Development of Modified Mattresses for Patient Handling in Hospital

Arvind T. Wadgure
(Asst. Professor)
DMIETR, Wardha

Sandip deshmukh
(Asst. Professor)
SRPCE, Nagpur

Ram D. Vaidya
(Asst. Professor)
DMIETR, Wardha

Abstract - In present day, we see in maximum hospital, transfer of patient from one place to another place that time require maximum labor work. During patient handling, patient and hospital staff suffers from many problems like stresses are produced in the body, some time it occur that sleep down the patient. It is required to eliminate such types of possibilities.

The present research work proposes a development of modified mattresses for patient handling. By using such modification we can easily transfer the patient from one place to another without any problem. We can totally eliminate the problem occur at the time of handling of patients.

Keywords: - Modified mattresses, Trolley cum stretcher, Hospital bed

1. Introduction

Now in hospital we see the, for various checkups, patient transfer from one place to another place. As per the demand required for better living quality of immobilized patients, for that should be improved the hospital mattresses for patient handling. Generally immobilized patients transfer by labour or nursing staff. Patients handling in various places are a labour intensive work. It is very dangerous for patient and hospital staff, if all transfer activity not done in exact manner. Mostly hospitals use fully atomized beds & stretcher for the patient handling. These are costly and cannot be affordable to all the hospital. At the time of patient handling, the stresses generated in patient & staffs are same for all the hospital. Our aim to provide a better solution for patient handling.

According to recent survey in hospital, it found that, 38% of nursing staff and labour suffers work from back injuries, 12% of nursing staff and labour suffer from low back pain at average age 39. Any other staffs suffer from any other various injuries.

The present working proposes designing of a new trolley cum stretcher along with the modified mattresses which will totally eliminate the handling of immobilized patients.

2. IDENTIFICATION OF PROBLEM

2.1 Present Method of Patient Handling

In hospital The patient transfer from various places like from Ambulance to O.T./ICCU/X-ray centers/MR scan / Sonography can be proceed through various stages.

2.1.1 Patient transfer From accident spot to Stretcher:-
When accident is happen. Patient Transfer From accident spot to stretcher.

2.1.2 Patient transfer From Stretcher to Ambulance:-
The patient handles from stretcher to ambulance by using three to four persons.

2.1.3 Patient transfer From Ambulance to Hospital stretcher:-
When patient come in hospital after accident, after that patient move from ambulance to stretcher by using man power.

2.1.4 Patient transfer From Stretcher to bed at O.P.D.:-
After that Patient move from ambulance to O.P.D. ward by using stretcher with the help of three to four persons.

2.1.5 Patient transfer From stretcher to bed at ICCU/ward bed:-
After that Patient transfer in other places by using stretcher with the help of labour As per the requirement like O.P.D. to ICCU/Ward Bed.
2.1.5 patient transfer From O.P.D. to X-Ray centre / MRI / SCAN / Pathology centre: -
Then after Patient transfer from one place to another for checkups like O.P.D. to X-Ray Centre/ MRI / SCAN / Pathology centre.

2.1.6 patient transfer Back to the bed of ICCD/Ward bed: -
Lastly patient is move back by following Reverse above Steps.

3. The Problem Associated with above Patient handling

3.1 When the patient is required to move on the same floor, he is wrapped in cotton bed sheet and sifted by three to four labour. Due to the handling, stresses are generated in the body of both i.e. patient as well as the nursing staff. Some time cramp may be produced in backbone and other parts of the human body.

3.2 During manual handling of the patient various accessories like blood transmission facility, oxygen supply, saline facility, are not available and this may create various problem if the patient is in serious condition.

3.3 When the patient is to be transfer from one place to another place, that time if the movement of the patient is on inclined plane that time chances to sleep down the patient from stretcher.

The above problems produced at the timing of patient handling which can be eliminated by developing a new trolley to handle the patients and modifying hospital mattresses.

4. FORMULATION OF PROBLEMS

As per the demand of safely patient handling and for better living quality of patients we can improve the hospital mattresses. Movement of unmovable patients is usually the work of labor. Transfer of patients in various places is a labor or hospital staff work and which is very dangerous for patient, if inappropriate patient handling is not done.

For safely movement of patient we proposed the modified mattresses.

4.1 3D Model of Modified Hospital Mattresses

The main aim of design of trolley cum stretcher and modified hospital bed is to minimize the manual handling of patient.

In this we use the modified stretcher. For the modification of the hospital mattress we used the layer of foam and aluminum square tube. In this aluminum square tube play the very important role at the time of patient handling. Due to aluminum square tube mattress cannot form sagging shape. It maintains the straightness of mattress.

3.2 During manual handling of the patient various accessories like blood transmission facility, oxygen supply, saline facility, are not available and this may create various problem if the patient is in serious condition.

4.2 Development of modified mattresses

As per the demand of safely transfer of patient from bed to stretcher or stretcher to bed, by using aluminum square tube we modified the mattresses.

As per the demand mattress should be light weighted.
5. How to manufacture the modified mattresses?

1. First select the memory foam of size (72 x 36 x 1) inch.

2. Cut out the memory foam size in four different size.
   i) (52 x 22.5 x 2.5) inch of 1 piece
   ii) (52 x 6.75 x 2.5) inch of 2 piece
   iii) (22.5 x 20 x 2.5) inch of 1 piece
   iv) (20 x 6.75 x 2.5) inch of 2 piece

3. First select the plastic fiber sheet of size (72 x 36 x 0.0393) inch.

4. Cut out the plastic fiber sheet size in four different size.
   i) (52 x 22.5 x 0.0393) inch of 1 piece
   ii) (52 x 6.75 x 0.0393) inch of 2 piece
   iii) (22.5 x 20 x 0.0393) inch of 1 piece
   iv) (20 x 6.75 x 2.5) inch of 2 piece

5. Stick out the pieces of plastic fiber sheet in between the pieces of memory foam of using gel.

6. Select the nylon resin for covering the assy. Of white foam and plastic fiber foam.

7. Cut out the nylon resin as per required size.

8. By using nylon resin, cover all assy. Of white Foam and plastic fiber foam.

9. In modified mattresses, for straightness maintenance use the removable aluminum square tube of two different size having length 6 ft & 2 ft.

10. For aluminum square tube provide the groove in modified mattresses from four side.

11. For aluminum square tube provide the groove in modified mattresses from four side.

12. Insert the aluminium square tube in mattresses from groove.

13. Insert the other aluminum square tube from other side groove of the mattresses.
14. After inserting all aluminum square tube in groove, then after it is ready for handling the patient.

6. **Parameters of modified mattresses.**
   1. **Size (72 X 36 X 2.5) inch**
      a. **Weight = 3.75 kg**
      b. **Material used**
         i. **Aluminium square tube**
            i) 38 x 38 x 1 mm 2 piece having 183 mm length
            ii) 38 x 38 x 1 mm 2 piece having 60 mm length
         ii. **Foam**
            j) (52 x 22.5 x 2.5) inch of 1 piece
            ii) (52 x 6.75 x 2.5) inch of 2 piece
            iii) (22.5 x 20 x 2.5) inch of 2 piece
            iv) (20 x 6.75 x 2.5) inch of 2 piece
         iii. **Plastic fiber**
            i) (52 x 22.5 x 0.039) inch of 1 piece
            ii) (52 x 6.75 x 0.039) inch of 2 piece
            iii) (22.5 x 20 x 0.039) inch of 2 piece
            iv) (20 x 6.75 x 0.039) inch of 2 piece
         iv. **Nylon resin = 4 meter**
   c. **Total Cost of product = 2500 /-**

7. **Conclusion & further suggested work**

7.1 **Advantages of Modified mattresses**
   1) By using such type of modified mattresses we can minimize the problem occur during patient handling
   2) By using such type of modified mattresses we can reduce the stresses produced in nursing staff

7.2 **Limitations of modified mattresses**
   1) Initially The cost of this project will be high because required to replace all the conventional hospital bed with new one bed.
   2) Extra care has to take at the time of patient transfer.

7.3 **Conclusions**
   In hospital we see that patient handling is from one place to another for further checkups. As per the demand for better living quality of immobilized patients, hospital mattresses should be improved accordingly. Transferring of immobilized patients is usually the work of nursing staff. Transferring of patients from one place to other place is a labor intensive work and It is very strenuous for nurses and dangerous for patient, if inappropriate operational procedure is used. Most of the hospitals are using fully atomized beds & stretcher for the above purposes. There are very costly and cannot be affordable to all the hospital. The stresses developed during the handling of patient in both i.e. patient & staffs are same for all the hospital. Our aim to provide a better solution for patient handling to these hospitals who are having limitations for the use fully automated beds & stretcher.

   Generally fully atomized bed and stretcher are used in metro city but it not affordable for rural area’s hospital due to cost problem. There were chances to sleep down the patient at the timing of handling.

7.4 **Future Work**
   1) Development of trolley cum stretcher.
   2) Development of modified mattresses

8. **References**
   1) Design and Development of modified mattresses for patient handling in hospital. ISSN 2278-0149, VOL 2, NO.4, OCT 2013.
   3) Kevin Hsu ET all fall 2008, a design of Portable Lift for Transferring Wheelchair patients to Elevated Vehicle/ ambulance, University of Michigan Orthotics and Prosthetics Centre.
   5) Wei Ching-Hua et all Nov. 5-8 2007, Hospital bed with Auxiliary Functions of Lateral and Transferring for Immobilized patients Taipei, Taiwan. The 33rd Annual
Conference of the IEEE Industrial Electronics Society (IECON) Pgs.2991-2995.

6) Tiernan John et al., A Survey of the Wheelchair and Seating Market in Irelands, Assistive Technology-shaping the future; AAATE conference proceedings, Vol. 11, No. 1 Pgs- 105-111.


11) www.narang.com/hospitalbed

12) www.en.wikipedia.org