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Innovation Article

An innovative support pillow for diabetic foot wound care

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A B S T R A C T

Background: Treating diabetic foot ulcers (DFU) sometimes takes a long time. During treatment, the patient's feet are usually given a cushion (such as a sleeping pillow or bolster) to make the wound seen. This way, some patients reported that their feet tingled because they were not positioned rightly for an extended period. So far, no unique pillow is available for this function. This pillow would help in treating DFU and should be comfortable for patients. Thus, it is essential to research designing such a product.

Purpose: To develop and test a special pillow for treating DFU.

Methods: This research adopts Research and Development (R&D). This research is divided into two stages: designing and developing and product testing.

Results: This pillow is made of multiplex and foam, covered with Polyester fabric. It is 75mm in length and 45mm in width. It is equipped with a foot care area and waste storage tank. The test results showed that the score for comfort for the patients was 92%, while the score from the nurse was 88%.

Conclusion: The pillow product helps the nurse conduct the DFU treatment and is comfortable for the patients.

INTRODUCTION

Diabetic foot ulcers (DFU) are wounds on the feet of persons with diabetes mellitus. It is among its many complications. Blood vessel disorders, nervous disorders, and infections in persons with diabetes cause this condition.[1,2] It is estimated that the overall prevalence of the risk of diabetic foot in the world is 53.2% (95% CI: 45.1–61.3).[3] There is no exact number regarding the prevalence of DFU in Indonesia. However, according to the International Diabetes Federation (IDF), the prevalence of diabetes in Indonesia is relatively high because it is one of the countries with a high rate of diabetes. However, people's access to health care is inadequate.[4]

A person with DFU needs to be adequately treated. Otherwise, the wound will take longer to heal and is at risk of infection.[5] DFU treatment includes positioning the wound to ease the care, washing, debridement, disinfecting, and dressing.[6] The process may take a long time to carry out. During treatment, the patient's feet are usually given a cushion (such as a sleeping pillow or bolster) to position the wound. This way, some patients reported that their feet easily tingled. This is due to the wrong position of their feet at a certain length.

Based on the initial review, no pillow has been designed explicitly for DFU. The pillow is expected to facilitate its treatment and would be comfortable for the patients. Previous research only examined pillows to reduce pressure on the neck and other body parts,[7] and studies explore using back pillows for people who should sit for an extended period.[8] This research aims to create and test a unique pillow for treating DFU.

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METHOD

Generally, this research is divided into two stages: designing and developing and product testing.[9]

Product Design and Development

The procedure covers literature study, design creation, design validation, and product development at this stage.

Literature studies

Various literatures were collected as a basis for creating product designs. We also learned about similar products in the market as reference material. The result was then used as the basis for product design.

Design Creation

The product design is made using the SketchUp application.

Design Validation

The design was validated by two independent practice nurses with clinical experience treating DFU. The indicator used is product suitability.[10]

Product Development

The feedback from experts is used for design fixation and final product development.

Testing Stage

Research Design

The research design used in this trial was posttest-only.

Population and Sample

The trial was conducted in Bantarwuni village, Kembaran district, Banyumas Regency. This study's population is patients treated for their DFU by practice nurses. The sample in this study consisted of ten nurses and ten patients involved in DFU treatment.[11]

Procedure

Practice nurses treating DFU were asked to use this tool in their treatment. An assessment was carried out to measure their comfort in using this product. The assessment was done on patients and nurses using questionnaires on a Linkert scale of 1-5. It consists of 10 questions.

Data Analysis

The comfort level in this study was analyzed using a simple descriptive analysis.

RESULTS

Results of Product Design and Development

Figure 1 shows the final product, revised in several stages. It was designed based on the feedback and input from the experts (expert test). It was made using multiplex material, foam with a thickness of 1 cm, and covered with polyester fabric (sofa fabric). The size is 75mm long and 45mm wide, and it is equipped with a foot care area and a reservoir for dirty water or gauze used for wound care. The reservoir is embedded with drawer rails to pull and push in quickly. It is also complemented with accessories such as lighting, hand wash bottles, and clean water bottles.

Result of Product Testing

Table 1 displays the results of comfort assessments on patients and their nurses. Most patients score it 4 of 5 on the size, which is higher than the nurses' valuation of 3. They suggested to make it smaller for its portability. From the design, both groups were satisfied, giving 5. They said the design was excellent and suited its function. Both gave a score of 4 to their material and quality, meaning they are sufficiently good. The positive responses are also seen in the accessories and functionality; they all give 5. It means they have functioned well and are regarded as helpful in supporting patient care. Similar good feedback also comes from the tool's ease, benefits, and comfort; both sides gave a maximum score, implying that it is easy to use and beneficial. The percentage score for the comfort of using the product is 92% (46/50) x 100%)) among the patients and it is 88% (44/50) x 100%)) for the nurses (Table 1).

Table 1. Average Score of Product Comfort from Patients and Nurses

Categories	Patients	Nurses
Size	4	3
Design	5	5
Material	4	4
Quality	4	4
Accessories	5	5
Functionality	5	5
Ease of use	5	5
Benefit	5	5
Comfort	5	5
Product care	4	3
Total	46	44

DISCUSSION

The design of a special pillow for DFU treatment must consider several essential factors to ensure the treatment's comfort, safety, and effectiveness. The material used must be soft, not irritate to the skin, and easy to clean. Its size must also be accustomed to each patient's foot. It should provide sufficient support without excessive pressure on the injured area. Besides, it must be easy to clean and maintain. The pillow has to be comfortable for the patient, even in extended use. Finally, such a pillow should be simple and easy for patients or healthcare workers to use.[6,12]

The pillow has a soap dish, water bottles, and lights. The lamp functions as a lighting aid to see the condition of the wound more clearly for better care. It also has a 1.5 L -

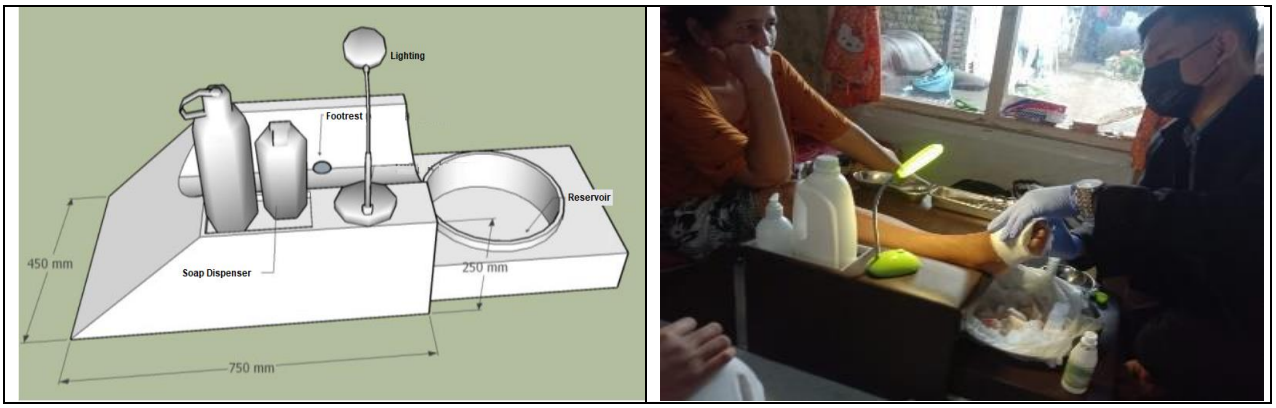

Figure 1. Product Design and How to use

bottle as a water container to clean the wound. Part of an aluminum basin is also provided to receive wastewater from wound care. This basin is placed under the pillow to pull and push it. The pillow uses waterproof foamy material, making it easy to clean and comfortable for the foot and leg.

The trial results found that 92% of patients are comfortable with this pillow; 88% of nurses perceive that this product has made it easier for them to treat DFU. It also reveals that patients who used to get tingled during the treatment no longer complained of it after using the product. The comfort factor is essential in treating DFU. It can increase their compliance with their care regimen and help in the healing process.[13] Physical comfort must be ensured; the treatments, like wound cleaning and bandaging, must not inflict discomfort.[14] These special care pillows for DFU treatment have been proven to be helpful in the treatment procedures. Hence, they are recommended for health workers. However, this still has a drawback in its size, limiting its portability.

The results support similar research that makes foot pads to facilitate bandaging and foot care procedures called Omläggningskudden. This product is designed to simplify daily care work. The body part that requires bandaging or care is placed on the cushion to provide an ergonomic work setting. In the case of bandaging situations, it is often expected that two people must assist – one to hold the limb and one to carry out the bandaging. With this support cushion, a single person can manage both tasks.[15]

CONCLUSIONS AND RECOMMENDATION

An innovative product has been created; a unique pillow for DFU treatment has proven comfortable for patients and nurses. This product is recommended in hospitals, clinics, community health centers, and other health facilities. This pillow is a safe and comfortable medical support tool for treating DFU in persons with diabetes mellitus. Further research is needed regarding product size simplification.

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