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TRANSFER ASSISTING DEVICE (PORTABLE STRETCHER), ERGONOMICALLY DESIGNED AND FABRICATED STRETCHER

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ABSTRACT

A stretcher is used for handling those patients who are not in a condition to move by his own. In a present day scenario handling of patient is a serious issue as it requires severe attention especially during acute condition. So, stretcher plays a vital role throughout the operation. As suggested by various medical attendants, modification of stretcher has vast area of research. So after applying various quality control tools we have come across the modified stretcher which is ergonomically fabricated and design. This model is than tested in laboratory and across various patients. After repeated testing and accounting all the reviews as suggested by various patients, all the anomalies are removed and we have come across the globally accepted design. A stretcher is made simple and light for easy and safe handling of patients and consists consist of two simple rods embedded with a base.

Keywords: Anthropometry, Stretcher

I. INTRODUCTION

'Effective immobilization and transportation are vital to the life-saving acute medical care needed when treating critically injured people. However, the most common types of stretchers used today are wrought with problems that can lead to further medical complications, difficulty in employment and rescue, and ineffective transitions to hospital treatment.

If this statement is considered as a fact than it is found that there is an acute need to improve the methodology employed by those in charge of patient mobilisation in hospitals or ambulance or anywhere using very trivial and out-dated designs. Though much research has been done in this context but most of the researchers have never considered the physical handling and movement that is used when transferring patients form site of accident to stretcher or from one bed to other, which causes maximum discomfort to the patient. So there was a need for filling this loophole, which formed the base of our research.

1.1 About Stretcher:

A stretcher is a medical device used for short-term carrying of patients who require medical care. Stretchers are primarily used in acute out-of-hospital care situations by EMS, military, and Search and rescue personnel. Stretchers can be equipped with a variable height lower frame containing wheels, tracks, or skids to allow the stretcher to be moved more easily. A simple stretcher does not have such a frame and therefore needs to be

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carried by two or more people. Despite these differences, their essential function remains the same. They can often be referred to as a cot, litter, gurney, bed, cart, or (for bariatric stretchers) land barge.

The majority of patient transportation in the pre-hospital emergency medical care environment involves the use of mobile stretchers. Stretcher utilization occurs in three distinct phases:

(1) Loading into the ambulance;

(2) Unloading from the ambulance;

(3) Transporting over surface structures.

Several commercially manufactured devices have been designed to best accomplish these activities. Constraints on the stretcher system are myriad, including weight and size of the patient, ease of use, and durability. With these limitations in mind, finding the balance of performance and safety is an important mission.

1.2 Emergency Medical Services (EMS)

Emergency Medical Services (EMS) ambulance personnel provide medical care to out-of-hospital patients. The important roles of EMS include response to requests for 108 emergency help, rapid assessment and on-scene treatment of patients, and triage and transport of patients to appropriate receiving hospital facilities. A unique task in EMS ambulance care is the physical handling and movement of out-of-hospital patients. These essential functions include extrication of the patient, movement of the patient to the ambulance, transport of the patient to the receiving hospital and transfer of the patient from the ambulance to the receiving hospital bed or stretcher. These tasks may occur in cramped or unsafe locations such as the third floor of patients' homes, shopping malls or even the wreck of a motor vehicle collision. The primary device used by rescuers for mobilising patients in the out-of hospital environment is the wheeled ambulance stretcher.

Ambulance stretchers must be light (to facilitate field portability), strong (to handle large patient loads) and compact (to allow movement through cramped spaces). Modern ambulance stretchers contain mechanisms to facilitate a variety of key tasks such as movement, changing of stretcher height, and loading into and unloading from the ambulance patient compartment (figs 1).

Fig:1 Adjusting ambulance stretcher height. Ambulance personnel must simultaneously activate mechanical triggers at each end of the stretcher, coordinate manual stretcher lifting or lowering, and then re-actuate the mechanism to lock the wheeled undercarriage in place

II. METHODOLOGY

2.1 Problem Realisation:

The discomfort felt by patient during manual lifting or transferring patient from site of accident to ambulance bed or from one bed to other in hospitals.

2.2 MEASURE (By Personnel Observation and Interview)

In this phase all the relevant data was collected to analyse the given problem. For this it was felt necessary to visit nearby hospitals to analyse the patient transfer in emergency situations, consulting the ambulance ward boys. These visit helps in finding the probable cause for patient discomfort and collected under three major categories.

a) Manual handling
b) Transporting vehicle problem
c) Design of Stretcher

2.3 Analyze (RCA Analysis)

After analysing the reports of observations Fish bone analysis (or Root cause analysis) is done.

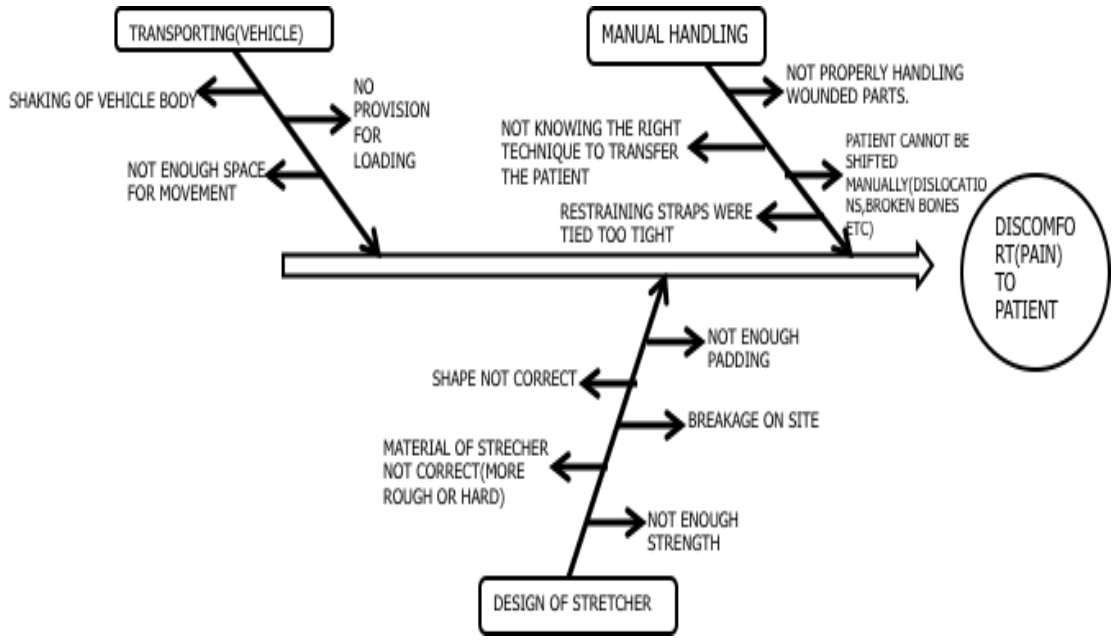

Fig: 2 Fish bone diagram of analysis reason behind discomfort to patient

After the RCA analysis the main reason for discomfort are under 'Manual handling' and 'Design of stretcher'.

III. DESIGN AND DEVELOPMENT

3.1 Design

To design a stretcher, space should be quite enough for Laying Patient. So the area of the stretcher is taken out "6.5ft×2ft" which is enough for a Normal 6.5ft patient. Four supports, i.e. neck support,Lower back support, knees support & ankle support are considered as shown in figures.

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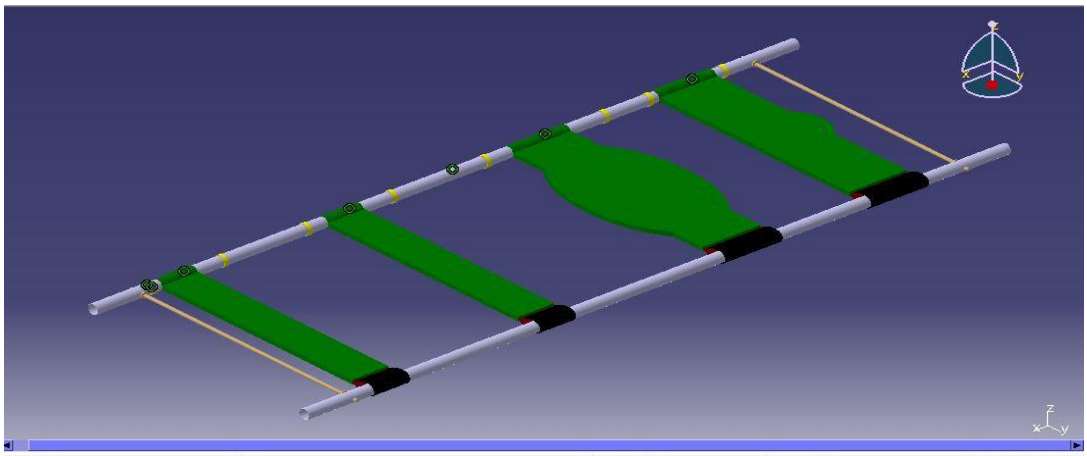

Fig.3 Final Design Of Stretcher

3.2 Anthropometry

Anthropometry is the science that defines physical measures of a person's size, form, and functional capacities. As applied to occupational injury prevention, anthropometric measurements are used to evaluate the interaction of workers with tasks, tools, machines, vehicles, and personal protective equipment, especially in regard to determining degree of protection afforded against hazardous exposures, whether chronic or acute.

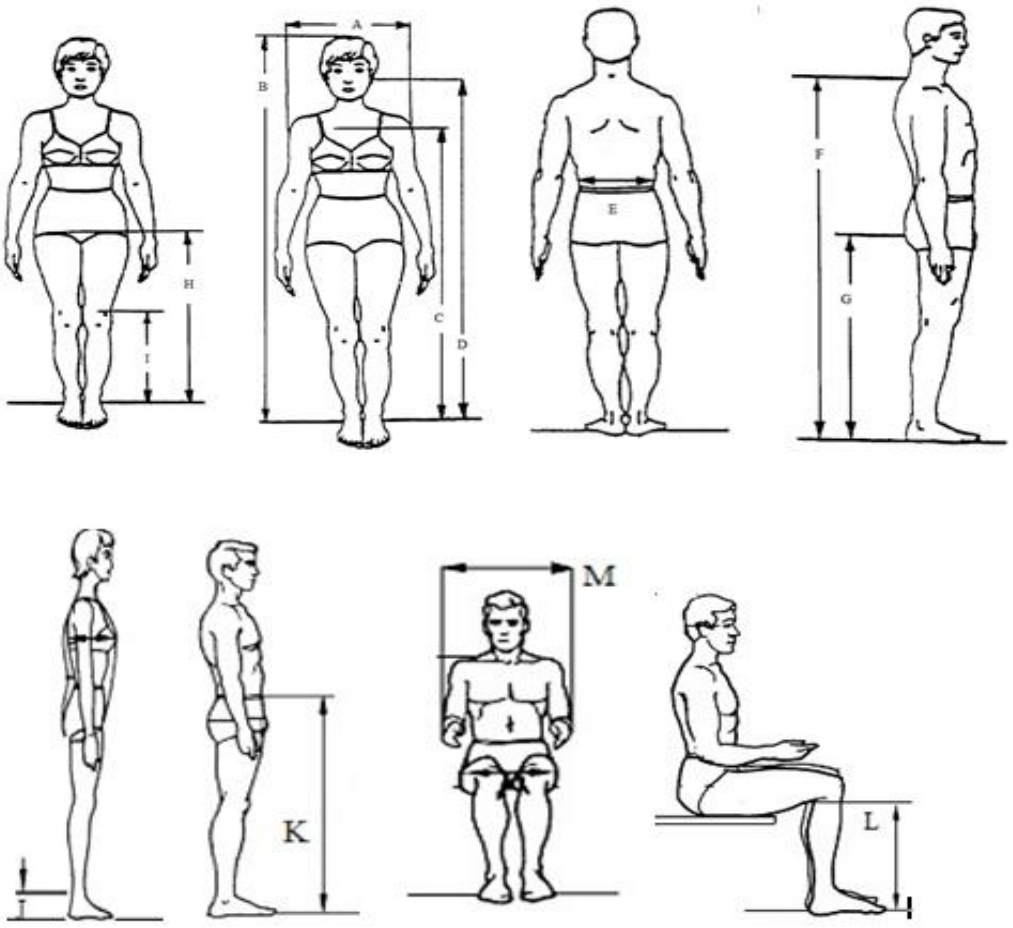

Fig. 4 Figure showing dimension anthropometry used for design development

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Method	Sex	Average Dimension (cm)	Actual Dimension(cm)
D – C	M	18.64	20
	F	17.48	
K-G	M	19.14	28
	F	12.6	
I-L	M	6.2	10
	F	7.7	
J	M	13.9	10
	F	6.1	
B	M	175.6	195.58
	F	163.1	
M	M	55.1	61
	F	46.85	

Table: 1 showing dimension anthropometry used for design development

3.3 Design Dimensions

Rods (2Nos)	Inter Locking Rings (8Nos)	Straps	
Mild Steel	Brass Alloy	Internal Material-Rough Leather (3mm thickness)	
6 feet 5 Inches	Width 1.2 cm	External Material-Smooth and water proof fabric	
External diameter 3.1 cm	Maximum diameter 4 cm	Length-72 cm	
Internal diameter 2.9 cm	Minimum diameter 1.9 cm	1st Hollow end diameter (3.2) cm	
weight 1.5 Kg each		2nd Hollow end diameter (3.4±0.2) cm	
		Thickness (1.3±0.05) cm	
1st Strap (Neck)	2nd Strap (Lower Back)	3rd Strap (Knee Strap)	4th Strap (Ankle Strap)
Weight 0.25 Kg	Weight 0.27 Kg	Weight 0.20 Kg	Weight 0.20 Kg
Width (16±0.5) cm	Width (16±0.5) cm	Width (10±0.2) cm	Width (10±0.2) cm
Circular section diameter 20 cm	Circular section diameter 28 cm		

Table: 2 Dimensions of child part of Stretcher

IV. CONCLUSION

In this research, development of rescue support stretcher system for a heavy casualty disaster helps in a quick and effective handling of patients. The stretcher system is expected to help firefighters, ambulance ward boy to achieve efficient rescue operations. Effectiveness of the system is checked by Trials and personal interviews and it is confirmed that the burden of rescue activities can be reduced by this improved design.

1. The pain patient felt during transfer can be reduced in comparison to presently available models.
2. Ergonomically design stretcher helps operator for better handling.
3. Lesser chances of injury during transportation process.

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