcus pyogenes*. It is an inflammation of subcutaneous tissue caused by *Streptococcus aureus*, *Streptococcus pyogenes*, or other bacteria. Cellulitis can affect any part of the body, but it is most frequently on the skin of the face and feet. The percentage of men was higher at 56.09%, with an average age of 50.22 years. The areas with the highest prevalence of cellulitis were the arms (12.19%), head and neck (13.08%), legs (71, 56%), and body (3.25%) (Naidoo et al., 2015; Rasid et al., 2020).

Cellulitis due to diabetes complications can disrupt basic human needs in the physiological aspect, where clients will experience changes in nutrition and disturbances in comfort in the form of acute pain and edema, which can interfere with patient mobilization, muscle stiffness occurs, and the patient's muscle strength decreases, interfering with movement. Cellulitis as a side effect of diabetes mellitus can be severe and even life-threatening if not treated properly. Lymphangitis, elephantiasis, recurrence, subcutaneous abscess, gangrene, sepsis, and even death is among the complications of cellulitis (Centers for Disease Control and Prevention, 2022; NHS, 2024).

Patients with cellulitis require treatment to relieve discomfort and swelling. This is intended to prevent infection from spreading to the blood and other human organs. Cellulitis is a serious condition, especially if the infection is extensive in the skin, and it frequently necessitates surgical debridement (Centers for Disease Control and Prevention, 2022; NHS, 2024).

Debridement is a crucial process in wound care. It involves the removal of dead tissue and foreign items from a wound to expose healthy tissue beneath. This process is essential for promoting healing by allowing cell migration across a moist wound without being inhibited by excessive levels of exudate and the associated infection concerns (UPMC, 2022; Manna et al., 2023; South Eastern Sydney Local Health District, 2023).

There are several types of debridement, including biological debridement, which uses sterile maggots to eat away at dead tissue and control infection. Enzymatic debridement uses an ointment or gel with enzymes that soften unhealthy tissue, while autolytic debridement relies on the body's natural enzymes and fluids to soften and remove dead tissue. Mechanical debridement involves the use of a moving force to remove unhealthy tissue, and sharp debridement involves cutting away dead tissue with scalpels or scissors (UPMC, 2022; Manna et al., 2023; South Eastern Sydney Local Health District, 2023).

Debridement is indicated for wounds that are not healing properly, are infected, or have a high risk of infection. It is a highly selective process that only removes necrotic tissue, and it is essential for preparing the wound bed for re-epithelialization. The clinical significance of wound debridement cannot be overstated, and it provides the benefits of removing necrotic tissue and bacteria, as well as stimulating the wound bed to support healing (UPMC, 2022; Manna et al., 2023; South Eastern Sydney Local Health District, 2023).

In the context of diabetes mellitus, debridement is a critical component of wound management to prevent complications such as cellulitis. Nurses play a key role in providing nursing care to patients with post-debridement indications of cellulitis, including wound care to prevent infection and other complications, effective patient education on personal hygiene and infection prevention, and collaboration with staff. Other health experts can assist in giving pharmaceutical therapy and developing an appropriate nutrition program to speed up the healing process (UPMC, 2022; Manna et al., 2023; South Eastern Sydney Local Health District, 2023).

In summary, debridement is a vital process in wound care that helps to promote healing by removing dead tissue and foreign items from a wound. It is indicated for wounds that are not healing properly, are infected, or have a high risk of infection, and it is essential for preparing the wound bed for re-epithelialization. Debridement is a critical component of wound management in the context of diabetes mellitus, and it is essential for preventing complications such as cellulitis.

Method

This case study employs a descriptive approach, reporting on nursing care provided to Mr. S with Integumentary System Disorders: Post Cellulitis Debridement e.c Diabetes Mellitus Type II a/r Femur and Fibula Dextra through a comprehensive process. Assessments, nursing diagnoses, nursing planning, nursing implementation and evaluation, and progress documentation were developed by observing and assessing the patient's state, as well as examining their vitals and physical condition.

Result and Discussion

In carrying out nursing care for patients, Mr. S with Post Debridement Case a/i Cellulitis e.c Diabetes Mellitus Type II a/r Dextra Femur for 3 (three) days, namely from 4th of April 2023 to 6th of April 2023. The author tries to implement steps starting from assessment, nursing diagnosis, planning,

implementation, and evaluation in accordance with theoretical objectives and paying attention to patient needs. In this section, the author will compare theoretical investigations with case reviews. The results of this comparison will reveal a gap between theoretical research and facts in the field, necessitating a discussion of numerous areas ranging from assessment to evaluation. The results achieved are:

1. Assessment

The initial stage of nursing care involves explaining the goals and objectives to the family and patient. During the assessment step, the author obtained subjective data from the patient and family through a direct interview, and objective data from the patient through a physical examination. During the assessment, the author conducted an anamnesis to determine the patient's identification, the identity of the person in charge, the main complaint, current health history, medical history, family health history, daily activity patterns, and performed a physical exam. The author was able to collect data for this study because of good cooperation, guidance, and direction, as well as full support from numerous parties and the desire of the family and the patient themselves.

Mr. S, a 53-year-old patient, reported pain after the debridement procedure. The pain was sharp, felt in the thigh and calf, and had a pain scale rating of 8 (0-10). The pain was intermittent. Patients also complain of losing their appetite because of nausea and vomiting. Upon evaluation of vital signs, the patient's body temperature increased to 38.2° C, pulse 112 times per minute (tachycardia), blood pressure 130/80 mmHg, and respiration 23 times per minute. A post-debridement wound was discovered on the right femur with a length of 12 cm, a width of 10 cm, and a depth of 0.5 cm; the wound on the right fibula was 13 cm, a width of 10 cm, and a depth of 0.5 cm; the wound had seeped into the dressing; and there was a decreased muscle strength scale in the right leg with a scale of 1, indicating that the extremities could not be moved but muscle contractions could be felt. Pain experienced by patients following debridement is an inflammatory response caused by injury to the skin tissue, which disrupts tissue continuity. In this example, the damage is induced by surgical trauma, specifically debridement. This rupture in tissue continuity causes the release of proteolytic chemicals such as bradykinin, histamine, and prostaglandins. These three compounds will activate nociceptors, which will release peptide substances (SP). The delta A pain receptor transmits this receptor, which is then conveyed via the spinothalamic tract to the thalamus, which is subsequently interpreted as pain in the cerebral cortex, causing pain to be sensed (Kendroud et al., 2022; Armstrong & Herr, 2023).

The patient's loss of appetite owing to nausea and vomiting is caused by acute discomfort, which activates autonomic (parasympathetic) nerve activity. This can increase the development and secretion of parietal cells from the stomach mucosa, resulting in hypersecretion of gastric acid and hyperacidity. This condition causes Mr. S to experience nausea and vomiting as well as a loss in appetite.

The patient's skin tissue integrity has been harmed because of a hyperglycemic state caused by complications from diabetes mellitus type 2. This hyperglycemic state increases blood viscosity, reducing blood flow to the periphery as well as oxygen availability. This situation will cause cellular ischemia and tissue necrosis.

He was also unable to move his right leg due to decreased muscle strength. In this situation, muscular strength decreases due to disruption of tissue integrity, leading the body to release proteolytic chemicals (bradykinin, histamine, prostaglandins, and substance P). These proteolytic chemicals produce dilatation of blood vessels, increasing capillary permeability and interstitial fluid shift, causing capillary fluid to leak and create exudates, resulting in edema. This edema state can put strain on blood vessels, reducing the delivery of oxygen and nutrients to the tissue and resulting in decreased muscle strength (Manna et al., 2023).

Post-operative debridement patients typically experience pain from the surgical procedure, wounds that may seep into the dressing, changes in vital signs (increased blood pressure, tachycardia, increased body temperature), and disruptions in breathing patterns because of anesthesia administration in the surgery room. As a result of anesthesia, patients may experience decreased appetite, nausea, and decreased muscle strength. When the skin is peeled off to show the necrotic tissue hiding beneath the skin tissue, patients who have undergone debridement will suffer integument system injury (Manna et al., 2023; Rahavi-ezabadi et al., 2021).

Based on the results of this study, the author discovered a correlation between the theory and the data collected from patients. It includes complaints of pain, decreased appetite accompanied by nausea, increased vital signs, seeping wound dressings, decreased muscle strength in the extremities, and damaged skin tissue integrity.

Post-operative debridement patients typically experience pain because of the surgical procedure, wounds that may seep into the dressing, changes in vital signs (increased blood pressure, tachycardia, increased body temperature), and impaired breathing patterns. Anesthesia in the operating room resulted in a decreased appetite, nausea complaints, and decreased muscle strength (Manna et al., 2023; Rahavi-ezabadi et al., 2021).

After conducting the study, the data analysis of the problems that arose for Mr. S revealed: acute pain caused by the activation of the pain center in the thalamus due to disruption of tissue continuity, characterized by the patient complaining of pain on a pain scale of 8 (0-10), nutritional deficit caused by increased gastric acid secretion, indicated by the patient complaining of no appetite, nausea, and vomiting. The integrity of the skin tissue is related to the disruption of tissue continuity, as indicated by the patient's statement that he has a post-operative wound on his right leg that is painful, and impaired physical mobility is related to a decrease in muscle strength caused by the disruption of tissue continuity, as indicated by the patient's complaint that he cannot move his right leg.

2. Nursing Diagnoses

Nursing diagnosis is a clinical assessment of a patient's response to current or anticipated health problems or life processes. Nursing diagnosis seeks to discover individual patient, family, and community responses to health-related circumstances (Tim Pokja SDKI DPP PPNI, 2017). According to the PPNI DPP SDKI Working Group (2017), nursing diagnoses that may occur in post-operative patients includes acute pain caused by activation of the pain center in the thalamus because of tissue continuity rupture and nutritional insufficiency caused by increased gastric acid secretion. Skin and tissue integrity are related to disruptions in tissue continuity, inferior physical mobility is related to decreased muscle strength, and infection risk is related to disruptions in tissue continuity (Tim Pokja SDKI DPP PPNI, 2017).

After conducting the study, the data analysis of the problems that arose for Mr. S revealed: acute pain caused by the activation of the pain center in the thalamus due to disruption of tissue continuity, characterized by the patient complaining of pain on a pain scale of 8 (0-10), nutritional deficit caused by increased gastric acid secretion, indicated by the patient complaining of no appetite, nausea, and vomiting. The integrity of the skin tissue is related to the disruption of tissue continuity, as indicated by the patient's statement that he has a post-operative wound on his right leg that is painful, and impaired physical mobility is related to a decrease in muscle strength caused by the disruption of tissue continuity, as indicated by the patient's complaint that he cannot move his right leg.

According to the DPP PPNI SDKI Working Group Team (2017), there are five nursing-related problems that can occur in postoperative patients. The author discovered four nursing difficulties that emerged and were consistent with the theory, as well as one nursing problem that the author did not detect in Mr. S, which is the possibility of infection caused by disruption

in tissue continuity circumstances (Tim Pokja SDKI DPP PPNI, 2017).

These nursing issues emerged because of complaints of pain, a decreased appetite accompanied by nausea and vomiting, a wound on the patient's right leg, and their inability to move that limb. In general, the nursing diagnoses that arose in Mr. S are consistent with the theory and regulations of the Indonesian Nursing Diagnosis Standards (SDKI), which require the completion of 80-100% of main data for each diagnosis.

3. Nursing Planning

Nursing planning or nursing intervention refers to all care provided by nurses that is based on knowledge and clinical judgment to accomplish the desired goals (PPNI, 2018). The author developed this nursing plan in multiple steps, including identifying nursing difficulties, nursing goals, and action plans for overcoming nursing problems in patients. The plans that the author compiled include:

- a. Acute pain is caused by thalamic pain centre activation because of tissue continuity disturbance.

The purpose of giving nursing care for 1 x 24 hours is to minimize pain, as evidenced by decreased pain complaints, a pain scale decrease from 8 to 5 on a scale of 0 to 10, decreased grimacing, and pulse frequency in the range of 60-100 times per minute. The SIKI DPP PPNI Working Group Team (2018) recommends the following interventions: 1) Monitor the patient's pain scale; 2) Monitor the patient's pulse rate; 3) To alleviate pain, apply a warm compress to the wound area; 4) Massage the lumbar 3-4 times to relieve pain; 5) Manage the environment by reducing noise in the room; 6) Teach distraction strategies to relieve pain, such as watching movies or listening to music; 7) Teach non-pharmacological approaches for pain relief (warm compresses and lumbar compression 3-4); and 8) Deliver the analgesic ketorolac injection according to the doctor's treatment plan (Tim Pokja SIKI DPP PPNI, 2018)..
- b. Nutritional deficiency is linked to increased stomach acid secretion.

The purpose of giving nursing care for three times a day is to raise the patient's nutritional intake, with the criterion being that the appetite increases, the patient consumes half a serving, and the frequency of nausea and vomiting complaints diminishes. The SIKI DPP PPNI Working Group Team (2018) recommends the following interventions: 1) Monitor the patient's nutritional intake every day; 2) Monitor the patient's weight; 3) Monitor complaints of nausea and vomiting; 4) Provide meals in warm, appealing conditions; 5) Encourage the patient to consume modest quantities

often every one hour; 6) Encourage eating in a seated position; 7) Teach the planned diet; and 8) Give omeprazole injectable pharmacological therapy according to the doctor's therapy programme (Tim Pokja SIKI DPP PPNI, 2018).

- c. Disruption of skin tissue integrity caused by disruption of tissue continuity.

The purpose of giving nursing care for 3x24 hours is to increase skin tissue integrity, as evidenced by decreased skin tissue integrity damage, decreased pain complaints, reduced wound odor, reduced wound bleeding, and skin temperature. The skin around the wound becomes less red. The SIKI DPP PPNI Working Group Team (2018) recommends the following interventions: 1) Monitor wound characteristics (drain, color, size, odor); 2) Check for indications of infection (rubor, dolor, calor, tumor); 3) Provide wound care using sterile principles; 4) Describe indicators of infection in wounds; 5) Teach how to treat wounds at home; 6) Encourage the consumption of high-calorie, high-protein foods; 7) Limit the number of visits; and 8) provide the antibiotic meropenem according to the doctor's treatment plan (Tim Pokja SIKI DPP PPNI, 2018).

- d. Impaired physical mobility corresponds to decreased strength of the muscles because of tissue discontinuity.

The purpose of providing nursing care for three times a day is to increase the patient's physical mobility, with the criteria being that the patient can move his right leg, that his right leg muscular strength rises from one to two, and that his pain when moving his right leg diminishes. The SIKI DPP PPNI Working Group Team (2018) recommends the following interventions: 1) Monitor the patient's overall condition during early mobilization; 2) Explain the aims and processes for early mobilization to the family and patient; 3) Perform passive and active range of motion exercises in bed; 4) Teach the patient and family basic mobilization techniques (sitting on the bed, inclined to the right and left); and 5) Teach the patient and family active ROM activities (Tim Pokja SIKI DPP PPNI, 2018).

4. Nursing Implementation

Nursing implementation refers to certain behaviours or activities carried out by nurses to execute nursing interventions. Nursing implementation was carried out on April 4-5, 2023. At this point, the author attempted to provide nursing care for Mr. S. This is because the treatments planned are customized to the patient's needs, circumstances, and condition. Acute pain correlates with activation of the pain centre in the thalamus caused by breakdown of tissue continuity.

Pain management is carried out by monitoring the patient's pain scale and pulse frequency, applying warm compresses to the wound area to relieve pain, massaging the lumbar 3-4 to relieve pain, controlling the environment by reducing noise in the room, and teaching techniques. To reduce pain, distract by watching movies or listening to music, teach non-pharmacological techniques (warm compresses and 3-4 lumbar compressions), and give analgesic ketorolac injections under the doctor's therapy program.

After this implementation, patients' pain complaints, grimacing, and pain scales decreased from 8 to 4 on a scale of 0 to 10. To relieve pain, patients might use non-pharmacological approaches such as distraction techniques, warm compresses, and 3-4 lumbar massages. This implementation is a targeted action to alleviate pain in patients.

Nutritional deficiencies are related to increased stomach acid secretion. The implementation carried out was nutritional management by monitoring the patient's nutritional intake every day, monitoring the patient's weight, monitoring complaints of nausea and vomiting, providing food in warm and appealing conditions, encouraging the patient to eat small portions but often once every 1 hour, encouraging them to eat in a sitting position, explaining the programmed diet, giving omeprazole injection pharmacological therapy according to the doctor's therapy.

After implementation, the patient's appetite increased from 2 spoons to ½ serving, and symptoms of nausea decreased from 8x/day to no vomiting. Aside from that, patients can learn which therapy and food plans are best for them to speed up the healing process. However, due to limited patient mobility for weight assessment, the author was unable to meet the requirements for increasing patient weight. This implementation seeks to improve patients' nutritional intake.

Disruption of skin tissue integrity leads to disruption of tissue continuity, the implementation includes wound care by monitoring wound characteristics (drain, colour, size, odor), looking for indicators of infection (rubor, dolor, calor, tumor), performing wound care complying with sterile principles, and explaining signs of infection to the patient, explain how to care for wounds at home, encourage the consumption of high-calorie and high-protein foods, limit the number of visits, and give the antibiotic meropenem in accordance with the doctor's therapy plan.

After this implementation, complaints of wound pain decreased, there was no odor in the wound, there was no bleeding in the wound, and the dressing did not leak, the temperature around the skin decreased from

initially feeling warm, and there was less redness on the skin around the wound. In addition, patients and families receive instruction on the signs and symptoms of infection, as well as how to care for wounds at home on their own, allowing them to monitor the condition of their wounds at home. This implementation is the primary activity for improving skin and tissue integrity and preventing infection in patient wounds.

Impaired physical mobility corresponds with decreased strength of the muscles due to disruption of tissue continuity, the implementation includes monitoring the patient's general condition during early mobilization, explaining the purpose and procedure of early mobilization to the family and patient, performing passive and active range of motion exercises in bed, teaching the patient and family simple mobilization methods (sitting on bed, tilted to the right and left), and teaching the patient and family active and passive range of motion exercises.

After this implementation, the patient can move his legs, his leg pain decreases, and his leg muscle strength increases. In addition, the patient's joint stiffness decreases, and the patient can practice mobilization and range of motion exercises that have been taught to enhance mobilization and speed up the healing process. This implementation may enhance patient mobility and muscle strength.

5. Nursing Evaluation

During the evaluation step, the author performed both formative and summative assessments. Each nursing action is followed by a formative evaluation. The results of the formative evaluation demonstrate that all nursing activities performed on the patient can minimize or eliminate the patient's issues, whereas the author performed the summative evaluation on the fourth day after three days of giving nursing care to Mr. S.

Based on the results of the nursing evaluation of four nursing difficulties that appeared in Mr. S acquired the following results:

1. Acute pain caused by the activation of the pain centre in the thalamus as a result of tissue continuity disruption can be resolved on the third day because Mr. S decreased, the pain scale decreased from 8 to 4, and the grimaces decreased; additionally, the family and Mr. S cooperated during the nursing care process, allowing the author to easily carry out nursing interventions to resolve acute pain.
2. On the third day, the nutritional deficiency caused by increased gastric acid output was fixed. The patient's appetite increased from 2 tablespoons to ½ serving, and symptoms of nausea and vomiting decreased. This is due to

the family, and Mr. S cooperates throughout the nursing care process, adhering to every recommendation and therapy program provided to resolve problems. However, due to limited patient mobility, the author was unable to assess the patient's weight and so was unable to track it.

3. The disruption of skin tissue integrity caused by the rupture of tissue continuity has been partially healed. After 3 days of nursing treatments, the patient's wound was improving, as evidenced by the wound looking clean, no bleeding, no unpleasant odor in the wound, less signs of infection, and reduced pain in the wound, but no new tissues had formed. This is due to the relatively long wound healing process, as well as the limited time available for giving nursing care, which only partially solves the problem of skin integrity abnormalities.
4. Impaired physical mobility caused by a decrease in muscle strength due to tissue continuity can be resolved on the third day, as seen by the patient's right leg muscular strength assessment, which increased from 1 to 2. Complaints of pain and grimacing when moving the extremities decreased. This is supported by the patient's family, who are cooperative and follow every advice provided, as well as the patient's active participation in early mobilization and range of motion exercises to resolve the problem.

Conclusion

This study showed that four issues surfaced during three days of nursing care. Nurses can only address nutritional issues.

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