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Role of Nursing Care in Healing Gangrenous Wounds in Dibetic Patients in Indonesia

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Key words: Nursing care, Gangrene, nursing service, nursing care consisting of diet, physical exercise, wound care, insulin administration, psychological factors, social factors and wound healing

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Abstract: Based on the initial survey, it was known that the number diabetic patients with gangrene at Dr. Pirngadi General Hospital Medan in the last 5 years were as many as 236 patients and the diabetic cases increase annually. Gangrenous wound healing can be affected by diet, physical exercise, wound care, insulin administration, psychological and social factors. The study analyzed the effect of diet, physical exercise, wound care, insulin administration as well as psychological and social factors, to KGD wound healing, wound size and time decreases. The study was a quasi-experimental design (quasi experiment), under the design of the separate pretest-posttest-sample control group design, involving two groups: the intervention group and the control group. Nursing care has a significant role to gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Medan. This is indicated by the role or influence of the sixth variables of nursing care consisting of diet, physical exercise, wound care, insulin administration, psychological factors, social factors and wound healing with the value of the odds ratio >1. Based on the multivariate analysis, the value of the role of nursing care to the gangrenous wound healing in diabetic patients is at 0410×100% = 41.0%. Gangrenous wound nursing care in patients with diabetes mellitus showed a significant effect with a significance value of 0.001, less than the sig-α (0.05). This means that the six independent variables simultaneously bring significant influence on the dependent variable (gangrenous wound healing). It is recommended that further studies improve nursing care services on gangrenous wound healing in diabetic patients, especially with the provision of better diet and exercise facilities so gangrenous wound healing in diabetic patients can be improved.

INTRODUCTION

Diabetes mellitus continues to increase with the increasing levels of prosperity, changes in lifestyle and diet, as well as age. Diabetes Mellitus is a disease that requires a long-term and lifelong therapy. Patients with low knowledge of the disease experiencean increased risk of complications as much as 100%. From the medical

perspective, Diabetes Mellitus is often present accompanied with hypertension and causes a lot of complications such as cardiovascular, skin, nervous system and kidneys (Endang, 2007).

Caregiver role is an activity or process in nursing care plan provided directly to patients to meet the objective needs of the patient, so as to solve the problem at hand and caregiver role is conducted by the rules of the science of nursing.

Caregiver role is given in an effort to meet the needs of the patient; in this case, Abraham Maslow describes five basic human needs, namely physiological needs, including nutrients and oxygen; safety needs; love and belonging needs; self-esteem needs and self-actualization needs (Yulia, 2002). The purposes of the provision of Caregiver Role in nursing care plan include the following (Marilynn and Frauces, 1999):

- Assisting individual patients to be independent
- Inviting individual citizens to participate in the health field
- Helping individuals to develop their potential in maintaining optimal health status as to create no dependence on other patients in maintaining health
- Helping individuals to obtain optimal health status

When a patient enters a health care system, the steps in nursing care plan are as follows: collecting data, identifying problems or needs (nursing diagnoses), setting up goals and identifying the expecting outcomes. After the intervention, nurses evaluate the effectiveness of the steps taken by considering the expected results and objectives to determine whether the problems have been resolved or not (Bararah, 2013).

Nursing service is a sub-system within the health care system in the hospital and it surely has an objective to maintain the quality of service. Nursing service is often used as a measure of the prestige of a hospital in the community; thus, there is the need for professional nurses and nurse managers to provide and regulate the activities of in nursing care plan to the patients, so that, optimal health quality and health care services can be realized.

The results of good in nursing care plan are reduced length of hospital stay with a variety of cases of the disease and costs saving during treatment. One of the many cases that need attention is Diabetes mellitus.

Diabetes mellitus can affect all organs and cause a variety of complaints; symptoms vary widely. Diabetes mellitus can occur gradually so individuals suffering are not aware of the changes such as more drinking, more frequent urination, weight loss. These symptoms can last for such a long time being unnoticed, until the time when one is seeing a doctor and checks the blood glucose levels.

Control of diabetes mellitus should be thoroughly understood and be implemented with such great support. Patients must understand the proper diet, regular physical exercise (lapstail), take appropriate pharmacological medication and get more health education associated with diabetes.

The short-term goal of diabetes management is to eliminate regular complaints on the symptoms of diabetes and to maintain a sense of comfort and healthy condition, as to prevent long-term complications of macroangiopathy, microangiopathy and neuropathy with the ultimate goal to lower morbidity and mortality of DM patients (Soegondo, 2004).

The prevalence of diabetes will increase along with the increase in socio-economic condition of the community. Some data related to the number of diabetes and diabetic wounds in general and in women and men, are listed below:

According to Wild etc. as written by Anja SuB-Burghat from the General Hospital of Munich-Schwabing (2000), Germany, the data is as follows:

In 2000, the prevalence of diabetes at all age groups worldwide is estimated as much as 2.8% and is predicted to rise to 4.4% in 2030. The total number of people with diabetes is predicted to increase from 171 million in 2000 to 366 million in 2030. The increasing rate is largely due to the increase in the population aged over 65 years. According to Wild, diabetes is more common in men than in women but there are more women with diabetes than men are.

Based on Rikesdas Data in 2007, diabetes in women ranks first as the cause of death, as much as 16.3% and the male ranks sixth as much as 6%. The results of 2013 Riskesdas are as follows: the prevalence of diabetes mellitus increased from 1.1-2.1%, the prevalence of hypertension increased from 7.6-9.5 and the prevalence of stroke increased from 8.3-12.1%.

Increased prevalence of non-communicable diseases associated with a variety of behavioral risk factors can actually be prevented. Based on the results of 2013 Riskesdas, non-communicable disease risk factors include central obesity 26.6%; consumption of salty foods 26.2%; consumption of fatty foods 40.7%; frequent consumption of sugary foods drinks 53.1%; low consumption of fruit and vegetables 93.5%; low physical activities 26.1%; sedentary behavior >6 h 25%; mental and emotional disorders (psychological stress) 6.0% and daily smoking 36.3%.

According to the data from Afiat (2001) Makasar, a wound care specialist clinic in South Sulawesi, it is known as follows:

In 2010, Indonesia ranked 10th in the number of diabetic patients and the country rose to rank 6th in 2030. As much as 15% of patients with diabetes will experience diabetic foot ulcer throughout their life. Amputation risk increases to 3.5 times in diabetic foot ulcer patients. Amputation, however does not resolve the problem. Death risk increases by 40% a year after amputation and 80% after 5 years of amputation. In fact, new diabetic foot

ulcer patients come to the hospital with a Wagner scale of 4-5 which makes them only having the option of amputation. There are also patients refusing amputation can recover after receiving treatment at G (Afiat, 2001) Makassar. Thus, the question is which wounds are the non-avoidable amputation and which can be the avoidable amputation; there are various factors to answer these questions, ranging from physical factors, psychological, economic and social. According to Waspadji, the data on diabetic foot ulcer patients shows the following:

Diabetic foot ulcer is rarely reported in population Indonesia; yet, some data available suggests that:

In Jakarta: In a population survey in 1983, the prevalence of diabetic foot ulcer was 2%. Studies on post-amputation diabetic foot ulcer did not show good results since survival of diabetic foot ulcer patients was low-14.8% patients died a year after amputation and within a 3 years follow-up study the figure rose to 37% and in average patients survived only for 23.8 months after amputation.

In Dr. Pirngadi general hospital Medan: Diabetic foot ulcer is the main cause of care needs in which it accounts for 80%. Other factors such as gestational diabetes or diabetes leading to kidney failure do not contribute much.

In the United States: Diabetic foot ulcer is also the main cause of care needs for diabetic patients in USA. Some studies confirm this. During 2 years of research, it is found out that 16% of the treatment of diabetes mellitus is due to diabetic foot ulcer; 23% of the total days of care is due to diabetic foot ulcer as many as 15% diabetic patients is predicted to experience diabetic foot ulcer in their life in this country, the successful management of diabetic foot ulcer ranges from 57-94%, depending on the levels of such ulcers.

Related to amputation in this country: the prevalence of diabetic ulcers in the US population is around 2-10%. In this country, the majority of diabetic ulcers can be saved through such careful management treatment, while only a small number of diabetic ulcer cases that continues to require amputation in lower leg (lower extremity). On this amputation in the United States, there is a declaration related to amputation rate reduction to 50% in 2000. Of the total amputation done in this country, 50% is caused by diabetes mellitus.

Before performing the amputation, a variety of physical, psychological and financial factors must be carefully examined as the condition of the patients after amputation is often not encouraging, because of the following findings:

In the United States that is in California, it has been found that 13% of all patients undergoing amputation will later require further amputation action within 1 year after the initial amputation. The data obtained also confirms that within a period of 1-3 years, 30-50% of patients who have undergone leg amputation will need another leg amputation within that period.

According to EM Yunir, the data is as follows: in 2008 evidence base on Wound Management Seminar, EM Yunir states that one person has to amputated due to diabetic foot ulcer in every 30 seconds all over the world. A 5 years study by Chen HF in Diabetes Care 2006 29-2409-14, on the non-traumatic incidents of diabetic foot ulcer amputation results in the following: non-traumatic incidents of diabetic foot ulcer amputation on men and women were 410.3 and 115.2 per 100,000 patients per year; control 44.4 and 26.9; relative hazard ratio on men was 9.22 and relative hazard ratio on women was 11.67.

A study by Hambleton (2009) in Diabetes Care 32-306-07 and by Bild etc. in Diabetes Care 1989 12-2-31, results in the followings. Life expectancy in 1 year was 1-97%; life expectancy in 5 years was 82%; the mortality or death rate after major amputations per 1,000 patients per year was 273.9 (non-diabetic patients was 36.4%); the mortality rate or death after minor amputations per 1,000 patients per year was 113.4 (non-diabetic patients was 36.4%); amputation in diabetic patients was 15 higher than in non-diabetic patients.

Dr. Pirngadi General Hospital is a hospital referral for the region of North Sumatra. Based on the initial survey, data obtained from the Medical Record (RM) of Dr. Pirngadi General Hospital for 5 years starting from 2009 shows that there were 38 patients with diabetes mellitus experiencing gangrene complications in 2009, 40 patients in 2010, 45 patients in 2011, 54 patients in 2012 and 59 patients in 2013. The total number gangrene in diabetic patients from 2009-2013 is 236 patients and there is an increase in the cases of DM annually. This is possibly related to dietary habits, irregular diet, lack of physical exercise, the uncontrolled use of pharmacologic agents as well as the lack of Diabetes Mellitus wound care in the hospital.

DM ranks four in the category of non-communicable disease at Dr. Pirngadi General Hospital. Based on the data obtained from the report of Communicable Diseases from 2012-2013, there were approximately 170 diabetic patients coming to the hospital. Of the 170 patients, 104 patients were regular patients and 75 patients were new patients the number of female patients was higher (100 patients) compared to the number of male patients (70 patients).

Diabetes can lead to chronic complications of both microangiopathy and macroangiopathy. Chronic complications usually occur within 5-10 years following the diagnosis. DM complications occur in all organs of the body to cause 50% mortality due to coronary heart disease and 30% due to kidney failure. In addition to death, diabetes can also cause disability. As many as 30% of patients with diabetes mellitus are blind due to complications of retinopathy and 10% undergo

amputation of limbs (Medicastore, 2007). Complications of diabetes can be prevented, delayed or slowed by controlling blood sugar levels.

DM management that aims to keep blood sugar levels within the normal range can be made non-pharmacological and pharmacological by controlling blood sugar HbAIc. Non-pharmacological management includes weight control, exercise and diet (Yunir *et al*., 2006). Pharmacological treatment is administration of insulin and oral hypoglycemic drugs. Pharmacological treatment must be done if the non-pharmacological therapies can no longer control blood glucose levels and shall be done by not leaving non-pharmacological therapies that have been applied previously (Yunir *et al*., 2006).

Programs on management of diabetic patients at Dr. Pirngadi General Hospital are carried out through the pharmacological management including the administration of oral hypoglycemic agents and insulin as well as non-pharmacological management that includes health education on meal plan, weight control and exercise. The provision of information by nurses and specialists in internal medicine for diabetic patients and their families is carried out once in a month with different topics discussed every month. Based on interviews with a number of patients, some patients confirmed that health education done periodically had indeed increased their knowledge about the disease, yet it did not make them truly understand the benefits of DM management and to immediately comply with the advice and recommendation from health professionals, especially nurses.

Based on the Medical Record (RM) data obtained from the hospital in 2014, there were 65 diabetic patients with gangrene complications and this condition may lead to even worse complication if theydo not control their eating habits, diet, physical exercise, pharmacological drugs and lack of Diabetes Mellitus wound care.

Younger diabetic patients experience even severe infections such as streptococcal gangrene. This situation is characterized by the expansion of cellulitis and the emergence of vesicular or hemorrhagic bullae. Necrosis will quickly happen to the skin tissue and this process extends in a few days. Giving antibiotics alone is generally not sufficient, therefore, wide excision possibly even amputation must be done. Mortality is high enough (>10%) and has not been changed much in the era of antibiotics. If there is an indication on the use of antibiotics, then penicillin is given at 18-21 million per day and vankonisin at 1 g/12 h. If renal insufficiency happens, the second dose of the drug should be adjusted. In diabetic patients with severe infection, antibiotic therapy alone is generally not sufficient and must be assisted with aggressive debridement. Poor vascularization and poor healing of tissues often requires more proximal amputation of apparent tissue (Abdurrahman, 2006). Minor trauma to the tissue experiencing vascular insufficiency can initiate infection in superficial tissues. Furthermore, peripheral sensory neurophaty for wound healing will cause less or no pain and this will lead to delayed treatment. Infection can take the form of necrosis cellulitis of soft tissue, sinusitis or osteomyelitis. Vascular insufficiency is instrumental in the emergence of foot infections. In diabetes mellitus, infection is an important factor in atherosclerotic gangrene pathogenesis. Gangrene happens more in female diabetic patients; when inflammation takes place, it increases vascularity and when atherosclerosis occurs, the response is thrombosis and necrosis. It is estimated that there is also a relationship of vascular insufficiency with urinary tract infections (Abdurrahman, 2006).

The duration of wound healing in diabetic patients in general cannot be predicted, since, wound healing is closely associated with blood glucose. Moya J. Morison concludes that there is a significant correlation between the prevalence of infection and high blood glucose levels. According to the report on diabetes mellitus treatment in the hospital, wound healing for gangrene in diabetic patients is generally, <1 month, followed by a dietary intake after wound healing process which usually leaves scar tissue and healing is not perfect and skin surface looks somewhat blackish that is not necrotic.

Physical exercise is recommended on a regular basis of 3-4 times per week for ½ h in line with CRIPE (Continious, Rhytimical, Interval, Progressive, Endurance training). Exercises must be performed continuously without stopping.

The muscles will be contracting and relaxing regularly, alternating between fast and slow motion, moving gradually from slight to severe exercise in a given time. Exercises to select are walking, jogging, running, swimming, cycling and rowing. Physical exercise must not be done before eating, must be done wearing comfortable shoes and must be accompanied by those who know hypoglycemia attacks. Diabetic people should always have candy and identification card during physical exercise. Foot must be checked carefully before exercise. If the patient has had good diet and done regular physical activities but the blood sugar level is still alarming, consider using efficacious oral hypoglycemic medications or injections (Smeltzer and Suzanne, 2004).

According to Suminarti etc. , most people believe that DM is a hereditary disease, making patients fell pessimistic and inferior. Diet for diabetic patients is affected by various factors both from within and from outside the diabetic patients, as stated by Rowley. Diet for diabetic people is a concrete manifestation of healthy behavior, as according to Sarwono (2003).

The research by Rachmawati confirms that more than 50% of patients with type 2 diabetes have insufficient knowledge on the disease and further complications it may cause making them coming to the hospital with high

blood glucose and severe complications. Soebadri etc., find that 75% of patients with diabetes do not comply with the recommended diet and 50% have poor blood sugar control.

The research by Juleka (2005) confirms that DM occurs due to an imbalance energy intake, carbohydrates and proteins. Soegondo (2004) states that the main risk affecting the occurrence of diabetes is unhealthy eating patterns, in which these people tend to be constantly consuming carbohydrates and food sources containing excessive glucose, plus the lack of physical activity.

Bustan in 2000 reveals that the main risk factors for DM include age, gender and genetic, eating habits, smoking habits. There are many similar studies in patients with diabetes but researchers have not found a specific study related to the role of nursing care in diabetes mellitus with gangrenous wound healing in Indonesia. This needs further investigation.

Based on the afore-presented description, it can be concluded that gangrenous wound healing can be affected by diet, physical exercise, wound care and treatment. Diet can affect wound healing because it is about taking foods with a balanced composition of carbohydrates (46-60%), protein (10-20%) and fat (20-25%), the amount of calories tailored to nutritional status.

In addition, to daily diet, diabetic patients must do sports or physical exercises. Exercises for people with diabetes are objected to burn calories, so that, blood glucose is changed into energy leading to lower sugar levels. Wound care is based on stages (1-5) the higher the stage, the worse the condition.

Consumption of drugs aims to maintain glucose levels, fat, insulin in the blood as well as to provide treatment of chronic diseases. An oral hypoglycemic drug, that is Solfonilurea is used to stimulate the pancreas produce insulin and to reduce insulin resistance, insulin therapy.

Research problem: Based on the above description, the research problem is whether the diet, physical exercise, wound care and treatment affect gangrenous wound healing in diabetic patients?

Research objectives: This study aims at:

- Analyzing the effect of diet on gangrenous wound healing
- Analyzing the effect of physical exercise on gangrenous wound healing
- Analyzing the effect of wound care on gangrenous wound healing
- Analyzing the effect of treatment on gangrenous wound healing
- Analyzing the significant effect of nursing care on gangrenous wound healing in diabetic patients toward their kgd, the size of the wound and kgd time decreases

The significance of the study

For the hospital: The results of the study will become a reference for nurses, especially those at Dr. Pirngadi General Hospital, in giving care related to management of diabetes, especially with gangrene complications in terms of improving the quality of services provided.

For educational institutions: This study will provide a comprehensive procedure on conducting research on nursing care for students, so as to provide them a reference to develop their field of study.

For applied science: The results of this study are expected to help improving the quality of nursing care for diabetic patients, especially as a basis in determining intervention, the most effective nursing care, as well as in developing science and for better treatment of wound healing in diabetic patients. Such that, it will help nurses, doctors, disease experts in creating innovative efforts to prevent further complications of diabetes which may arise as a result of patients undergoing treatment recommended.

For the field of study: This study is expected to shed a light on nursing care and to help nurses develop themselves professionally.

Novelty of the study: In the literature search, we have not found generalization on the role of nursing care in gangrenous wound healing in diabetic patients, such as certain time required for KGD reduction through diet, exercise, wound care as well as medical, psychological and social factors. The impact of wetter environment is better than drier environment for gangrenous wound healing. Controlling the size of the wound is based on stages the higher the stage, the worst the wound is and the vice versa. If progress occurs, then we will find dry wound and the skin returns to normal marking no infections. Wound care is generally done by replacing the bandage every day and by cleaning the wound using antiseptic solution. Wound isleft to dry and open. This treatment can be applied as a role model of nursing care in case of DM gangrenous wound in hospitals.

Literature review

The concept of diabetes mellitus: Diabetes mellitus is derived from the Greek language. Diabetes means to flow continuously. Mellitus means honey or sweet. Diabetes mellitus is a group of symptoms that occur in a person characterized by blood glucose levels exceeding normal (Hyperglycemia) and consequently the body lacks insulin either absolute or relative; it is a chronic disease.

According to Soegondo (2004), diabetes is a group of symptoms that arise in a person caused by the increase of blood glucose level due to insulin deficiency either absolute or relative.

Diabetes mellitus according to Slyvia and Price (2002) is a clinically and genetically metabolic disorder, is heterogeneous and its manifestation includes loss of tolerance of carbohydrates.

Etiology: Insulin Dependent Diabetes Mellitus (IDDM) Type I is a disorder resulting from beta cell destruction which is identified as a foreign object, activating the immune response, or a virus which caninfiltrate the lymphocyte of the pancreas slet that causes the destruction of beta cells and the appearance of symptoms. Non-Insulin Dependent Diabetic Mellitus (NIDDM) type II is due to damage to pancreatic beta cell function and insulin resistance a recuts of the inability of weak muscles and tissues to increase glucose uptake influenced by several factors such as obesity, high-fat and low-carbohydrates diet, lack of exercise and heredity (Jay. H. Stein).

Signs and symptoms: According to Soegondo (2004), the initial symptoms of diabetes mellitus are as follows:

Weight loss and lack of energy: Weight loss that takes place in a relatively short time and lack of energy that causes great decrease in physical abilities are two signs of diabetes since glucose in the blood cannot get into the cells, so there is shortage of fuel to generate cells power.

Frequent urination: High blood glucose levels will cause frequent and in large amount of urination, especially at night.
Excessive thirst: This happens due to the large amount of keton in urine.

Increased hunger: Calories from food eaten, after being metabolized into glucose in the blood are not fully used by the body.

Pathophysiology
Diabetes type I or Insulin Dependent Diabetes Mellitus (IDDM): Environmental factors such as viruses causing autoimmune process that destroys the beta cells of the pancreas, making pancreas unable to destroy the insulin. If insulin is not active, glucose will remain within the body which means that its level in the blood increases and in this circumstance, the body will be weak as there is no energy source in the cell (Massing *et al*., 2003).

Diabetes type II or Non-Insulin Dependent Diabetic Mellitus (NIDDM): In this type, there are two major problems associated with insulin, i.e., insulin resistance and impaired insulin secretion. Insulin is normally tied to specific receptors on the cell surface as a result of this binding, less glucose will get into the cells, causing shortage of fuel (glucose), while the amount of glucose presents in the blood vessels increases. This type of diabetes in addition to high glucose levels, insulin level is too high or normal and it is called as insulin resistance level (Tjokronegoro, 2004).

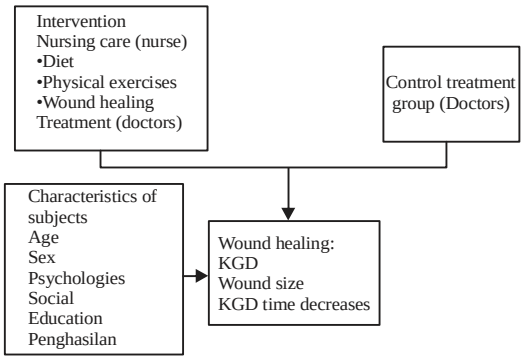

Fig. 1: Research conceptual framework, the role of nursing care in healing gangrenous wounds in diabetic patients

Classification of diabetes mellitus: According to American Diabetes Association and recommendation from Endokrinologi Indonesia (Perkeni), there are three types of diabetes:

Diabetes Type I: Destruction of beta cells, commonly leads to absolute insulin deficiency:

- Autoimmune
- Idiopathic

Diabetes Type II: Varies from dominant insulin resistance up to defect insulin secretion accompanied with insulin resistance.

Other types including:
- Genetic defect of beta cells (DNA Mitochondria)
- Genetic defect of insulin production
- Diseases such as pancreas exocrine (pancreatitis, tumor or pankreatektomi)

Conceptual framework: In this study, the conceptual framework shows the relationship between the variables that is determining the role of nursing care in the treatment of gangrenous wound in diabetic patients from the aspect of KGD, the size of the wound, KGD time decreases.

Based on the theoretical framework that has been developed above, the development of the conceptual framework in this study is as Fig. 1.

Hypothesis: Diet, physical exercise, wound care and treatment affect gangrenous wound healing in diabetic patients from the perspective of their KGD, the size of the wound and KGD time decreases.

MATERIALS AND METHODS

Research design: This study is quantitative and qualitative, using a quasi-experimental design (quasi experiment), under the design of the separate-sample pretest-posttest control group design, involving two groups: the intervention group and the control group. This design aims to find a causal relationship with the involvement of research in the manipulation of the independent variable (Polit and Hungler, 2004).

This design also seeks to reveal the effect of the independent variables and dependent variables by way of involving the intervention and control groups. Measurements in this study were made in the control group and the intervention group on KGD wound healing, wound size and KGD time decreases in diabetic patients with gangrene. The control group does not receive the intervention (Burn and Grobe, 2001). The study design is described in Fig. 2. The analysis was to compare the final results of the control and intervention group (Table 1).

The sample of this study were the subject of as much as 60 gagren injury in patients with DM. This research subject taken based on the criteria of research and voluntary consent of the patient. The subject of research for each treatment group of 30 patients. Reason sampling of 30 patients for each group to compare the two methods of treatment of 60 patients had a minimum sample could represent research data. The samples in this study used consecutive sampling technique in which all study subjects who come and meet the inclusive criteria entered into the study until the deadline is met. The criteria for inclusion in this study are:

- Type 2 diabetic patients
- DM patients with gangrenous wound complications
- Patients aged 34-65 years
- Patients can read, write and can communicate reasonably

Table 1: Nursing Interventions Role in Wound Healing in Patients DM Gangrene in Hospitals Dr. Pirngadi Medan

Targets	Approach	Goals	Intervention	Frequency
Patients	Empowerment	Changes in behavior to improve understanding on prevention and adaptation to psychological conditions as well as better quality of life	Planning the nursing care is one of the ways r processes in nursing directly provided for patients to meet their needs as to solve problems they face and is provided based on scientific requirements	45 minutes, once every week
Secondary: family support	Social and family suppor	To interact with other patients, to ensure patients that they are loved and supports are available physically and psychologically by their parents, siblings, children, relatives, friends, colleagues, paramedic and communities	Socialization involving family, patients through meetings and consultation	4 times in 12 weeks
Tertiary: medical support	Advocacy	Getting medical support in the forms of: prevention, promotion, curative and rehabilitation	Meetings between patients, doctors, nurses and family	4 times in 12 weeks

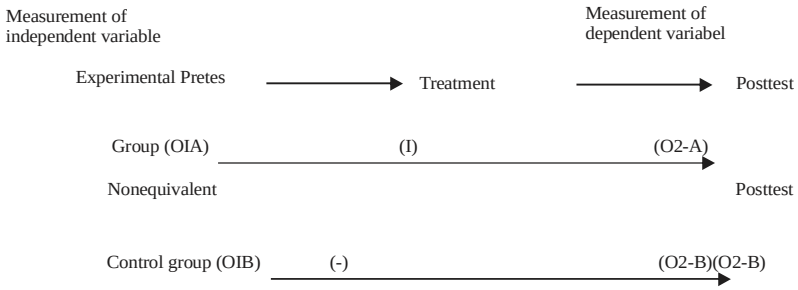

Fig. 2: Study design; K-A: The intervention group; K-B: The control group; I : Intervention on the role of nursing care on gangrenous wound healing on diabetic patients toward their KGD, the size of the wound and KGD time decreases through diet, physical exercise, wound care and treatment; -No intervention; O1-A: Wound healing: KGD, the size of the wound, and KGD time decreases before intervention; O2-A: Wound healing: KGD, the size of the wound and KGD time decreases after 12 weeks; O1-B: Wound healing: KGD, the size of the wound and KGD time decreases in the control group; 02-B: Wound healing: KGD, the size of the wound and KGD time decreases 12 weeks after intervention

Intervention (empowerment) conducted against targets as well as consideration of psychological factors as health workers aimed to cultivate the good behavior in diabetic patients with gangrenous wound healing, because social support allows individuals to interact with other patients. In addition, individuals can develop personality and realize who they are and their position in the social hierarchy, so as to determine their self-identity and self-esteem of those individuals. Social support also serves to reduce stress because it is through interaction patients can think more realistically and see from another perspective, so as to better understand their problem. At this stage, the researchers also conducted advocacy with health workers on preventive services (prevention), health promotion, curative (treatment) and rehabilitative (recovery).

To analyze the data used several methods: Univariate Analysis is to determine the frequency distribution of each independent variable, dependent variable and confounding variables. Bivariate analysis used to test the independent variables are suspected to have an influence on the dependent variable is done with chi square test. Multivariate analyzes were performed to analyze the effect of the intervention role of nursing care in a gangrenous wound healing in diabetic patients in hospitals Dr.Pirngadi field by using multiple logistic regression test at 95% confidence level, so as to obtain the estimated model and the influence of the Wound Healing Gangrene in patients with DM.

RESULTS AND DISCUSSION

Univariate analysis: Table 2 shows that in the intervention group, the majority of the respondents were 45-55 years old as many as 14 respondents (46.7%); most of them was female as many as 23 respondents (76.7%); the highest education was low level (primary and secondary) and the majority of the income was low, as many as 20 respondents (66.7%).

In the control group, the majority of respondents were 55 years old as many as 13 respondents (43.3%); the majority were female as many as 17 respondents (56.7%); the highest education was low level, as many as 26 respondents (86.7%) and the majority of the income was low as many as 17 respondents (56.7%).

Diet variable: Table 2 shows respondent's answers on the five items related to dietary administration of the intervention and control group. In the intervention group, most respondents said "yes" to item , as many as 28 respondents (93.3%) whereas in the control group, the majority of the respondents said "yes" to item 1, as many as 26 respondents (86.7%) (Table 3).

Table 4 shows respondent's answers on the 5 items related to physical exercise of the intervention and control group. In the intervention group, most respondents said "yes" to item 5 on the importance of physical exercises for diabetic patients, as many as 27 respondents (90%), whereas in the control group, the majority of the respondents said "yes" to item 5 as many as 21 respondents (70%).

Table 2: Frequency distribution of respondents based on age, sex, education background and Income at Dr. Pirngadi General Hospital in 2014

	Intervention		Control	
Characteristics	n	Percentage	n	Percentage
Age (Years)				
<45	6	20.0	8	20.7
45-55	14	46.7	9	30.0
>55	10	33.3	13	43.3
Total	30	100	30	100
Sex				
Male	7	23.3	13	43.4
Female	23	76.7	17	56.7
Total	30	100	30	100
Education				
High	11	36.7	4	13.3
Low	19	63.3	26	86.7
Total	30	100	30	100
Income				
High	10	33.3	13	43.3
Low	20	66.7	17	56.7
Total	30	100	30	100

Table 5 shows respondent's answers on the 5 items related to wound care of the intervention and control group. In the intervention group, most respondents said "yes" to item 1 and 5 on how to care wounds and the use of antiseptic or disinfectant to care wounds, as many as 25 respondents (83.3%), whereas in the control group, the majority of the respondents said "yes" to item 1 on how to care wounds as many as 25 respondents (83.3%).

Table 6 shows respondent's answers on the 5 items related to insulin therapy of the intervention and control group. In the intervention group, most respondents said "yes" to item 1 on daily insulin therapy as many as 26 respondents (86.7%) whereas in the control group, the majority of the respondents said "yes" to item 1 as many as 25 respondents (83.3%).

Table 7 shows respondent's answers on the nine items related to physiological factors of the intervention and control group. In the intervention group, most respondents said "yes" to item 1 on difficulty in performing diabetic diet, as many as 28 respondents (93.3%) whereas in the control group, the majority of the respondents said "yes" to item 1 as many as 28 respondents (93.3%).

Table 8 shows respondent's answers on the 6 items related to social factors of the intervention and control group. In the intervention group, most respondents said "yes" to item 1 on support from friends in healing of their gangrenous wound as many as 26 respondents (86.7%), whereas in the control group, the majority of the respondents said "yes" to item 1 as many as 26 respondents (86.7%).

Table 3: Description of respondent's responses on diet variable from the intervention and control group

	Intervention				Control		
	Yes		No		Yes	No	
Items	n	%	n	%	n	%	n
Do you give up on your appetite without considering the diet program set up?	28	93.3	2	6.7	26	86.7	4
Do you eat a plate of rice in the morning, at noon and in the evening?	21	70.0	9	30.0	15	50.0	15
Do you comply with the diet program?	23	76.7	7	23.3	13	43.3	17
Do you eat complete meal in the afternoon?	23	76.7	7	23.3	9	30.0	21
Does your family support your diet program?	22	73.3	8	26.7	16	53.3	14

Table 4: Description of respondent's responses on physical exercises from the intervention and control group

	Intervention				Control			
	Yes		No.		Yes		No	
Items	n	%	n	%	n	%	n	%
Do you do physical exercises	22	73.3	8	26.7	17	56.7	13	43.3
What kind of physical exercises	23	76.7	7	23.3	19	63.3	11	36.7
Do you do physical exercises on a regular basis?	24	80.0	6	20.0	15	50.0	15	50.0
After getting education on the importance of physical exercises will you start doing it by taking a thirty-minute walk every day?	19	63.3	11	36.7	13	43.3	17	56.7
Do you think physical exercises are important for diabetic patients?	27	90.0	3	10.0	21	70.0	9	30.0

Table 5: Description of respondent's responses on wound care from the intervention and control group

	Intervention				Control			
	Yes		No.		Yes		No	
Items	n	%	n	%	n	%	n	%
Do you know how to care wounds in diabetic patients?	25	83.3	5	16.7	25	83.3	5	16.7
Do you know that wounds in diabetic patients are hard to heal and tend to leave scar?	21	70.0	9	30.0	16	53.3	14	46.7
Does the medical staff inform you on how to care wounds in diabetic patients?	21	70.0	9	30.0	19	63.3	11	36.7
Do you think right wound care will heal it completely?	23	76.7	7	23.3	18	60.0	12	40.0
Do you use antiseptic or disinfectant to care your wounds?	25	83.3	5	16.7	21	70.0	9	30.0

Based on Table 9, it can be seen that 19 respondents (31.7%) had bad wound size was and 11 respondents (18.3%) had good wound size in the intervention group during pre-test. In the control group during pre-test, there were 21 respondents (35.0 %) with good wound size and 9 respondents (15%) with good wound size. During the post-test, there were 26 respondents (43.3%) for the intervention group having good wound size and 23 respondents (38.3%) for the control group having bad wound size.

Based on Table 10, it can be seen that 30 respondents (50%) in the intervention group had bad glucose level and 30 respondents (50%) in the control group during pre-test. During post-test, there were 26 respondents (43.3%) in the intervention group with good glucose level and 14 respondents (23.2%) in the control group with good glucose level.

Based on Table 11, there were 28 respondents (46.7%) with good glucose level time and 2 respondents (3.3%) with bad glucose level time in the intervention group. There were 20 respondents (33.3%) with good glucose level time and 10 respondents (16.7%) with bad glucose level time in the control group.

Based on Table 12, there were 22 respondents (36.7%) with good wound healing and 8 respondents (13.3%) with bad wound healing in the intervention group. There were 27 respondents (45%) with good wound healing and 3 respondents (5%) with bad wound healing in the control group.

The cross tabulation results on Table 13 shows that from 60 respondents, under good diet program of nursing care as many as 21 respondents (35%) experienced good wound healing and 14 respondents (6.7%) experienced bad wound healing. Under bad diet program of nursing care, as many as 21 respondents (35%) experienced good wound healing and 14 respondents (6.7%) experienced bad wound healing.

Furthermore, the Chi-square test shows that the $p = 0.001 < 0.05$ and this means that diet program of nursing care has a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the $p = (0.001) < 0.25$).

The cross tabulation results on Table 14 shows that from 60 respondents with good physical exercise of nursing care as many as 23 respondents (38.3%)

Table 6: Description of respondents' responses on Insulin therapy from the intervention and control group

	Intervention				Control			
	Yes		No.		Yes		No	
Items	n	%	n	%	n	%	n	%
Do you get insulin therapy every day?	26	86.7	4	13.3	25	83.3	5	16.7
Is your insulin therapy be done regularly?	18	60.0	12	40.0	17	56.7	13	43.3
Is the oral and injection therapy the same?	20	66.7	10	33.3	18	60.0	12	40.0
Do you know the location of the insulin therapy?	19	63.3	11	36.7	14	46.7	16	53.3
Do you take oral insulin regularly?	21	70.0	9	30.0	13	43.3	17	56.7

Table 7: Description of respondents' responses on physiologicalfactors from the intervention and control group

	Intervention				Control			
	Yes		No.		Yes		No	
Items	n	%	n	%	n	%	n	%
I find diabetic diet hard to do	28	93.3	2	6.7	28	93.3	2	6.7
I can control my family when I need support for my diabetic diet	16	53.3	14	46.7	16	53.3	14	46.7
I believe that diabetic diet can help preventing complications	14	46.7	16	53.3	9	30.0	21	70.0
I believe that diabetic diet can help controlling my diabetes	24	80.0	6	20.0	18	60.0	12	40.0
Controlling weight is the most important thing to do no matter how	24	80.0	6	20.0	16	53.3	14	46.7
I believe that consuming diabetic drugs can help preventing complications	25	83.3	5	16.7	14	46.7	16	53.3
Consuming diabetic drugs is the most important thing to do no matter how	21	70.0	9	30.0	13	43.3	17	56.7
I believe that consuming diabetic drugs can help controlling my diabetes	23	76.7	7	23.3	15	50.0	22	36.7
I believe that consuming diabetic drugs can help making me feeling more comfortable	24	80.0	6	20.0	20	66.7	10	33.3

Table 8: Description of respondents' responses on social factors from the intervention and control group

	Intervention				Control		
	Yes		No		Yes		No
Items	n	%	n	%	n	%	n
I find much support from friends to heal my gangrenous wound	26	86.7	4	13.3	26	86.7	4
My neighbors suggest me to go on with my wound healing therapy	20	66.7	10	33.3	17	56.7	13
Care from family helps me to go on with my wound healing therapy	16	53.3	14	46.7	12	40.0	18
Support from other respondents helps me to go on with my wound healing therapy	23	76.6	7	23.3	18	60.0	12
Support from other parties helps me to go on with my wound healing therapy	21	70.0	9	30.0	18	60.0	12
I never feel alone with the support given to me in my wound healing therapy	22	73.3	8	26.7	15	50.0	15

Table 9: Frequency distribution on pre-test and post-test wound size from the intervention and control group through observations at Dr. Pirngadi General Hospital

	Pre-Test				Post-Test			
	Intervention		Control		Intervention		Control	
Wound size	n	%	n	%	n	%	n	%
Bad	19	31.7	21	35.0	4	6.7	23	38.3
Good	11	18.3	9	15.0	26	43.3	7	11.7
Total	30	50.0	30	50.0	30	50.0	30	50.0

Table 10: Frequency distribution on pre-test and post-test glucose level from the intervention and control group through observations at Dr. Pirngadi General Hospital

	Pre-Test				Post-Test			
	Intervention		Control		Intervention		Control	
KGD	n	%	n	%	n	%	n	%
Bad	30	50.0	30	50.0	4	6.7	16	26.7
Good	0	0.0	0	0.0	26	43.3	14	23.2
Total	30	50.0	30	50.0	30	50.0	30	50.0

Table 11: Frequency distribution on pre-test and post-test glucose level time from the intervention and control group through observations at Dr. Pirngadi General Hospital

	Intervention		Control	
KGD time	n	%	n	%
Good	2	3.3	10	16.7
Bad	28	46.7	20	33.3
Total	30	50.0	30	50.0

Table 12: Frequency distribution on pre-test and post-test wound healing from the intervention and control group through observations at Dr. Pirngadi General Hospital

	Intervention		Control	
Wound healing	n	%	n	%
Good	8	13.3	27	45.0
Bad	22	36.7	3	5.0
Total	30	50.0	30	50.0

experienced good wound healing and 14 respondents (6.7%) experienced bad wound healing. With good physical exercise of nursing care, as many as 21 respondents (35%) experienced bad wound healing and 2 respondents (3.3%) experienced good wound healing.

Furthermore, the Chi-square test shows that the p = 0.000<0.05 and this means that physical exercises of nursing care have a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the p = (0.000)<0.25).

The cross tabulation results on Table 15 shows that from 60 respondents, under good treatment of nursing care, as many as 22 respondents (31.7%) experienced good wound healing and 19 respondents (31.7%) experienced bad wound healing. Under bad treatment of nursing care as many as 16 respondents (26.7%) experienced bad wound healing and 3 respondents (5%) experienced good wound healing.

Furthermore, the chi-square test shows that the p = 0.006<0.05 and this means that treatment of nursing care has a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the p = (0.006)<0.25).

The cross tabulation results on Table 16 shows that from 60 respondents, under good insulin administration of nursing care as many as 21 respondents (35%) experienced good wound healing and 14 respondents (23.3%) experienced bad wound healing. Under bad insulin administration of nursing care as many as 21 respondents (35%) experienced bad wound healing and 4 respondents (6.7%) experienced good wound healing.

Furthermore, the Chi-square test shows that the p = 0.000, <0.05 and this means that insulin administration of nursing care has a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the p = (0.001)<0.25). The cross tabulation results on Table 17 shows that from 60 respondents, under good psychological factors of nursing care as many as 23 respondents (38.3%) experienced good wound healing and 16 respondents (26.7%) experienced bad wound healing. Under bad psychological factors of nursing care, as many as 19 respondents (31.7%) experienced bad wound healing and 2 respondents (3.3%) experienced good wound healing.

Furthermore, the Chi-square test shows that the p = 0.000<0.05 and this means that psychological factors of nursing care have a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the p = (0.000)<0.25).

The cross tabulation results on Table 18 shows that from 60 respondents, under good social factors of nursing care as many as 20 respondents (33.3%) experienced good wound healing and 13 respondents (21.7%) experienced bad wound healing. Under bad social factors of nursing care, as many as 22 respondents (36.7%) experienced bad wound healing and 5 respondents (8.3%) experienced good wound healing.

Furthermore, the Chi-square test shows that the p = 0.001, <0.05 and this means that social factors of nursing care have a significant effect toward gangrenous wound healing in diabetic patients. Thus, this variable can be included in the multiple regression analysis as the p = (0.001)<0.25).

Multivariate analysis: Table19 shows that the significance level 0.385 is bigger than the sig-α (0.05); thus, this value fulfills the requirement of goodness of fit test, that is sig>0.05 and the assumed model is suitable with the research data.

Simultaneous test: Table 20 shows that the significance level 0.001 is smaller than the sig-α (0.05). This means that the six independent variables have simultaneous significant effects toward the dependent variable. The size of the effect can be calculated based on the determination test employing the following Nagelkerke R^2.

Table 21 shows that the Nagelkerke R^2 = 0.410. Thus, this means that the role of nursing care toward gangrenous wound healing in diabetic patients is as much as 0.410×100% equal to 41.0%.

Table 22 shows that the six independent variables have an odd ratio (expB) bigger than 1; this means that the six independent variables have significant effects on the dependent variable (wound healing).

Table 13: The effect of diet on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
	Bad		Good		Total		
Diet	n	Percentage	n	Percentage	n	Percentage	p-values
Bad	21	35.0	4	6.7	25	41.7	0.001
Good	14	23.3	21	35.0	35	58.3	
Total	35	58.3	25	41.7	60	100.0	

Table 14: The effect of physical exercises on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
Physical exercises	Bad		Good		Total		
wound healing	n	Percentage	n	Percentage	n	Percentage	p-values
Bad	21	35.0	2	3.3	23	38.3	0.000
Good	14	23.3	23	38.3	37	61.7	
Total	35	58.3	25	41.7	60	100.0	

Table 15: The Effect of treatment on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
	Bad		Bad		Bad		
Treatments	n	n	n	n	n	n	p-values
Bad	16	26.7	3	5.0	19	31.7	0.006
Good	19	31.7	22	36.7	41	68.3	
Total	35	58.3	25	41.7	60	100.0	

Table 16: The effect of insulin administration on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
	Bad		Good		Total		
Insulin administration	n	Percentage	n	Percentage	n	Percentage	p-values
Bad	21	35.0	4	6.7	25	41.7	0.001
Good	14	23.3	21	35.0	35	58.3	
Total	35	58.3	25	41.7	60	100.0	

Table 17: The effect of psychological factors on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
	Bad		Good		Total		
Psychological factors	n	Percentage	n	Percentage	n	Percentage	p-values
Bad	19	31.7	2	3.3	21	35.0	0.000
Good	16	26.7	23	38.3	39	65.0	
Total	35	58.3	25	41.7	60	100.0	

Table 18: The effect of social factors on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Year 2014

	Wound healing						
	Bad		Good		Total		
Social factors	n	Percentage	n	Percentage	n	Percentage	p-values
Bad	22	36.7	5	8.3	27	45.0	0.001
Good	13	21.7	20	33.3	33	55.0	
Total	35	58.3	25	41.7	60	100.0	

Furthermore, to know the role of nursing care on gangrenous wound healing in diabetic patients, a test on the intervention and control group was done and the results are as follows:

Table 23 shows that the mean of the intervention group is 0.73±0.450 and the mean of the control group is 0.10±0.305, at 95% degree of confidence. This result shows that the gangrenous wound healing mean for the

Table 19: Hosmer and Lemeshow's goodness of fit test

Step	χ^2	df	Sig.
1	6.354	6	0.385

Table 20: The results of simultaneous test

Step 1	χ^2	df	Sig.
Step	21.794	6	0.001
Block	21.794	6	0.001
Model	21.794	6	0.001

Table 21: The results of Nagelkerke R^2 determination test

Step	-2 Log likelihood	Cox and Snell R^2	Nagelkerke R^2
1	59.709(a)	0.305	0.410

Table 22: The results of the Multivariate test of the nursing care and gangrenous wound healing in diabetic patients

Variables	B	SE	Wald	df	Sig.	Exp(B) (odd ratio)
Diet (X1)	0.560	0.848	0.437	1	0.508	1.752
Physical exercises (X2)	1.217	1.179	1.066	1	0.302	3.378
Wound healing (X3)	0.533	0.901	0.399	1	0.527	1.768
Insulin administration (X4)	0.753	0.842	0.800	1	0.371	2.123
Psychological factors (X5)	0.646	1.188	0.296	1	0.587	1.907
Social factors (X6)	0.303	0.848	0.127	1	0.721	1.353
Constant	-3.187	1.060	9.043	1	0.003	0.041

Table 23: The results of healing on intervention group and control group

Groups	N	Mean	SD	Sig. (2-tailed)	-------CI95%-----	
Intervention	30	0.73	0.450	0.010	0.435	0.434
Control	30	0.10	0.305			

intervention group is higher than the gangrenous wound healing mean for the control group. Furthermore, based on Levene's test, it has been found out a significant difference on the rate of healing between the two groups, indicated by the p = 0.01<005. Therefore, it can be concluded that nursing care has a significant effect on gangrenous wound healing in diabetic patients.

CONCLUSION

Based on the analysis on the effect of nursing care on gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Medan 2014, it can be concluded that:

Nursing care has a significant role to the gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Medan. This is indicated by the influence the six independent variables such as diet, physical exercises, treatment, insulin administration, psychological factors and social factors with the odd ratio >1.

Based on the multivariate analysis, the Nagelkerke R^2 = 0.410. This means that the role of nursing care to gangrenous wound healing in diabetic patients is as much as 0410×100% or equal to 41.0%.

Nursing care on gangrenous wounds in diabetic patients shows a significant effect with a significance value of 0.001 less than the sig-α value (0.05). This means that the six independent variables have simultaneous significant influences on the dependent variable (gangrenous wound healing).

Nursing care on gangrenous wound healing in diabetic patients has a significant relationship with gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Medan. This can be seen from the average (mean) rate of wound healing of the intervention group which is 0.73+0.450 and the control group which is 0:10+0305 at a 95% confidence level. This means that there are differences in the level of healing between the intervention and the control group the cure rate is higher in the intervention group. Furthermore, it is known that there is a significant difference in the healing rate of the control group with the intervention group, indicated by the p = 0.01 which is <0.05.

There is a significant difference between pre-intervention and post-intervention in terms of the level of gangrenous wound healing in diabetic patients.

LIMITATIONS

This study did not analyze further complication with high blood glucose dissertation complications. In addition, this study does not analyze consume carbohydrate diet and food sources of excessive glucose.

SUGGESTIONS

Regarding the success rate of nursing care to gangrenous wound healing in diabetic patients at Dr. Pirngadi General Hospital Medan which is not yet achieving its best, some suggestions are given as follows:

The management of the Hospital is expected to improve services given to diabetic patients by providing diet program and sports facilities as to support gangrenous wound healing program for diabetic patients.

Diabetic patients with gangrenous wound at Dr. Pirngadi General Hospital Medan are suggested to improve their compliance with the diet program, physical exercises and treatment as to increase the rate of healing.

Diabetic patients with gangrenous wound must be careful in getting insulin administration, making sure that it is done under professional control.

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