Low-cost technology: Use of discarded material to improve bathing in bedridden patients

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ABSTRACT

The technological advance seeks to improve the performance of bedridden patients' therapeutical and hygienic activities. In this present study, a qualitative research containing 20 caregivers of 12 adult patients assisted by basics heath units (BHU) from the city of Maringá, in the region northeast region of Paraná state and in the south of Brazil. Every patient was bedridden with severe limitations, including locomotor ones. Vinyl canvas banners and others, such as raw material for the manufacturing of bed bath sheets. The caregivers were trained prior to the procedure and answered a questionnaire in order to evaluate the usage, accessibility and interaction with the patient during the hygiene. The study was approved by the ethical research committee on human beings (COPEP/UEM). The use of bed bath sheets by some caregivers was considered satisfactory, due to the good performance during the patients' hygiene, in addition to contributing to the environment. All the evaluated criteria were 100% approved by the participants. The reuse of the vinyl canvas so as to fabricate the bed bath sheet attends the therapeutical needs of the bedridden patients, possessing economic, social and environmental relevance.

Keywords: Polyvinyl Chloride, bedridden patients, Personal hygiene, Nursing home, Reuse.

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INTRODUCTION

Bathing is recognized as a basic human need, being part of the process of personal hygiene. Bed bathing is a necessary procedure for patients unable to perform their activities of daily living, being performed by a caregiver, a family member or paid professional[1], promoting patients' personal hygiene and improving comfort, reducing the risk of infection and helping to maintain skin integrity in critically ill patients[2].

In Intensive Care Units (ICUs), homes, nursing homes or recovery institutions, bed bathing is usually performed with the use of wet wipes, due to several factors that limit the application of immersion baths, such as the lack of sufficient staff and the lack of accessible tools to adapt this type of bath[3]. Issues related to the physical structure of an establishment or residence can hinder the exercise of qualified and safe care during bed bathing, mainly due to the fact that there are risks of falls and bone fractures in bedridden patients[4].

Immersion baths promote better personal hygiene, comfort, dignity, and well-being for bedridden patients, as the procedure reduces dirt and odors and favors skin protection against infections[3]. On the other hand, there are still few technical and scientific advances aimed at improving the hygiene of bedridden patients who depend on caregivers to perform this action[5], showing the need for studies that promote the development of products with low cost and easy access to the general population.

In Brazil, there are several studies demonstrating the reuse of *banner* canvases, composed of polyvinyl chloride (PVC) as raw material for the production of artifacts, utilities and new products[6,7,8,9]. Reuse, or reuse, is essential to give a new use to the waste, slowing down the processes of environmental degradation and reducing the expenses related to the disposal of this material[10]. Reuse or recycling contributes to the reduction of waste and the reduction of the use of raw materials, which are often non-renewable and have incorrect disposal[11].

The National Solid Waste Policy (PNRS)[12] encourages reuse and recycling. However, of the 79 million tons of solid waste generated in Brazil in 2019, only 6.3 million tons were properly disposed of[11]. Landfills are still the main places where these materials are disposed of in almost all developing countries. The negative impacts of landfills cause an annual loss to the public coffers of more than R$3.6 billion in environmental care expenses[13].

The objective of this study wasto make bed sheets by reusing vinyl tarp *banners* as raw material, and to evaluate the use of a prototype of the bed sheet in the test modality by caregivers and bedridden patients.

DEVELOPMENT/METHODOLOGY

STUDY DESIGN

In the first half of 2022, a literature review related to bed bath activity was conducted. The present study was approved by the Human Research Ethics Committee (COPEP) of the State University of Maringá, opinion number 5,265,806.

COLLECTION, CLEANING OF VINYL TARPS AND MAKING OF THE BED BATH SHEET.

All raw material used to make the sheet was collected directly from the disposal sites in the city of Maringá, a municipality in the northwest region of the state of Paraná, southern Brazil, taking into account the structural and visible quality of the product to be used. All collected materials that showed wear due to natural weather and/or possible damage were considered unsuitable The collected material was sanitized with clean running water and neutral soap. Then, cleaning was performed with sodium hypochlorite (1%) for 10 minutes, and then rinsed with plenty of water. The materials were dried and kept in a clean environment.

The sheets were made by a professional sewing professional. During the preparation, the non-screen-printed part, i.e., without ink, was used as the inner lining of the sheet that was in contact with the patient.

To manufacture the prototype of the bed sheet, vinyl tarpaulins with the following dimensions were reused: 2.30 meters long and 1.30 meters wide. Tapes were fixed at six points of the sheet for support, allowing positioning and keeping the sides of the sheet elevated during the procedure (Figure 1). To keep the sheet in the correct position, it was recommended to use physical structures, such as chairs, armchairs or any object that served as support. This structure could vary according to the place where the caregiver bathed the bedridden patient. The sheet was always cleaned with 70% alcohol before and after the bed bath procedure.

Figure 1. Prototype of bed bath sheet, from the reuse of vinyl material.

Source: Author.

CHARACTERIZATION OF RESEARCH PARTICIPANTS

This study was conducted with 12 patients and their respective caregivers, including adult patients aged 20-89 years, primary care users in the municipality of Maringá, in the northwest region of the state of Paraná and southern Brazil. These patients were bedridden with total locomotor limitation for more than seven days and were accompanied by caregivers, family members or professionals with remuneration.

The population for the study was selected from the contacts provided by the Basic Health Units (UBS) in the city of Maringá-PR, and 3 UBS were selected, but 1 private patient and 1 hospitalized patient were also selected.

The contact was made through a telephone call, where the project was explained to the caregiver or family member and the answer was awaited as to whether or not to accept the home visit in order to test the product.

The first UBS selected cared for 9 bedridden patients, where 5 did not answer the calls, 3 accepted and 1 gave up. The second UBS assists 6 bedridden patients, 4 of whom did not answer the calls or there were wrong telephone numbers, and 2 patients agreed to be bathed in bed using the research product. Eleven patients were part of the third UBS, and 5 of them accepted to be bathed in bed, in 3 cases the family said they would return the call, but they did not return. Three of these

patients did not answer or the phone number was wrong. A private patient and a patient hospitalized at the Memorial Hospital of Maringá also agreed to be bathed in bed with the use of the product.

Therefore, in all, twelve patients were submitted to bed bathing using the research product, and 20 caregivers, 1 paid professional and 19 family members, answered the questionnaire. None of the patients answered the questionnaire because they were all patients with severe limitations.

TRAINING OF CAREGIVERS AND GUIDANCE ON PROCEDURES FOR BED BATHING.

The caregivers received individual training to learn about the functionality of the bed bath sheet, and instructions were given on hygiene, before and after the use of the sheet, the proper positioning in the place where the bed bath was performed, and the positioning of the patient on the sheet (Figure 2). The bed bath procedures were performed privately with the bedridden patient who was bathed by his respective caregiver, and all bed baths were assisted and guided by at least one member of the team.

APPLICATION OF THE QUESTIONNAIRE

After training and the application of the bed bath, a quantitative-descriptive analysis was carried out, using a questionnaire composed of 10 questions, 8 of which were questions with "yes" or "no" answers. To evaluate the criterion of usability and reuse, it was questioned whether the bath sheet was easy and practical to be used in homes; The following criteria were also evaluated: accessibility, possibility of adaptation to the bedridden patient's environment, creation of an environment of interaction between the patient and the caregiver, and hygiene and preventive care for the patient's health. The other questions were of the dissertation type and aimed to evaluate the levels of satisfaction of the participants regarding the prototype tested, and could also report the difficulties and/or benefits regarding the use of the bed sheet, as well as suggestions and/or criticisms to improve its development.

Figure 2. Patient preparing to start bathing in bed with vinyl bath sheet.

Source:Author.

DATA ANALYSIS

The data collected from the participants through the structured questionnaire were compiled in an Excel spreadsheet, Microsoft® Excel version 2010, with subsequent quantitative-descriptive analysis of the frequency of responses. Bardin's content analysis[14] allowed its application in various discourses and in all forms of communication, through three fundamental phases: pre-analysis, exploration of the material and treatment of the results as described by Câmara[15].

RESULTS AND DISCUSSIONS

According to Bardin's content analysis[14,] it is applied to various discourses and all forms of communication, through three fundamental phases: pre-analysis, exploration of the material and treatment of the results[15].

The three stages of content analysis, initiated by the "floating" reading of the questionnaire forms applied to the participants, resulted in the hypothesis that the proposed tool would have positive satisfaction criteria for use, with homogeneity of responses regarding the criteria evaluated. The criteria of usability, accessibility, flexibility, hygiene, reusability, interaction with the use of the sheet and adequacy were approved by 100% of the participants in the analysis carried out.

The analysis of the essay questions pointed to reports of satisfaction with the use of bath sheets by the caregivers, describing good performance in the bath and perception of hygiene of the patient, in addition to admiration for the contribution to the environment.

Some participants reported the following perceptions of use (Figure 3):

Figure 3. Word cloud of the reports about the use of the tool.

Source: Author.

Report 1 - "The product was good, the bath brought relaxation (of the patient), comfort and contact". In the form of a bed bath, this procedure aims to promote individual comfort and maintain skin integrity by promoting circulation and physiological hydration[16]. Hygiene is defined as a set of practices that promote health and comfort through personal cleanliness[17].

Report 2 - "We wash her head here (patient) and the water falls down into the bucket. It was a good idea, because it doesn't take the patient out of bed to take it to the bathroom, right here we give her (patient) a very nice bath and she doesn't go without taking a bath (for immersion)." In the case of bedridden patients, the bath is given in bed, a technique that must have previous planning and organization of the materials, and it is also necessary to follow all the established steps[18].

Report 3 - "Complete hygiene without risk of falling". Most patients in critical care are unable to perform their own bath, so bed bathing is characterized as a complex technique, to be performed in a humanized and safe way, in order to ensure that its objectives are achieved without harm to those who receive it[16].

Report 4 - "I thought it was great! I didn't find it difficult at all! ”.

Report 5 - "That all families can have access (to the tool)".

Report 6 - "It was wonderful how this sheet was made, even more so because it uses recyclable plastics." In fact, PVC is one of the cheapest and most versatile materials for use in the production of various products[9].

Report 7 - "Hygiene, interaction and well-being". The Bed Bath is simply defined by skin hygiene, a technique that can reduce the risk of infection and condition the patient to a feeling of relaxation[18].

One participant suggested that the edge of the sheet could be rigid to avoid folding during bathing, but that she was able to handle the edge with the six-pronged ribbons to avoid this problem. Two participants suggested the placement of the central drain to help the water fall. The vinyl material proved to be light and sanitizable, with ease of application of the bath and drainage of the water and soap used in the procedure. Sewing vinyl material is easily carried out and can be done by anyone who knows the basic principles of cutting and sewing. The measurements of the sheets were satisfactory for the size of the beds and the patients.

We know that immersion baths promote better personal hygiene, comfort, dignity, and well-being for bedridden patients[3], but there are still few technical and scientific advances aimed at improving the hygiene of bedridden patients who depend on caregivers to perform this action[5]. Thus, the progress of this work appears as an alternative to develop adequate hygiene techniques in bed, for debilitated patients, generating comfort and satisfaction.

In addition, the demands for low-cost materials, so that all families and the public health system can have access. Therefore, the bed bath sheet that was made and tested in this group of patients and caregivers has as a differential characteristic, the low cost of using reused vinyl material, being an alternative to be used by health managers in several locations, especially among the poorest populations.

The National Solid Waste Policy (PNRS)[12] encourages reuse and recycling, however, in Brazil, 79 million tons of solid waste generated in 2019, only 6.3 million tons were properly disposed of[11]. Reuse, or reuse, is essential to give a new use to the waste, slowing down the processes of environmental degradation and reducing the expenses related to the disposal of this material[10]. This work also shows an alternative for the maintenance of the environment, favoring processes of reuse of materials harmful to the environment in the medium and long term.

The increase in the pace of technological innovation is one of the main conditions for Brazil to accelerate its economic growth. In the last 20 years, Brazil has consistently increased its investment in Research and Development, considered one of the inputs for innovation and productivity. However, this effort has yielded limited results.

There are two main problems identified: first, government investment needs to increase its effectiveness; second, private investment is small, being very limited to a few large companies[19].

According to the document "Policies to Support Technological Innovation in Brazil"[20], the Brazilian state has intensified efforts to consolidate the National Innovation System (SNI), with the objective of expanding support and promotion of science, technology and innovation (ST&I) activities in the country. In this study, we agree that the stimulus to the development of low-cost technologies, especially in Brazil, in the case of the public health system, should be emphasized and reinforced in all areas of applicability that promote human satisfaction and adequate management of

the environment. The limitations of this study stem from the sample size, attributed to the pandemic, requiring expansion of use to review results, in addition to the possibility of including other places for bathing (such as hospitals and institutions that support bedridden patients).

FINAL THOUGHTS

The reuse of vinyl material to make bed sheets, in addition to its low cost, can be a tool that goes beyond a therapeutic need for bedridden patients, with a relevant importance at a social and environmental level.

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