

# DESIGN AND FABRICATION OF A MANUAL DEVISE FOR PROVIDING SAFETY FOR THE PATIENTS AND HEALTH CARETAKERS

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## ABSTRACT

*In most of the hospitals and homes, patients are carried by health caretakers without any safety which may lead to distractive consequences like accidents, injuries, back pain to the caretaker while lifting the patient, and many other problems. To solve this kind of problems we come up with an idea that gives safety for patient as well as caretaker and requires less effort to handle the patient while moving him place to place  
By designing a simple mild steel structure that supports and bare the weight of the patient and make things work out faster and safely*

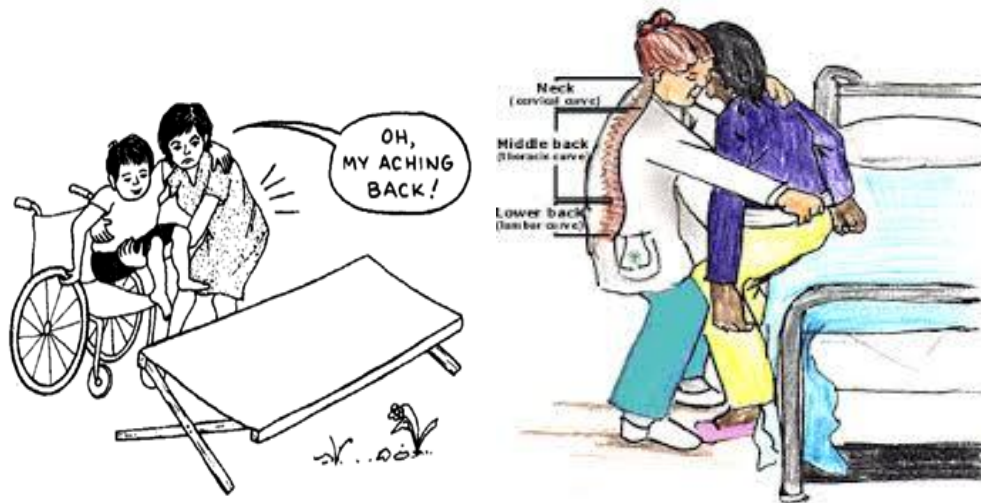
***Keywords: design and fabrication, patient and health caretakers' safety, Hospitals and domestic use, fabrication***

## I. INTRODUCTION

In today's hospitals and even in home the patient suffering from paralysis or any sort of diseases who can't walk or sit by himself required Healthcare providers, it is being more challenging for Healthcare providers to handle their patients while moving them from one place to another place particularly in hospitals the health care providers face every difficulty in performing their duties because they won't have to focus on their own safety and thinking they'll get hurt, to able to spend all their energy and alertness in providing good, this sentiment applies to a myriad of worker safety issues, from needlestick injuries to injuries from lifting patients to fear of being assaulted by a patient

To prevent such consequences we have come up with an Idea to designing a simple device which is helpful for the health caretakers to handle the patients with minimum effort and also to preventing them from injuries which are caused by lifting the patients such as back injuries shoulders injuries etc. design includes typical Mild Steel metal round and square tubes fabricated together by means of hinges and sliding pairs and the base with wheels to move in all the directions additionally a soft cushioning chest plate where the patient rest his chest while moving. The chest plate is supported by U frame the two ends of the U frame are hinged on a base frame, round sliding pairs are hinged to U frame and the base frame, another square sliding pair is hinged on foot plate and round sliding pair. A curved wooden plate is employed in the design of chest plate which observes the 60% of patient weight and the remaining is observed by foot plate which is a high gauge MS metal sheet.

### Illustration of problems



Spinal injuries

## II. METHODOLOGY

Modelling of designed experimental setup is done by manual drafting by analysing practical parameters suitable for average personality patient. Following parameters that are considered for the best size of model which can be utilized by all patients irrespective of their weight and height excluding exceptional cases.

### 1. Stable Chest Plate

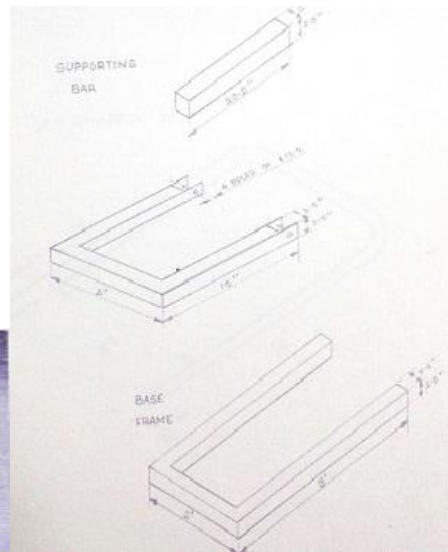
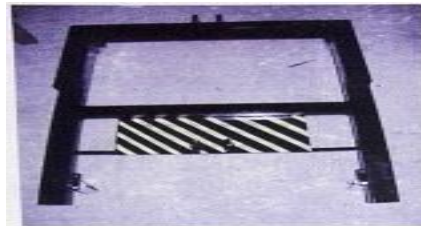
A chest plate is designed in curved shape to fit properly on to the patient's chest while transferring. Cushioning effect is provided to give better comfort to the patient while transferring. Chest plate can move in an angular position (maximum to minimum positions at angle of 60). It can resist the weight about 100kg's. The chest plate itself absorbs the 60% of the patient weight and the remaining weight is absorbed by the foot plate



### 2. The Base Frame

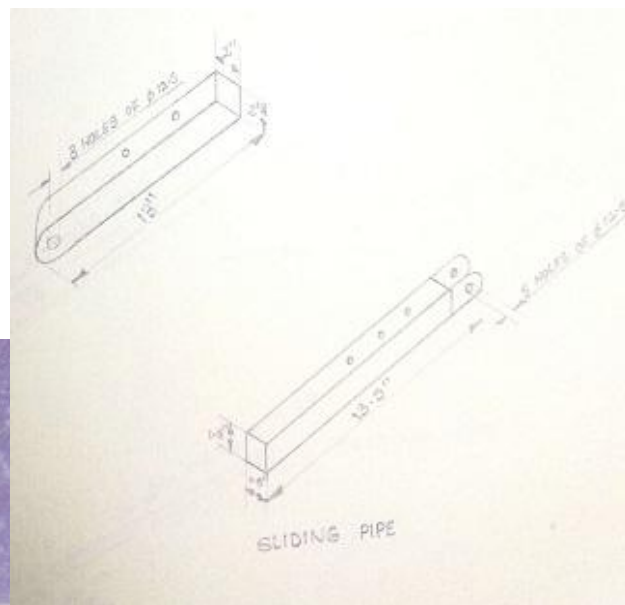
The base frame is mounted on the wheels and rest of the parts are mounted on this particular frame which is made of a square mild steel of 2.5-inch square tube,

the length of the screen is 3 feet long and 2 feet wide and fabricator with the supporting bar of length 20.5 inches on the top of these a 2 feet wide and 15 inches long tube is fabricated which have holes of Dia 12.5 mm at the either ends of this frame where the U-frame is fixed with the help of studs



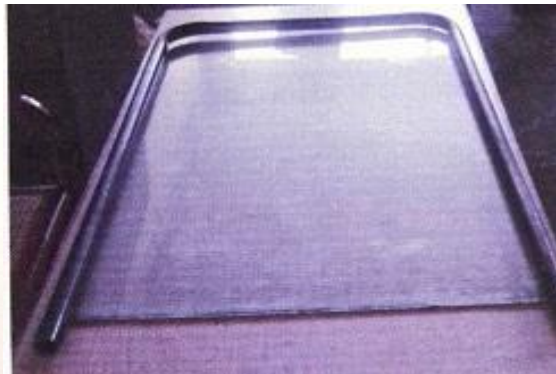
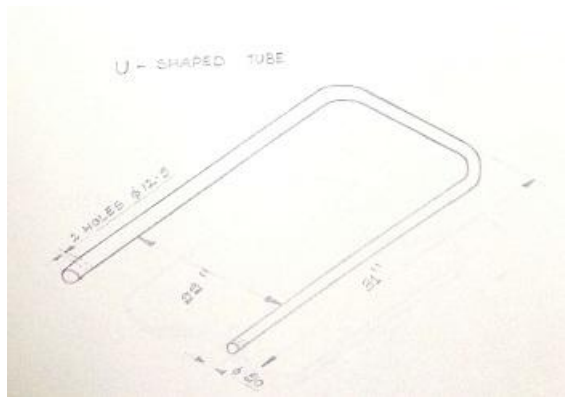
### 3. The Sliding Pairs

The sliding pairs its supports the U frame, it is hinged on the top of the base frame. At one end is hinged to the middle frame and other is to the chest plate. The sliding pair consists of two different pipes which is consists of no. of holes on its surface of the both pipes. The smaller diameter pipe slides in the bigger diameter pipe. It enlarges when the U frame is moves down and it moves inside when the U frame moves up. Its carries 2/3 weight of the patient.



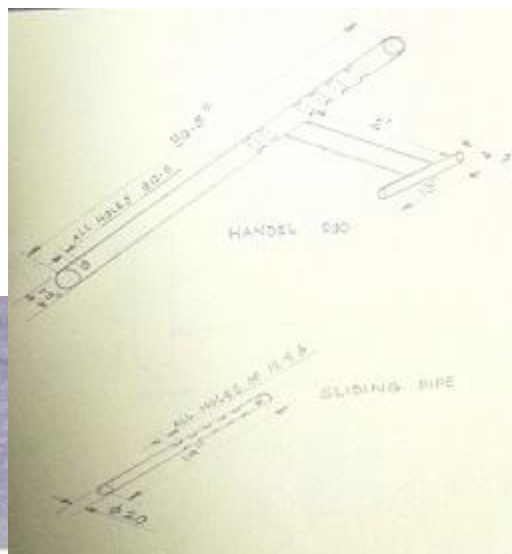
### 4. The U Frame

U-frame supports the chest plate the two ends of it is hinged on base frame



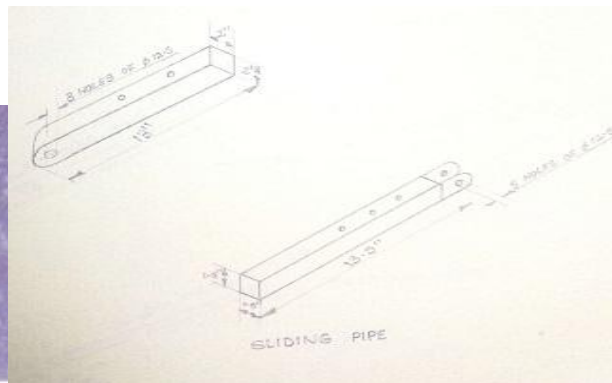
### 5. The Sliding Round Pairs

The sliding pairs its supports the U frame, it is hinged on the top of the base frame. At one end is hinged to the middle frame and other is to the chest plate. The sliding pair consists of two different pipes which are consists of no. of holes on its surface of the both pipes. The smaller diameter pipe slides in the bigger diameter pipe. It enlarges when the U-frame moves down and it moves inside when the U frame moves up. Its carries  $\frac{2}{3}$  weight of the patient.



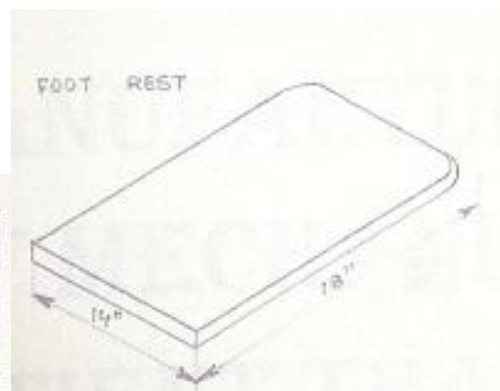
### 6. The Sliding Square Pairs

It is also same as the sliding round pairs. But it's in square type is hinged at one end to the sliding round pairs and other to the foot plate. It carries  $\frac{1}{3}$  of the weight of the patient. It enlarges when the U frame moves up and decreases when U frame moves down.

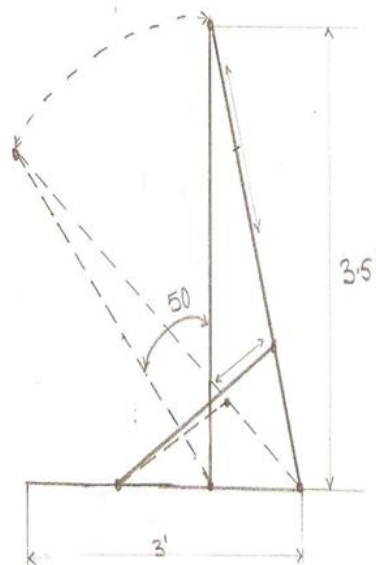


## 7. The Footplate

It is used to support the legs of the patient on it. While it is transferring from one place to another place. It is mounted on the base frame of the device by means of arc welding.



## III. KINEMATIC DIAGRAM





## FINAL PRESENTATION VIEW



## CONSOLIDATED PARTS LIST WITH DIMENSIONS

PARTS	TYPES	SIZES (Feet's)	Q.t
BASE FRAME (Mild Steel)	SQ Hollow	14x 1.5x 1.5	1
U- FRAME (Mild Steel)	Round hollow	$\Phi$ 0.1x3.1	1
HANDLE (Mild Steel)	Circular Hollow	$\Phi$ 0.3 x 3.5	1
CHEST PLATE (Wood)	Elliptical Bent	As per req.	1
HINGES (Mild Steel)	Simple	$\Phi$ 12.5x 0.5	6
SPLIT PIN (Mild Steel)	Simple	$\Phi$ 0.3x 0.1	6
HINGE PLATES (Mild Steel)	Rectangular	2x2x0.2	12
CLAMPER (Mild Steel)	Rectangular	2x2x0.2	1
BOLTS	Hexagonal	M12x60mm	10

#### **IV. WORKPLACE PROBLEMS**

1. Lifter maintaining a single position for an extended periods.
2. Lifter absorbing the variation of the device.
3. Lifter where frequently wants to away from their work.
4. Lifter wants to changes there works.
5. Lifter who wants to changes there equipment.
6. Multiple lifters handling the same equipment.
7. Controls that is difficult to reach.
8. Controls that is difficult to manage.
9. Poor handling.
10. Aged lifters.
11. UN sufficient placer to work.

#### **V. LIFTER'S PROBLEMS**

1. High work related accident or injuries.
2. High absenteeism on a specific work.
3. High turnover on a specific work.
4. High disciplinary action on a specific work.
5. Single person on a specific work.
6. More rework.
7. More energy waste.
8. Low interest.
9. Low wages for specific work.
10. Decaling work for the different shifts.
11. Low work performance

#### **CONSIDER THE RULES FOR THE HANDLING THE HEALTH AND SAFETY**

Lifting the heavy patient can't be possible without using the lifting aids unless you don't mind hurting your back or limbs. Lifting light patients incorrectly can also result in injuries. Work absence due to aching backs and shoulders and limbs injuries losses a business and society billions of rupees every year.

Preventing all these injuries has huge monetary benefits for all the hospitals and the societies.

To prevent the injuries they have to make the proper equipment in the hospitals.

While working the workers has not to be in a hurry because if he is in hurry it leads injuries to him and the patients.

While lifting the patient the hand of the patient has to properly on the chest plate.

While pulling the device the worker should not apply the frequently suddenly force Because it leads to muscles strain to him and the patient.

## **VI. BENEFITS OF PATIENT TRANSFER DEVICE**

1. In each and every hospital and clinic there is continuous need of patient transfer device for transferring the patient from one surface to another surface. Generally, a heavy patient requires 2 to 3 persons to lift and more time is consumed. At this time if any mistakes occur the patient may severely be injured and the caretakers may also get back pain. The patient transfer device is the ideal solution to resist the problems.

2. **SAFETY**

This will be a significant device for safety of the patient and also for caretaker, as it can reduce the risk of causing uncertain errors by the caretaker

3. **PORTABILITY**

The device can provide in a portable configuration using wheels or casters. Using this property the patient can be easily moved from one place to another comfortably and safely with minimum human effort.

4. **LOW MAINTENANCE**

Patient Transfer Device is rugged, heavy-duty device designed to provide years of reliable service with minimum maintenance

## **VII. GENERAL TYPES OF TRANSFER DEVICE THAT ARE AVAILABLE IN THE MARKET**

### **1) SOLO VEST:**

This is a very complicated in design and requires more attention and skills to operate, the hanging belt makes the design complicated and delicate in use, and however it comprises a hydraulic mechanism which is a good advantage in smooth handling with minimum effort.



### **2) HYDRAULIC PATIENT LIFT**

This also has the hydraulic mechanism which is an advantage on the other hand it also has some limitations like complicated design and need perfection in operating this equipment





### **3) STAND ASSIST 350**

This is an advanced with more flexibility in using and it has automated features which lead to high initial cost and expensive maintenance requires high skilled worker



Additionally it has portable facility as it is run by the battery, however this is a highly precession devise with digital screens to monitor and to operate.

Technical Specifications:

Safe working load 158kg (348lbs)

Fuse type 5Amp

Charger 24v, 24 Amp

Min overall height 105cm (41 3/4")

Max overall height 172cm (68")

Internal width - Legs closed 56cm (22")

Internal width- Legs open 80cm (31 1/2")

Overall length 90cm (35 1/2")

Height of legs 11cm (4 1/3")

Weight including batteries 52kg (114lbs)

Comes complete with spare battery and battery charger

### **VIII. APPLICATIONS OF OUR DEVICE**

- I.** Accessing comfortable lifting
- II.** Loading the patient for transferring
- III.** Working on long transferring
- IV.** Working on unloading the patient



This patient transfer device can employed for this process. It has the ability to transfer the patient from one place to another place comfortably and safely.

FOR EXAMPLE:

- 1. from bed to wheel chairs or vice-versa.
- 2. from wheel chairs to toilet chairs.
- 3. from bed to sofa chair

While transferring from one surface to another surface the patient requires two persons to change his/her positions. While changing position the patient may slip or fall down this results in saviour injuries fracture of bones to the patient and also they caretakers may get back pains and more time is consumed. This device avoids all this problems and the patient can feel comfortable and safe while they changing his positions.

Moving the patient in horizontal motion requires two persons. They may find difficulty in doing this job. The patient also feels uncomfortable. This device may be employed in moving the patient in horizontal traveling comfortably and safely with minimum human effort and within the minimum time. With the help of this device the patient can also travel the medium distance.

Moving the patient may twist and accidents may occur in the general patient transfer device, but with device like this it is easy to lift and carry the patient. This device can help the caretaker to lift the patient comfortably and safely with minimum effort.

## IX. FREQUENT PROBLEMS OCCURRING IN PATIENT TRANSFER DEVICE

FAULTS	REASONS	ACTIONS
No movement of the hinges	Formation of rust on hinges. Absence of lubricant	Apply the lubricant on the hinges. Apply grease
No lifting movement	The sliding pair is strucked. Blocking of hinges. No proper position of the patient on the chest plate	Apply lubricant and then adjust it. Apply the grease on the hinges. The weight is placed in improper position.
Chest plate does not reach to the patient.	No working of the hinges and shafts.	Apply lubricant on the hinges and replaced the old shaft with new one.
Jerky movements.	Sudden load on the chest plate. Worn out of washers and shafts.	Apply the weight of the patient slowly on the chest plate. Check and Replace the washer and shafts.
The chest plate lowered without lowering.	The shaft has not placed in the holes of siding pairs.	The lock pin has to place in the holes of the sliding pairs after loading and unloading of patient.
No horizontal movement of the device.	Blocking of the tyres or castors. Worn out of tires or castors.	Apply the lubricant or grease in the tires or castors. Check and replace the tires or castors.

## X. CONCLUSION

In each and every hospital this device will be helpful to the patients and also to the healthcare providers for their efficient working time and safety, prevent accidents, injuries and hazards. And results in high satisfaction of clients and workers with an increase in productivity of their efficiency

It is also simple designed and no maintenance with easy operating additionally very low investment

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