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“REVIEW PAPER ON STRETCHER DESIGN”

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ABSTRACT

Ambulance personnel use wheeled stretchers for moving patients in the out-of-hospital setting. The nature of adverse events and associated injuries occurring during ambulance stretcher operation was characterized. The focus for this project is to design and build a new complex stretcher to be used in standard ambulances. The background research rendered useful information on different types of ambulance stretchers that are found all over the world. The redesigning of the stretcher begins following the specifications and goals set forth by the group, which are to reduce vibrations experienced by the patient, trim down the amount of weight, and simplify user operation while still maintaining a high level of safety, comfort, and patient-centered care. It is decided that the rebuilding of the stretcher will be from the ground up, utilizing lightweight materials, and minimizing the amount of components. The new stretcher employs new designs and features not seen or used on stretches today, while still successfully achieving its objectives. Ambulance personnel use wheeled stretchers for moving patients in the out-of-hospital.

Keyword: Ambulance, stretcher, patient, materials, vibration.

I. INTRODUCTION

Emergency Medical Services (EMS) ambulance personnel provide medical care to out-of-hospital patients. The important roles of EMS include response to requests for 911 emergency help, rapid assessment and on-scene treatment of patients, and triage and transport of patients to appropriate receiving hospital facilities. Each year in the United States, EMS ambulances transport over 16 million patients to hospital emergency departments.¹ 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, 2). A specialised fastening system secures the stretcher to the ambulance floor during transportation (fig 3). While individual reports highlight adverse events associated with ambulance stretcher operation, there are presently no systematic descriptions of these incidents.^{2 3} In this study, we characterise the nature of adverse events and associated injuries occurring during the operation of EMS ambulance stretchers.



Fig. 1: Ambulance stretcher

II. LITERATURE REVIEW

Papers and licenses investigated here are connected straightforwardly or by implication to the proposed zone of work that is plan and advancement of a Wheelchair cum Stretcher. These papers are to help and edify the entire procedure of structure in the explicit territory. A wheelchair is seat with wheels, intended to encourage the incapacitated people. Stretchers are portability gadgets used to transport the patients from one place to other. These both restorative portability helps are utilized in hospitals and facilities for helping the patients.

Stretchers are basic in development and the patient needs the help of an aide to transport from one place to other. Though wheelchair is structured so that either patient can control the gadget physically or with the assistance of somebody's help.

As indicated by **Mr. Diminish Axelson, Mr. Jean Minkel, and Mr. Denise Chesney, [1994]** choice of a fitting wheelchair will lead an open to living to the client. Execution, security and measurements are the three classes which must be considered while choosing a manual or controlled wheelchair. A superb way to deal with the wheelchair determination is to set needs based on user's portability and seating needs. It is profoundly prescribed that an amateur can counsel with there habilitation authorities so as to choose the fitting wheelchair.[1]

James J. Kauzlarich, [2000] says self energized vibration is a standout amongst the most fascinating points with regards to the field of vibrations and is the science winning caster wheel shimmy. Self energized vibration is portrayed by vibration that is delivered by the movement of the framework like wheelchair speed. It tends to be seen that in a large portion of the least expensive wheelchairs, the plan of the casters makes utilization of a sliding frictional damper in the axle support to enhance the shimmy qualities. Understanding the hypothesis of damping for the casters indicate how shimmy anticipation functions in ultra-light and controlled wheelchairs.[2]

As per **Mr. Rory A. Cooper, [2002]** recovery is a humanistic calling. Estimation of the client and wheelchair are basic to accomplishing greatest useful versatility. He says Biomechanics and ergonomics give the data important to comprehend numerous parts of wheelchair use. These variables influence seating solace and stance, drive, productivity and agony. Appropriate seating is an imperative part of wheelchair determination, and wheelchair pads give weight help and some postural support.[3]

Dr. Daniel E. Happy, [2010] says appropriate readiness ought to be taken before exchanging the patient from wheelchair to bed or the other way around. Utilization of sliding sheets will be useful for paraplegic patients. The best sliding board is made of hard wood, smooth, tapered on closes. Support of two help, bolster lashes, belts and so on will encourage simple exchange. The patient ought not be slide into seat, lift from the wheelchair and exchange is the discretionary and wellbeing technique for patient transfer.[4]

Mr. Debkumar Chakrabarti [1999] says essential thought ought to be given for solace, so individuals can sit for long time without feeling any physical inconvenience. Thinking about the appropriate materials for seat surface, outline and can make an open to seating for the plan. Without considering the ergonomics and application can make a differing impact to the client. Seat pads are so critical in the plan of wheelchair.[5]

Kevin Hsu et al. [2008] talks about a plan of Portable Lift for Transferring Wheelchair Patients to Elevated Vehicle/ambulance. Moving wheelchair bound individuals from their seat into a vehicle is regularly tedious. The procedure gets progressively mind boggling when the patient must be lifted out of the seat and into a truck with a hoisted seat tallness. The finding of this examination indicates last structure is an air jack controlled via vehicle exhaust, or by an outside air blower. The jack is upheld by a scissor lift outline which holds the jack set up and takes into account uniform lifting of the tracks to address situate stature. The whole edge is made of aluminum, which is solid, lightweight, hostile to destructive and simple to machine. The gadget is planned with the goal that the air jack conveys a larger part of the heap, and the edge guarantees the jack's security. Furthermore, the tracks have locking instruments to additionally hold the wheelchair set up. [6]

Wei Ching-Hua et al. [2007] presents the instrument: 1) to change the situation of patient from deceiving sitting, 2) to change the horizontal position of patient, 3) to exchange the patient from fundamental bed to stretcher or trolley. The motivation behind this plan was both for decreasing the physical stacking of medical caretakers, and for keeping from consecutive ailment, calming the awkward sentiment of delayed bed ridden patients. This proposed bed has simple activity highlights, which not exclusively can give patients to change position from misleading sitting or feet rising motion, yet in addition can help medical caretakers to change horizontal position of patients and transport patients from one bed to the next bed. The mechanical plan idea of changing parallel position and exchanging patient originated from the transportation of patient by stretcher. This work uncovered the utilitarian components, they are: (1) Mechanism for helping patient to pivot along the side that encourage patient to change sidelong position either right or left inside the most extreme point by 80 degree and causes medical caretakers to effortlessly give rub on the back of patients. (2) Mechanism for helping patient to transport along the side from fundamental bed to the next bed or moving bearer, for example, wheelchair. (3) Mechanism on moving bearer, for example, gurney to change into wheelchair that causes patients to effectively get off the principle bed and move to areas, where the therapeutic treatment or entertainment design are wanted. [7]

Hongbo Wang and Fumio Kasagami [2008] present a Careful-Patient Mover utilized for patient move in hospital. Utilizing this Careful-Patient Mover, the medical caretaker can exchange the frail, harmed or incapacitated patient from bed to stretcher or from stretcher to bed without anyone else's input and the affliction, push and uneasy sentiment of the patient can be lightened. This paper portrays the motivation behind advancement, structure of instrument and control arrangement of the mechanical assembly. Another servo framework is utilized in this control framework and its control rule and calculation are proposed. The assessment aftereffects of approval preliminaries demonstrated the viability of the framework. It is outstanding that countless experience the ill effects of lumbago torment since they should take the patient lying on beds up their arms to exchange them. Since the rough and imprudent transportation can cause the torment of the patient or a mishap; the attendant must use heavier work to exchange a patient than to exchange an article with same weight. [8]

Ehsanullah Khan et al. (2011) presents a calculated improvement of trolley cum wheelchair for disposing of manual patient dealing with. The manual treatment of patient is damaging to the patient as stresses are delivered in the body of the patient, particularly in neck, spine, appendage joints, and so on., alongside the essential therapeutic problem he has. Ill-advised dealing with may make wounds the patient. Additionally the nursing staffs who handles patients, faces some medical issues like agony in the shoulder, spine, etc.[9]

Shih-Wei Peng and Feng-Li Lian (2010) examines the component plan and mechatronic control of a multifunctional test bed for testing and assessing medicinal services exercises intended for helping bedridden individuals. The proving ground comprises of a lot of two mechanical beds: one primary bed and one nursing bed. The principle bed is assigned for stance changing and the nursing bed is for transportation. The two beds are likewise furnished with a belt framework

for exchanging the body between them. The structure idea of the bed framework is defined dependent on the field investigation of comparable device in hospitals. The two beds are then made and controlled by an efficiently planned mechatronic framework and can be cooperated through an uncommonly structured graphical UI program. Related trial assessments are shown widely. The proposed proving ground is assigned for mechatronic architects and social insurance work force at the same time to all the more likely help the day by day life of a bedridden individual. The assessment results demonstrate the adequacy of the bed framework. [10]

Premchand Gupta, Suresh Garg and Sachin Maheshwari, [2012] had distributed a paper on plan of setback departure stretcher utilizing pivot joint. They have examined utilization of various joints like attachment joint, pivot joint, slider joint and so forth to make reduced plan of stretcher which is reasonable for Indian armed force. The stretcher winds up foldable and increasingly minimized with utilization of pivot joints. [11]

Arif Duran, Hayrettin Ozturk, UmitYasar, Muchahit Emet, [2013] had examined the impact of stretcher sort on security and simplicity of treatment in a crisis office. An overview of 139 polls from fifteenth January to 29th February 2012 would choose the necessities of patients from a divine being stretcher. Expert 'wire spring and frame organization, inc. had distributed a diagram on investigation of various materials and their properties. In the wake of concentrate diverse materials given in this diagram, hard drawn spring steel material is chosen for helical spring. [12]

Vajreshwari Umachagi, KattaVenkatarmana, G. R. Reddy,[2013] had examined on utilization of safeguard for vibration control of various structures. Safeguards can be utilized for vibration control of stretcher and the techniques to actualize them. While planning a stretcher, the most important factor to be considered is the wellbeing of patient. [13]

Sudarshan Martande, Y.N.Jangle and N.S.Motgi (2013), has contemplated on various corresponded strategies to structure segments of safeguard utilizing FEM based instruments. FEM apparatus is utilized to ascertain distinctive pressure and diversion esteems in safeguard to contrast it and expository arrangements. [14]

III. CONCLUSION

Adverse events may occur during ambulance stretcher operation and can result in significant injury to patients and ambulance personnel.

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