

Determination of Criteria for the Design of Examination Table for Patients

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Abstract— Bedridden patient management is a critical issue because many people are engaged, and patients require round-the-clock help. Any decrease in the number of persons involved and the amount of effort necessary will benefit a huge segment of society. As a result, the authors are attempting to lessen the amount of support required in handling these patients by constructing a novel examination table for such patients. The design requirements and expectations of the user must be known before designing any new system. A survey was undertaken of all those involved in the care of bedridden patients. For this aim, several patients, doctors, nursing staff, caregivers, and others were interviewed. This study first discusses the current trend in the design of such examination tables and their limits for Indonesian conditions and then shows the findings of a survey conducted for the purpose of creating a new examination table for bedridden patients. The survey results are the instructions for developing and constructing the new examination table.

Keywords— *Design, Beds, Guidelines, Examination Table*

I. INTRODUCTION

Indonesia's population is expected to be 273.8 million in 2021 [1]. This population has approximately 26,66 million persons over the age of 60, and a large percentage of them are bedridden owing to age-related disorders. Aside from that, many people are compelled to stay bedridden for a variety of reasons, including paralysis, orthopedic issues, vehicle and other accidents, and so on. These bedridden persons require near-constant support and care from relatives, caregivers, doctors, and others. This difficulty is exacerbated by the fact that the joint family structure is essentially nonexistent now, and there is no round-the-clock aid in the family to care for bedridden people. Any reduction in the number of people involved and the amount of work required to manage such individuals will help a wide segment of society. As a result, some form of healthcare system that allows such patients to be easily controlled is required.

There are few published works in the field of equipment or system design for bedridden healthcare. Because the examination table is the most significant element in this healthcare system, the primary emphasis is on the design of

examination tables or related systems that allow patients to be managed without requiring much support. Various scholars have experimented with various ways for designing such healthcare systems. These approaches can be broadly categorized into three types.

The first idea is to use an automated bed cum wheelchair that patients can move themselves. Lin Tan, Shouyin Lu, and Wei Zhang [2] have built a robotic nursing bed with the functions of lifting the back, curling the legs, side flipping over from left to right individually, and voice recognition control, in response to the needs of paralyzed patients. Shih-Wei Peng and Feng-Li Lian [3] created a test bed mechanism with mechatronic control. Their test bed is made up of two robotic beds: a main bed and a nursing bed. The main bed is meant for posture shifting and the nursing bed is for transportation. Both beds have a belt system for moving the body from one to the other. Mascaro, Spano, and Asada [4] created a hybrid wheelchair/bed system for individuals who are bedridden. The motorised wheelchair could be mounted to the bed and flattened to match the examination table.

The second method focuses on situating patients on the examination table for transfer or to prevent bed sores. Wei Ching-Hua and colleagues [5] proposed a lateral positioning and shifting of immobilized patients examination table. The main goal was for patients to be able to transfer easily from the examination table to the bed and vice versa. The notion of a marionette bed - for the automated rolling and repositioning of bedridden patients - was suggested by Basmajian, Blanco, and Asada [6]. Continuing along the same lines, Roy, Basmajian, and Asada [7] proposed a way of moving a bedridden patient by maneuvering a bed sheet. They used this procedure on a rehabilitation bed to turn and shift a bedridden patient to relieve bedsores and other problems [8]. Fiedler et al. [9] also address the issue of bed sores. They created a bed with a movable mattress surface, specifically for the prevention and treatment of decubitus ulcers. This examination table surface aids in the reduction of average

contact pressure peaks during prolonged supine bed rest, as well as the onset and progression of pressure sores.

The third method focuses on moving patients from the examination table to the bed and vice versa. Wang and Kasagami [10] created a patient mover system for intra-hospital patient transfers. The patient was said to be readily transferred from the examining table to the stretcher and vice versa. For transferring bedridden patients, Spano and Asada [11] developed a surface wave dispersed actuation mechanism. Based on the prototyping and testing, they discussed design tradeoffs and principles for constructing a practicable and practical surface wave bed.

Aside from the previously published literature, there are some US patents, largely prior to 1975, that explain comparable concepts in bed design but with mechanical devices/linkages. The essential point is that none of these patents have been commercialized due to one or more flaws in the suggested designs. Because these patents are more than 35 years old, and due to space constraints for the length of the document, discussion of these patents is not included in this study.

All of the published research reveals design approaches centered on the employment of automated devices/systems comprised of sophisticated sensors with electronic or computer controls, as shown above. As a result, such examination tables will be rather expensive, and the patient or caregiver will also need to become acquainted with the sophisticated controls for operating such devices. As a result, these beds are unsuitable for use in Indonesia, and there is a need to produce a simple, low-cost alternative for bedridden healthcare for the Indonesian populace. A survey was conducted in this regard to determine the needs of such a system for bedridden healthcare. The results of the survey are presented in this report.

II. METHODOLOGY OF SURVEY

Bedridden patients must be managed in hospitals or at home by a team of caregivers. Other people involved include the patient's family members, doctors, nursing staff, and other caregivers. Normal physiological activities such as excrement and urine are tough and sensitive issues to handle in immobile people. As a result, it was decided to solicit the opinions of all parties involved in order to determine the design needs. A questionnaire was created for this purpose and distributed to all interested parties, who provided comments. The following sorts of questions were included in the questionnaire, to which replies were gathered:

- (1) Describe the patient's ailment paralysis, for example.
- (2) Issues experienced in handling / nursing patients, such as urination, sponging, and so on.
- (3) Patients' own problems or sentiments, such as the use of a bedpan, difficulties elevating the body, and so on.
- (4) The type of examination table currently in use, such as a household bed, a chair with a commode, and so on.
- (5) How daily bodily processes, such as urine and feces, are managed.

- (6) Improvements required to easily handle the everyday routine.
- (7) Examination table systems that will be effective for patient management.
- (8) Estimated cost of new equipment or facility to be developed.

In total, 50 people were questioned and the questionnaire was completed. Figure 1 shows the people who were contacted, and Figure 2 shows the categories of patients who were covered, including those who were covered through their doctors, caregivers, and so on.

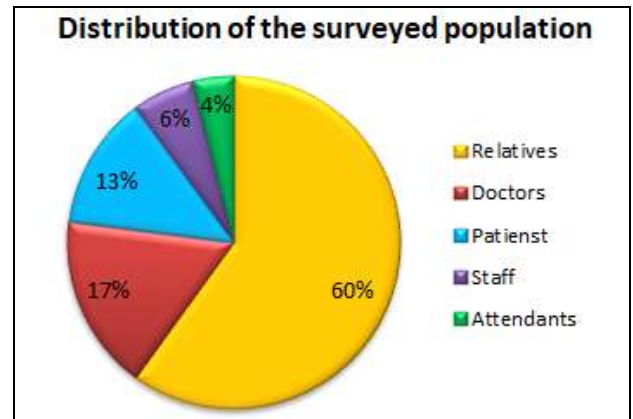


Fig. 1. Distribution of the surveyed population

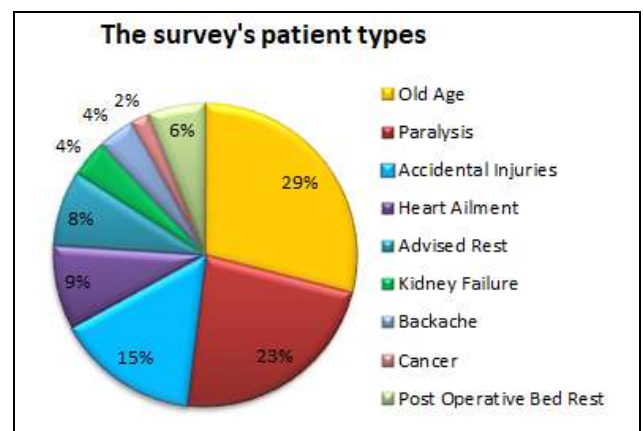


Fig. 2. The survey's patient types

III. FINDINGS FROM THE SURVEY

Based on the survey results and the numerous questions answered by patients, caregivers, doctors, and nursing staff, the various issues they faced, the need for a new bed design, and their expectations from the new design were short-listed and are shown in Tables 1÷ 4. Each respondent has expressed

a variety of issues and suggestions for improvement. As a result, the total number of responses to the difficulties/recommendations is greater than 50 (the total number of people contacted), although the percentage is based on the total number of 50.



Fig. 3. Based on the results of the poll, the old examining table will be redesigned.

That from the requirements that have been obtained several designs that refer to the above requirements as shown in Figure 3 and Figure 4. The examination table model before being redesigned has dimensional and material specifications, namely Overall Length 2.059 (1.985)m, Overall Width 778 (750)mm, Base Height 650mm, Safe Working Load 210 kgf (2.059N), and the material for this product is Table Tops for Mattress Particle board with melamine coating, Polyurethane foam mattress covered with vinyl leather, Mattress Stopper 4 steel stoppers (chrome plated), Head/Foot Board Fixed steel pipe (chrome plated), Main Frame Powder coated steel, Caster/Leg 125mm it's Tente-Precision casters (corrosil) with 2 brakes on diagonal, doesn't have Back Raise Angle and Hi-Lo Adjustment

Table 1: Difficulties faced by the support staff / assistants

Sr. No.	Activity / Difficulty	No. of responses	% of total
1	Raise and lower the patient	39	75%
2	Transfer the patient to the inpatient room	36	69%
3	Urination	27	52%
4	Sitting	15	29%
5	Auto heart check	12	23%
6	Infusion pole	9	17%

Table 2: Difficulties faced by the patients (as reported by patients / assistants)

Sr. No.	Difficulty faced by patient	No. of responses	% of total
1	The caster wheel is still unstable to push	31	59%
2	The examining table cannot be raised and lowered in accordance with the ergonomics of the patient.	27	52%
3	The patient cannot be moved because the mattress is too heavy.	19	37%
4	Back rise is still manual	15	29%

Table 3: Major needs highlighted by the survey

Type of need	No. of responses	% of total
Special examining table	48	92%
A safety fence has been built for patient transport.	8	15%

Table 4: Expectations from the new design

Expectation from new design	No. of responses	% of total
Simple design and easy to use.	33	63%
The examination table can be automatically raised and lowered.	34	65%
Heart scan numbers	18	35%
User friendly	18	35%



Fig. 4. Based on the results of the poll, the new model examining table.

After being revised, the new inspection table model includes the following dimensions and material specifications: Overall Length of 2.059 (1.985)m, Overall Width of 778 (750)mm, Base Height of 650mm, Safe Working Load of 250kg(2.450N), and material for this product is Particle board mattress table top Steel construction, powder coating (part of which is a resin mold), polyurethane foam mattress covered in vinyl leather 4 steel plugs (chrome plated), Mattress Stopper Fixed steel pipe (chrome plated) head/foot board, Powder-coated Steel Main Frame, 125mm Casters/Foot Tente casters - Precision (corrosil) with 2 diagonal brakes. This examination table has a Back Raise Angle and a Hi-Lo Adjustment, and it may be utilized to move patients from room to room in addition to being an examination table.

IV. CONCLUSION

According to the results of the survey, there is a need to create a new examination table for bedridden healthcare. Using the following design requirements, this examination table should be created as a single unit with the capability Mattress Transfer Patient from the examining table to Inpatient Bed. i.e. The examination table should be designed to be basic and straightforward to use. The patient should

move as little as possible. The examining table can be raised and lowered. The examining table is equipped with patient transfer facilities from the examining table to the inpatient bed. It should have more facilities for transferring patients from the examining table to the inpatient bed. The design should minimize the amount of work/assistance required to care for immobile people. The new examination table should be reasonably priced. The following characteristics define beds on the market: they are made of wood, cannot be raised and lowered (low height), the head cannot be raised, and do not have wheels.

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