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STRETCHER NEUTRALIZING HARMFUL FORCES ON INJURED PERSONS

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ABSTRACT

This study attempts to address the design of stretcher neutralizing harmful forces on injured persons that has been invented by the authors. In current study a variety of stretchers and their strengths and weaknesses based on studies is considered and in continue the design of stretcher neutralizing the harmful forces on injured persons and advantages of using this invented industrial design is described by the authors for stretchers and available hospital beds.

KEYWORDS : Stretcher, Hospital bed, Patient transport board

A stretcher is a device used to transfer the injured person that is in critical condition or is severely hurt, to minimize the risk of worsening his/her condition or more damage (Ganji et al., 2012). A stretcher is the oldest and the most basic and most common means of transport of patients and due to critical conditions, its importance is becoming more apparent (Daneshmandi et al., 2002). A stretcher is named "Brancard" in French that is one of the medical devices for short-term transporting of patients who need medical cares. Stretchers are primarily used in acute conditions of care outside the hospital by emergency medical services, military, and rescue operation rescuers. Research results show that the stretchers that often used today to transport injured persons cause some damages for patient through his/her displacement along route. In some cases, it is accompanied by irreparable consequences such as spinal cord injury. This study seeks to explain the industrial design that is added to the stretcher which has been developed by the paper's authors. Remarkably, inventors of this industrial design after investigating the available stretcher samples in medical emergency center observed that earlier in the design of stretchers the prevention of sudden patient movements during transport with stretcher has been neglected. In this industrial design that is added to the stretcher, some points have been taken into account which eliminates the weaknesses of emergency stretchers.

Types of Stretcher

Standard stretcher

A standard stretcher or Furley has been made of masts, handholds, folding rods, legs, and canvas bed. The folding rods make possible opening and closing the stretcher. While the stretcher is closed, the masts place close together and the bed is folded upward and the folding rods are closed using two belts. These belts are applied for fastening of patients with fracture that rest on the stretcher.

Folding Stretcher

It is the light weight type of the standard stretcher. This stretcher has light weight metal masts with telescopic handholds and a canvas or plastic bed. Folding stretchers are

Figure 1 : Standard Stretcher

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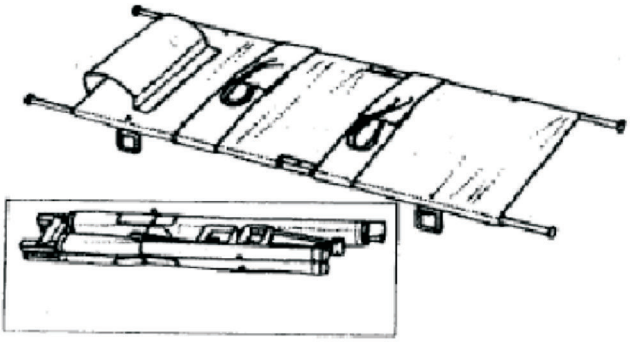

Figure 2 : Folding Stretcher

available in two different types. One type is folded like a standard stretcher and the other type is folded in middle and therefore occupies less space.

Orthopedics Stretcher

This type that is known as the orthopedic stretcher is adjustable and it is used to place the patient into the ambulance or on the wheeled cot without changing the condition of the patient. This type of stretcher is not applied for transporting of the patient in far distances. The adjustment of it depends on the size of the patient. This stretcher is useful for patients without any shakes specially those who are likely to have spinal cord fracture or internal bleeding (Ghafouri, 2006).

Wheeled Stretcher

The most of wheeled stretchers has been designed so that it bears high weights up to 180 kg and it is consistent with the patient situation. One of the good capabilities of this device is its states. For example, we can raise the head of the bed for an asthma patient. To move the wheeled stretcher, the person who stands in the head section exerts pressure and the person who stands in feet section steers it. One of the limitations of this device is that its motion is usually restricted to flat surfaces. However, four persons, each at one side, can keep the wheeled stretcher in a stable status and pass it along uneven ground. It is possible that the stretcher become unbalance so that carrying it needs a considerable force. For this stretcher, medical care personnel must stay with the patient and the patient is never left alone even when the balustrades of the bed are raised (Gafouri, 2006). In American English, the wheeled stretcher is called "gurney". The stretcher can be equipped with a height adjustment leg including wheels, rails, and roller sites for easier motion purpose. Simple stretchers do not have such a leg and it is necessary to carry it with the help of some people. In spite of these differences, main application of all of them is identical.

In addition to above-mentioned stretchers, two types of old stretchers including type A and type B were used in military centers in the past. The stretcher type A has the length and the width of 180 and 60 cm, respectively. It has a weight of 6950±250 g. Its fabric is canvas and it has aluminum pipe and rivets. Some belts with metal taches have been embedded for fixing legs and body at the end and middle of the stretcher. The stretcher type B is made of two

Figure 4 : Wheeled Stretcher

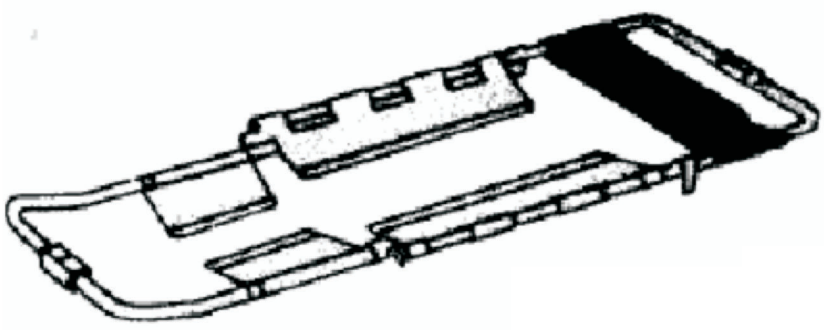

Figure 3 : Orthopedics Stretcher

aluminum straight rods with the length of 2 m that have been covered by a canvas fabric. Its width and weight are 70 cm and 3.450 kg±250 g, respectively.

Research results have shown that fixing the patients' organs has not been taken into account in stretcher type B at all. However, it has not been seen statistical difference in transporting patients and strength of stretchers types A and B. The strength of belts and their performance in mentioned stretchers have been desirable in reports. But fixing of organs and spinal cord is proper in the stretcher type A and it has meaningful difference with the stretcher type B statistically. The exerted pressure in organs in stretcher type B is more than one in the stretcher type A. Various studies have investigated these two stretchers such as Lovell and Bradshaw's study. The stretcher type B has a less weight than the stretcher type A and this issue results in easy transport of patients using the stretcher type B (Daneshmandi et al., 2002). What is afforded from results of conducted researches in the field of the stretcher design is that considering the belt is an essential issue. Inasmuch as a problem of mentioned stretchers is the identically exerted pressure on head and neck, embedding of the belt and neck cushion for fixing head and neck does not seem without any benefit (Daneshmandi et al., 2002). Being folded the stretcher also makes its transport easier if this issue does not result in enhancement of its weight. However, research results show that the weights of the stretcher and the patient exert pressure on waist and spinal cord of users. Time and efficiency of transport are increased through the belts attached to the user's shoulder or through the rings connected to his/her waistline (Knapik et al., 2000). Therefore, embedding such devices in stretchers results in increasing of their quality.

Defects of Various Types of Stretchers

The simple fabric stretchers were used in the past. These stretchers were attached to two rods from two sides and they were mainly used in military centers and wars. In these stretchers, organs of a patient were not fixed and also they did not have sufficient security for protection of a patient. Research results have shown that the simple fabric stretchers are not comfortable and some parts of the patient's body will be at a risk of ischemia and necrosis in the long term (Lovell and Bradshaw, 1993).

Explanation of Shapes and Maps

Due to the disadvantages that the stretchers were always encountered, in these circumstances, researchers decided to think of ways to eliminate its defects and increase its performance. In today's world, stretchers with different shapes and materials are designed and built. While the need to promote stretchers and diversity of existing products, favorable properties with certain conditions should be found, and then with making a sample stretcher and testing the more proper types are entered to the market. The first step to achieve this purpose is to compare existing stretchers and recognition of their strengths and weaknesses (Daneshmandi et al., 2002). The disadvantages of the stretchers force the inventors of this industrial design to decrease the defects of these stretchers. In the design devised by the paper's authors in order to stabilize the patient permanently in the horizontal direction, a mechanism has been designed to keep the bed surface horizontally. This system consists of two rails that are a part of a circle. These two rails are mounted on the main body and the bed is located on these rails with some rollers so that in conditions such as placing in the slope of the bed, the bed under the weight of the patient can move and place in a horizontal position. At the end of each rail, one protector has been embedded to prevent exiting of rollers. Also, two rollers have been embedded under each rail to prevent the collapse. The existing operators in this stretcher were completely mechanical and driving force is the weight of the patient. Below is a built sample.

Some of the benefits of this industrial design adding to stretchers and existing beds are as follows:

1- Ease in displacement of patients from bed to stretcher and vice versa
2- Convenient use by staff of health centers 3-prevention of injury to the patient during transport (keeping the security of a patient according to mission of security of the patient and clinical domination debate)
4- Prevention of serious damage (particularly falling down a patient) during transferring from bed to stretcher and vice versa
5- The device is easy to install on all stretchers
6- Low cost of this device

Figure 5 : Industrial Design Adding to the Stretcher and Existing Beds

CONCLUSION

What is concluded from current research is if during transport the patient be on a permanently balanced stretcher and some aerobics have been mounted on the stretcher (this action prevents forces such as shakes and displacements) we would observe that the patient would have not been hurt during displacement with a stretcher. This case is the concern of this industrial design and it was ended successfully. This industrial design has many advantages such as the prevention of damages to the patients, cost savings, prevention of falling down of a patient from the bed, and accelerating the transport of the injured persons.

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