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A novel method for transferring patients between beds in a hospital

Vinayakarao Thimmaraju

Military Engineer Services,
Visakhapatnam, Andhra Pradesh, India

ABSTRACT: Innumerable patients visit hospitals everyday around the world. For emergency cases and most inpatient services, especially those involving surgical procedures, patients are frequently shifted between rooms and beds. Most common transfer is that between stretcher and patient rest bed. In many hospitals, this is carried out by the unskilled staff who does the job physically. They either lift or drag patients as a part of shifting them from one bed/stretcher to another. This procedure is not only inconvenient to the patient but also poses work related hazard for the employees. In order to facilitate the hospital worker and at the same time increase the comfort levels of the patient, this procedure needs to be made mechanical. The present article describes a new methodology that involves transferring patients between rest units with no/minimum physical contact. The physical burden of employees is mostly relieved by means of this process. Unlike other methods that usually require development of an entirely new set, the present design is a modification of the existing rest units such as beds, stretcher and mattresses. The design involves welding steel frames to the existing units and making use of rollers to accomplish the job. The new set up drastically reduces the physical burden for the hospital staff and also comforts patients without aggravating their pain.

KEYWORDS: hospital bed, stretcher, welded frames, roller mechanism, patient comfort.

1 INTRODUCTION

Patient transfer from one place to another is the most common sight in any hospital. Units such as wheel chairs and stretchers are used for the purpose. When patients are self supportive, transferring between beds/stretchers is not a process of concern. However, when patients have to be supported, transfer becomes very painful, especially with the methods being followed. Such instances include transferring patients from ambulance stretcher/ hospital stretcher to beds and also between rest bed in a ward or an operation bed in ICU.

The procedure being followed to transfer patients is physical handling which involves manual labour. Patients are physically lifted along with the bed sheets from the ambulance stretcher to hospital stretcher. The same method is followed for transferring the patient from stretcher to rest/operation bed. Especially in case of heavy built patients, physical labour is very high and the process is painful. Usually nurses carry out this routine procedure. In some developing countries, this process is carried out by unskilled hospital staff who are completely unaware of the exact injuries of the patient and sometimes this may lead to elevation in the level of injury. As the procedure involves heavy physical labour, musculoskeletal injuries are prevalent. It was observed that the number of these injuries in nurses is double that of construction workers[1]. A study on musculoskeletal injuries among hospital staff showed that one-third (n = 876) of all injuries resulted from patient handling activities[2]. In one study, the peak compressive forces in manual lifting of average built patients was found to be greater than 10000 N which far exceeded the 6500 N limit of NIOSH [3]. Approximately 1.8 tons of weight is lifted by nurses during a 8 hour shift [4]. This number can go up in hospitals with greater turnaround of patients or for an overtime duty. Hence the process of transferring patients between beds is a matter of concern for both the patients as well as the nurses. A study in 2004 concerning patient safety and comfort during transfers between beds showed that the patients' perceptions were positively correlated to the work technique score. Various techniques of transfer were adopted and patients felt comfortable during transfers performed with a safe technique as designated by the study[5]

Corresponding Author: Vinayakarao Thimmaraju

From time to time, several methods of transferring were proposed[6-10]. Some include mechanical modifications whereas others have electronic controls. However, practical reach of these models was not possible due to reasons unknown. The present work involves redesigning the bed, stretcher and mattress so that the new design elevates the comfort levels of patients while transferring between stretcher/ beds. Each of bed/ stretcher and mattress are provided with extra gadgets to facilitate free and smooth movement of patients with at most comfort mechanically rather than manually. The procedure can be carried out by nurses / unskilled staff without getting into physical contact and causing pain to the patients. This method is also more hygienic than the present one.

2 METHODOLOGY

The main concept of the design is to transport patients with no/minimal physical contact. Smooth transition between units is made possible by incorporating the mechanism of rolling. Appropriate grooves are made available for the mattress to move the patient from bed to bed. In the modified design , mild steel channels of appropriate size are fixed to bed along the width by welding to the frame. These are then supported by mild steel flats of suitable size welded to frame and channel. The mattress is fixed with mild steel/aluminum boxes to house wheels. The patient along with the mattress is moved by way of rollers along mild steel channels fixed to bed. In this system neither the patient nor the bed sheet is touched and the patient is smoothly and freely transferred from bed to bed. There is no skill involved in operating this mechanism. The existing personnel can be employed for this purpose. The patient feels full comfort while transferring from/to bed/operation bed.

3 MODIFIED DESIGN

3.1 MODIFICATIONS TO BED AND STRETCHER

Mild steel channels of appropriate size to suit the size of the bed frame is welded along the width of the bed. The idea of welding along the width allows horizontal transfer. The channel is further supported by way of mild steel flats welded to bed frame and MS channel at 300 mm centre. The channels act as guides for wheels of mattress to move freely on the bed. This is the only modification required for the bed. The welded channel is shown in Fig.1

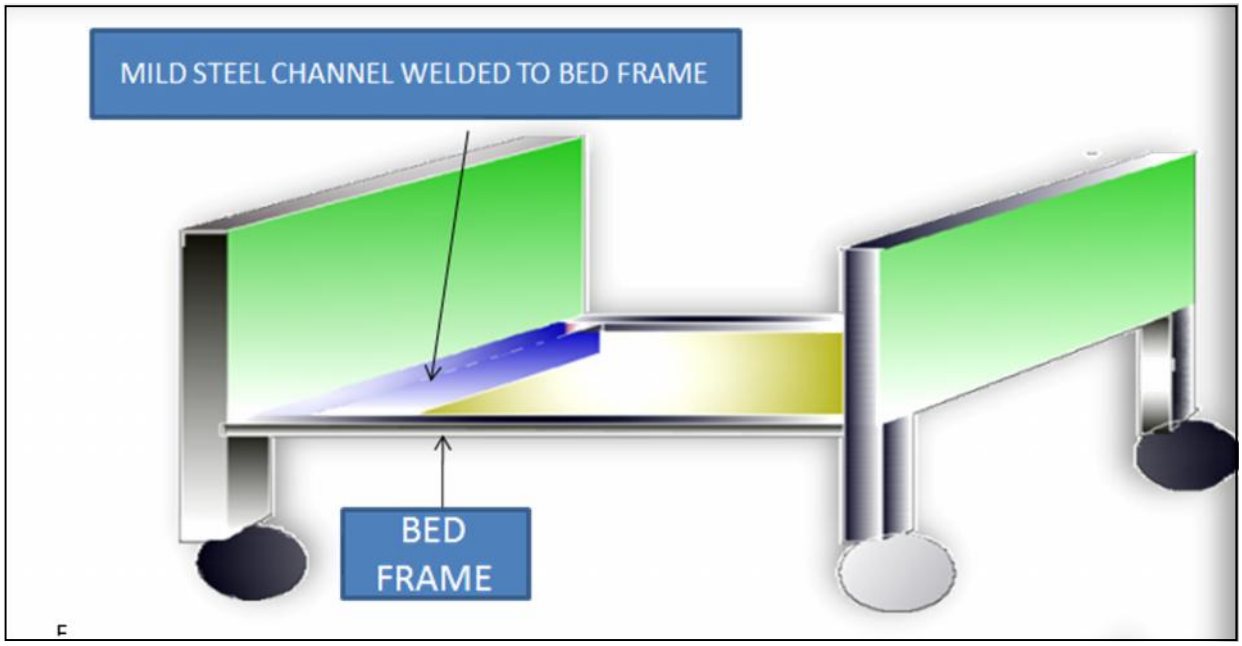

Fig.1 : Mild steel channel welded to the frame of hospital bed

The modified stretcher design is shown in Fig. 2. In the remodelled stretcher, mild steel channels are fixed both along the length and width of it. Movement of patients from stretcher can be in both direction; horizontal and vertical. In situations where space availability is a constraint to transfer patients, vertical movement is favoured. However when shifting to/from a rest bed, horizontal movement is needed as the bed is supported by headrest and footrest. Hence, channels are fitted all round the stretcher to facilitate both types of movement of the mattress. An additional inclusion to a stretcher is the height

adjustment mechanism. This is the usual pulley method that is incorporated for rest beds. This adjustment will allow alignment of the stretcher with bed and hence assists in smooth movement of the mattress.

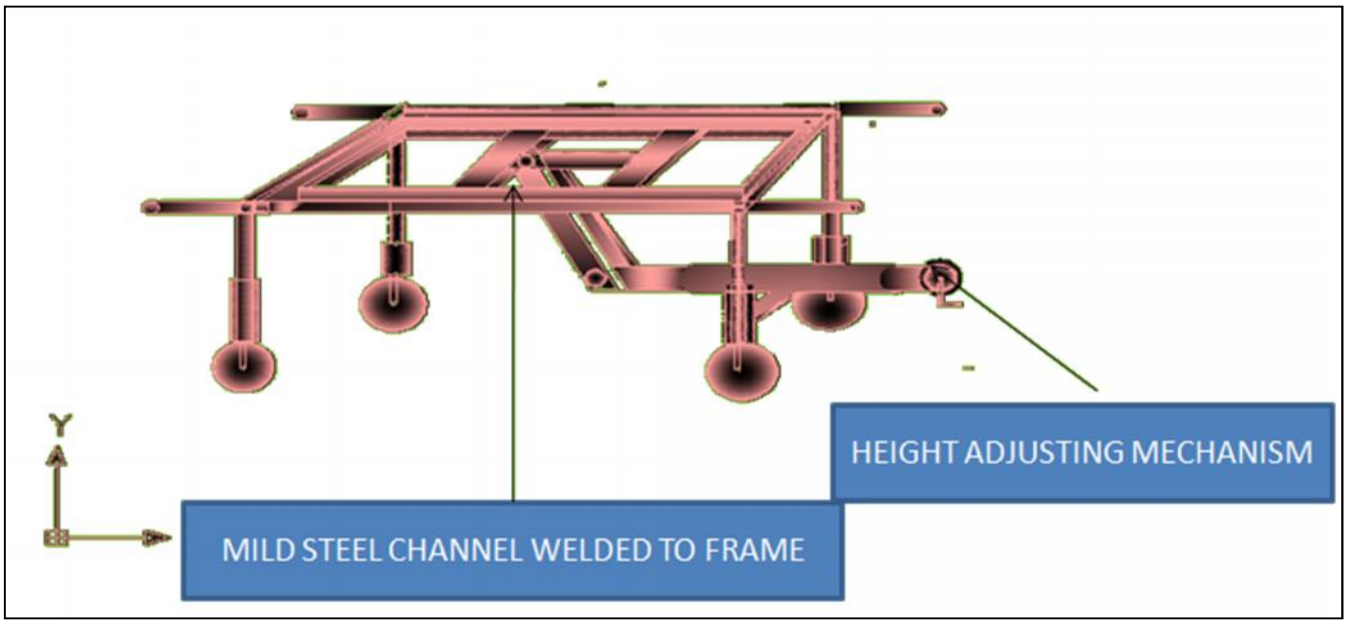

Fig.2 : Remodeled stretcher

3.2 MODIFICATIONS TO MATTRESS

Fig.3 illustrates the modifications proposed to the mattress. Normally stretchers are manufactured with less than 2' width so as to move freely along the corridors of the hospital or when used in ambulance vehicle. Accordingly, to achieve the concept of moving the patient along with mattress, the mattress is designed to consist of 3 units. The modified mattress typically has a central unit supported by edge units on both sides. The central unit and the edge units combined have the dimensions of a normal hospital bed. The central unit matches with the dimensions of a mattress that is normally used on stretchers. The two edge units each have half the remaining dimensions and are fixed on either side of the central unit by means of piano hinges. Nevertheless all three stay connected on one side so that the patient on the bed feels no difference in comfort with respect to the bed. The edge units are unfolded when used on bed so as to suit the size of bed whereas they are lifted up on both sides when used on stretcher thereby acting as supports on sides when the stretcher is moving.

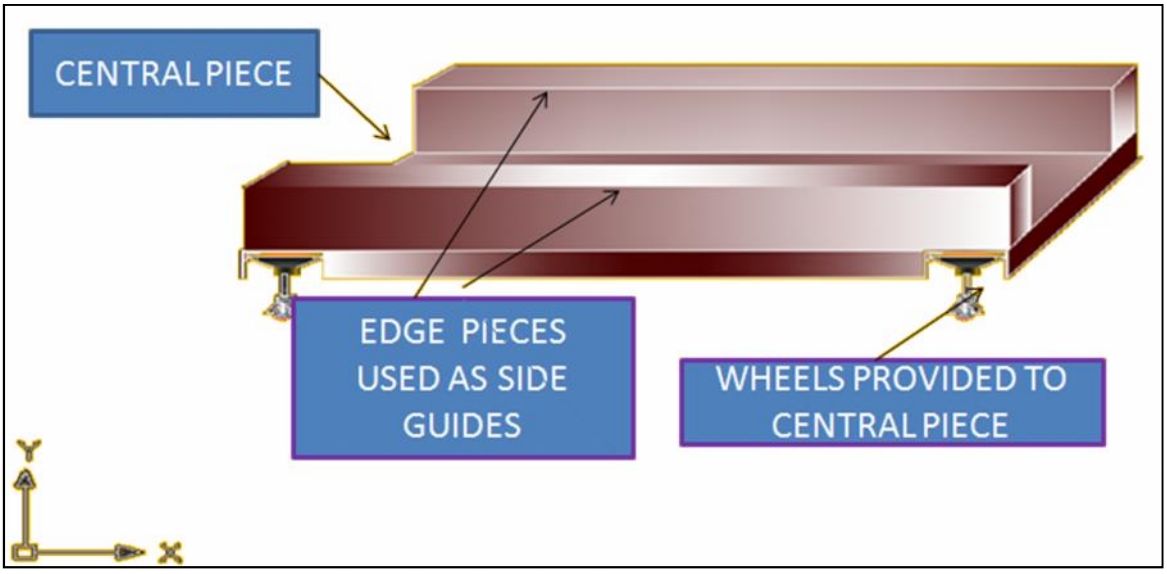

Fig.3 : Modification to mattress

In order to move the mattress along the channels welded to the frame of bed and stretchers, rollers/wheels are incorporated into the design. The central unit of the mattress is fitted with rollers/wheels at the four corners by means of wooden supports. Brackets may be used to fix the rollers to the wooden supports which are held in position by means of an aluminum channel that runs lengthwise on the mattress. The brackets are fixed in such a way that the rollers/wheels are capable of moving in both the directions; along the length and width so as to facilitate the use of same mattress on stretcher as well as on bed. The wheel brackets are designed in a way that the rollers/wheels can be folded(when the mattress is stationery) and un folded (when the mattress is moving from bed to bed). The schematic is shown in Fig.4

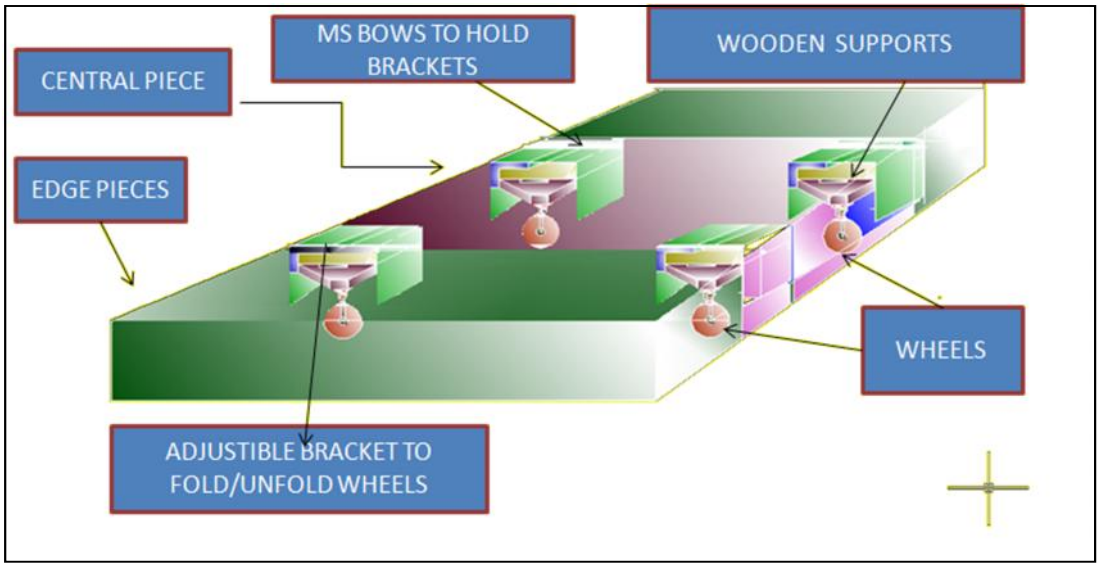

Fig.4 : Fixtures to the central unit of the mattress

4 CONCLUSION

The modifications recommended will definitely ensure lot more comfort to the patient. The design is not provided with any scale as the dimensions may vary from country to country and hospital to hospital. The idea of using the mattress as a whole to transfer patients will not only help increase patient comfort levels but also reduce physical burden to the hospital staff employed to do the same. The design is also highly economical as the hospital management can implement these modifications to their existing beds instead of going for a completely new set of beds. Maintenance of these units is also

simple. From time to time it has be made sure that the wheels are fixed well to the wooden supports and that the MS channel is free of any obstacles for smooth travel of the mattress.

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