

# EMERGENCY PATIENT TRANSFER SYSTEM

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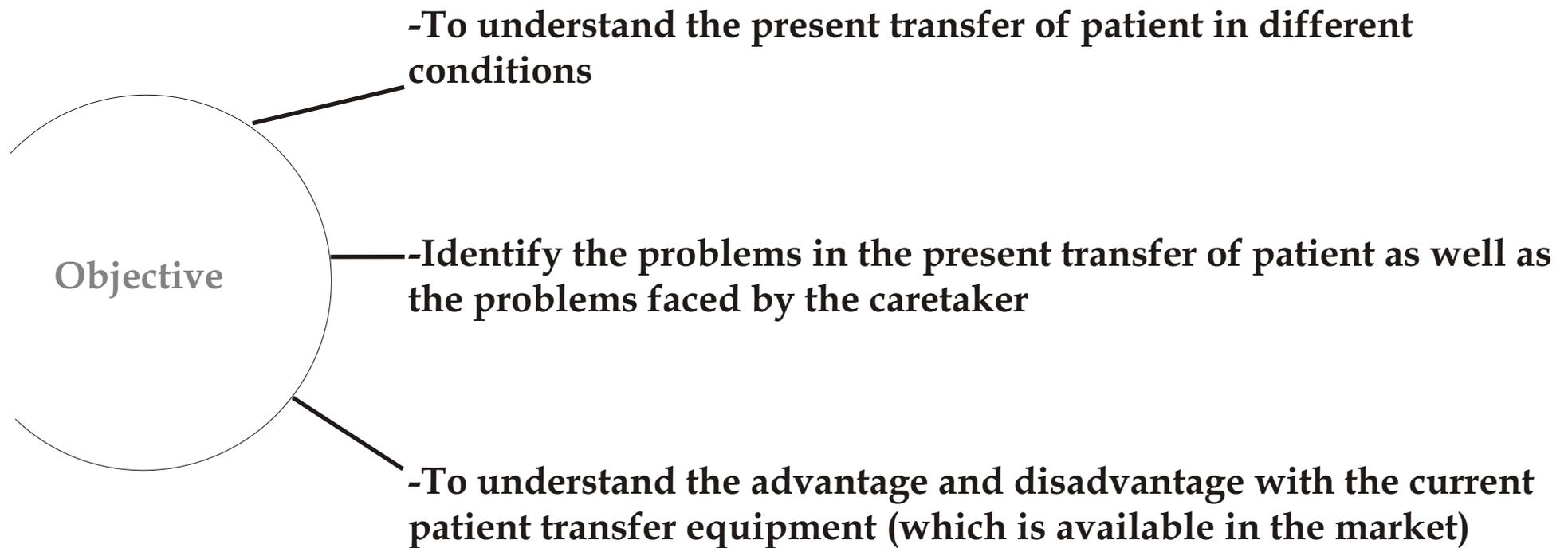
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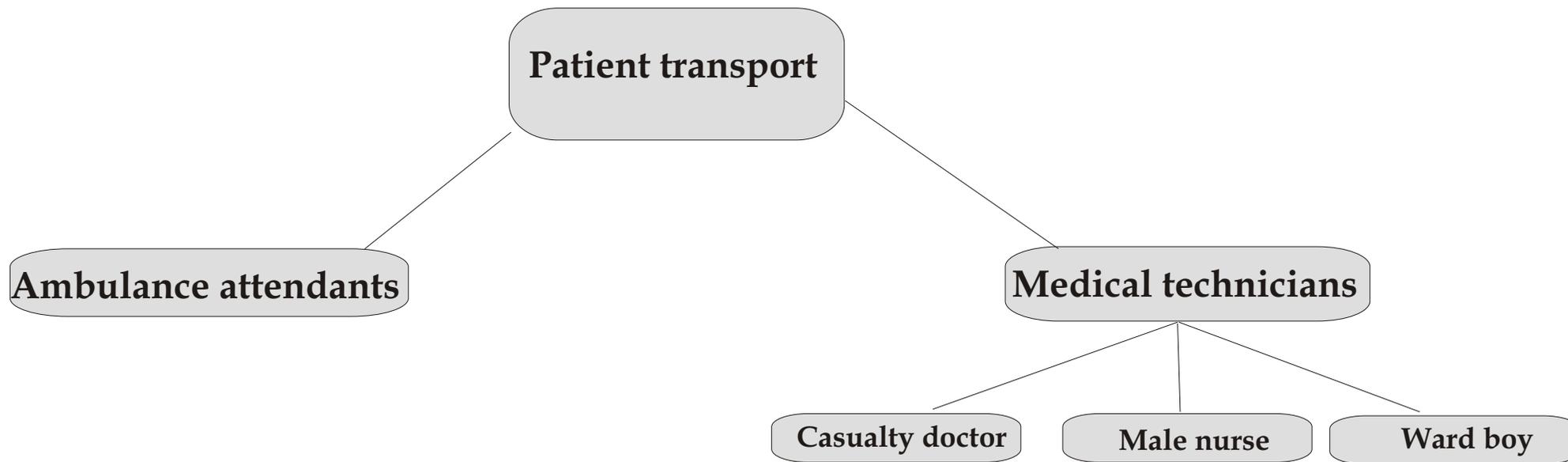
**Need for patient transfer arrives at various kind of scenario. In different scenarios patient is transfer from one surface to the stretcher or to the hospital bed and vice-versa. The initial transfer of patient which is done by lifting causes lots of injury to patient. In case of the spinal injury the utter care should be taken to transfer patient otherwise it may damage the spinal cord which might become a lifetime injury.**

**Inside the hospital lot of time patient has to be transferred laterally to various department beds for constantly monitoring and checkups. So there must be some transferring aids for easier and safety of patient**

## Aim Of The Project

To provide emergency transfer equipment from different surface level to stretcher, trolley ,hospital bed and vice versa



**Plan of Treatment: -**

The condition of patient is studied and following treatments are followed

They check the blood pressure and heart rate

-supply cardiac electrodes

-supply intravenous

-Examine the data and medicines are given to stabilize the condition

-Sometime they also supply oxygen and C.R.P

-Also they carry the oxygen cylinder and C.R.P long with patient inside the hospital.

## Present patient transfer

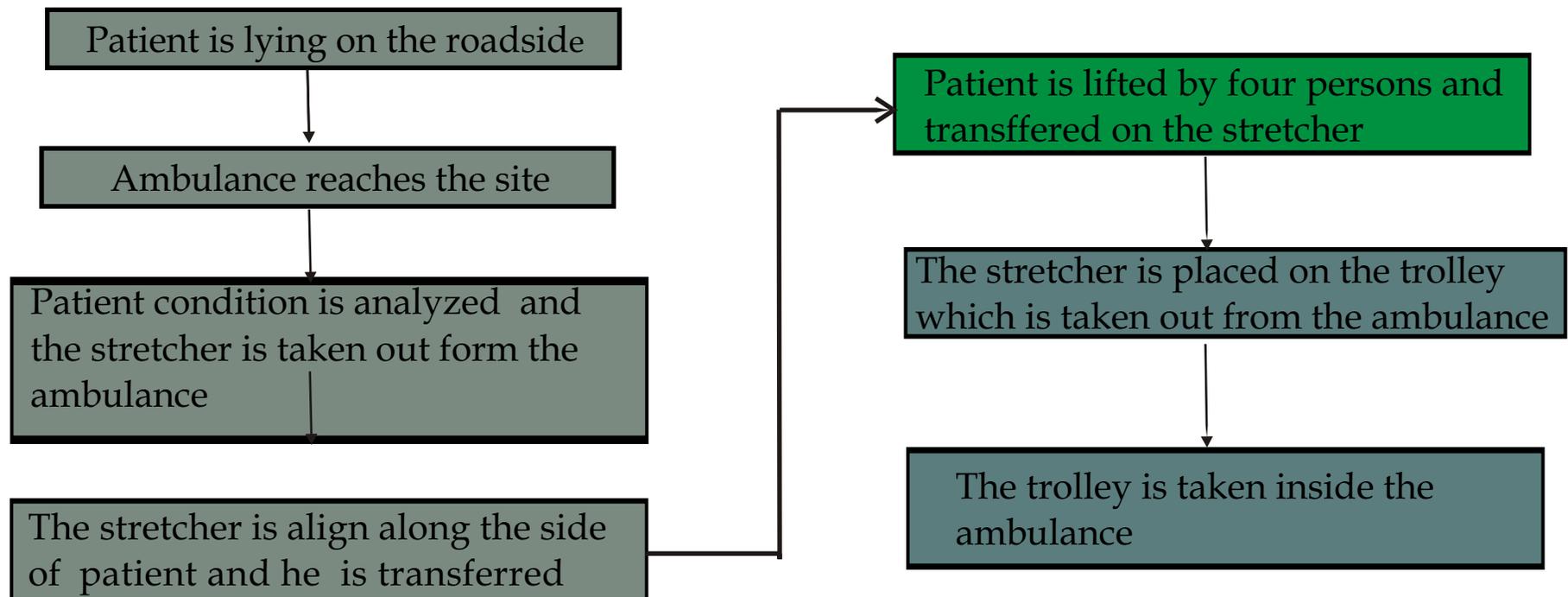
Outside The Hospital

Inside The hospital

Outside the hospital

Scenario 1 :- Road Accident

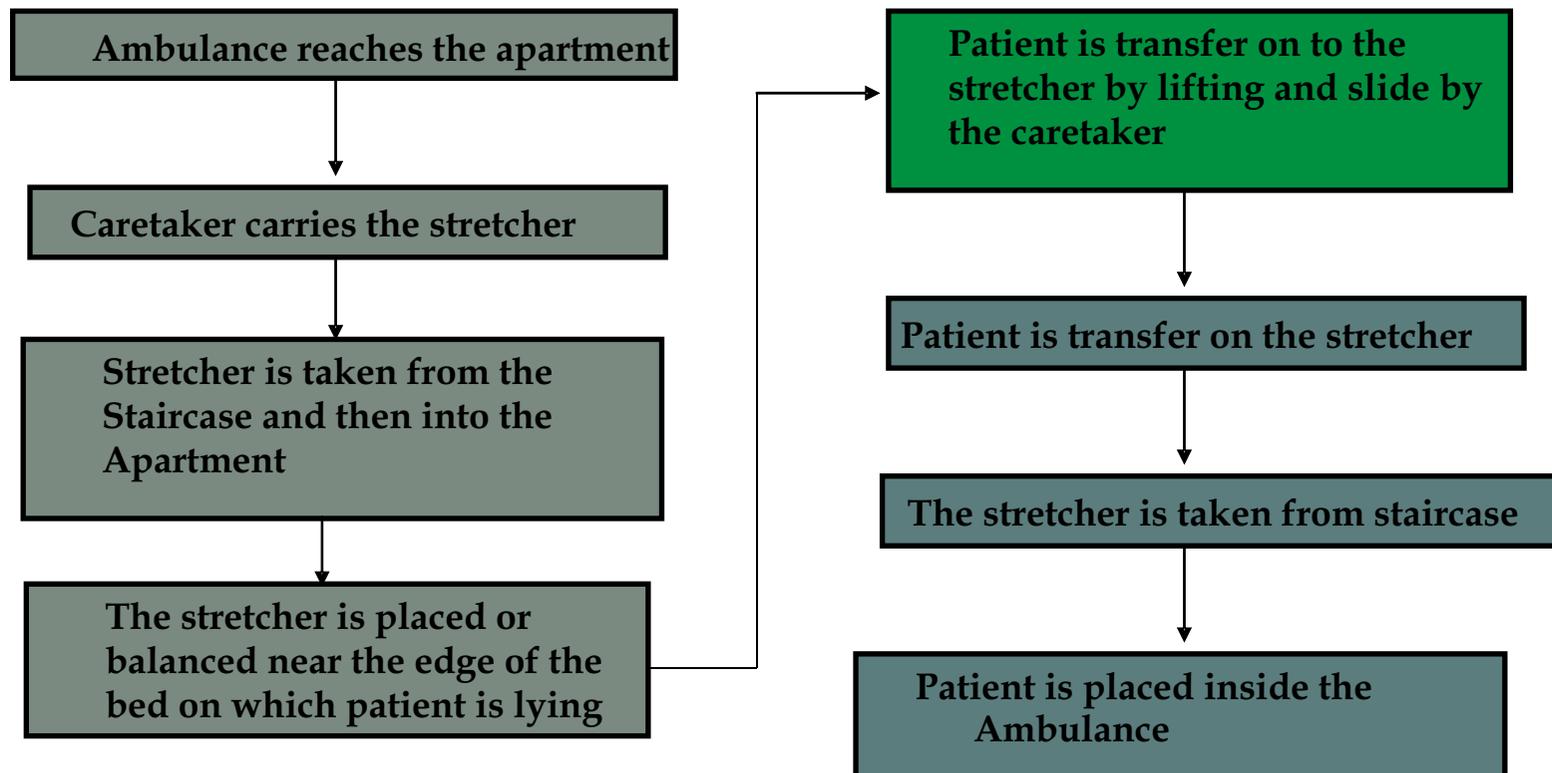
In case of a road side accident the ambulance is called on the site and patient is transferred by the group of casualties which include a casualty doctor, wardboy, and an ambulance driver



**Scenario 2 :-Patient transfer from apartment to the ambulance**

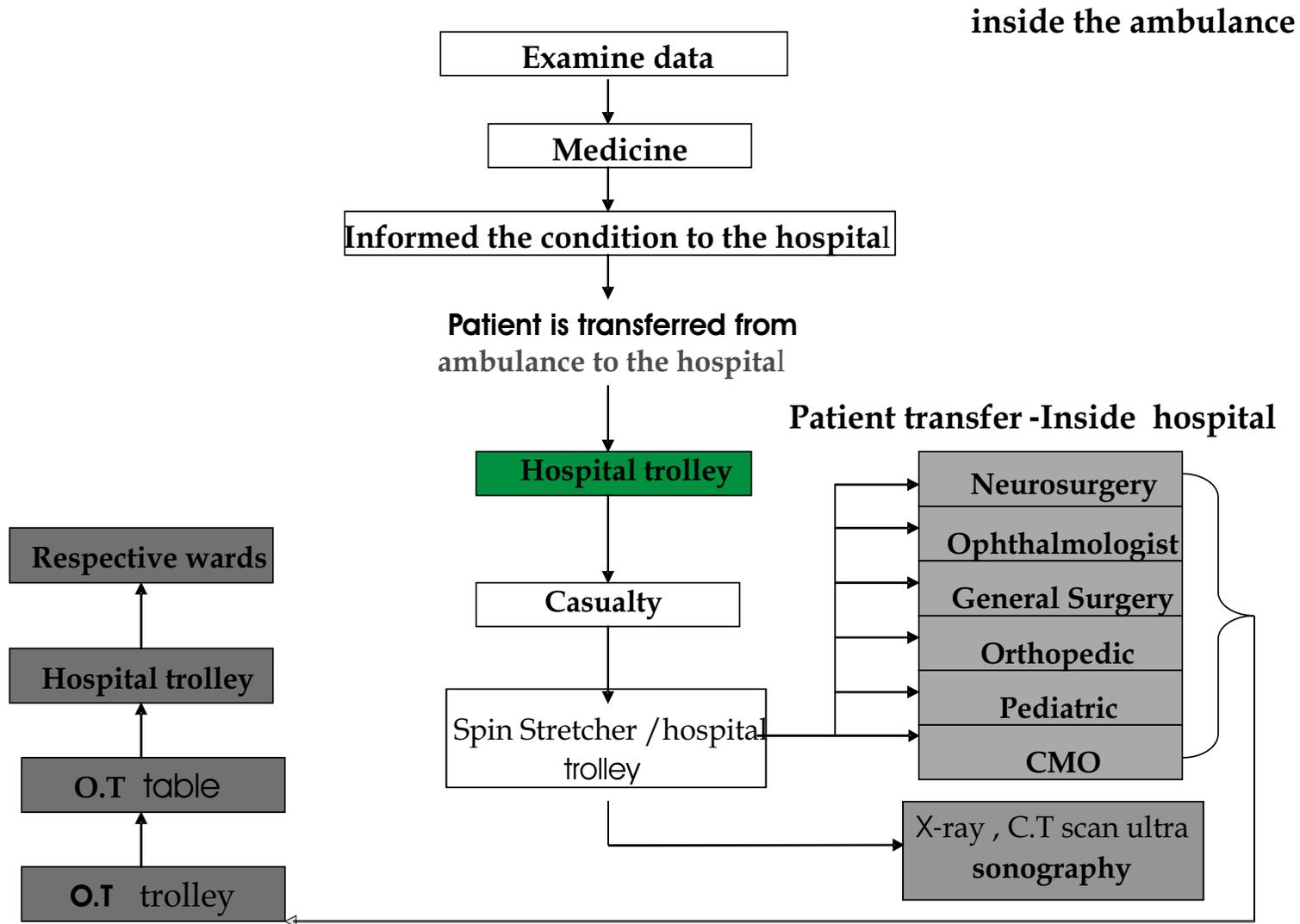
In the apartments which are the usual since in Mumbai the beds are generally placed along the wall so the approach to patient for transferring is less.

Patient usually taken on a stretcher through a staircase to the ambulance because the apartment lift is not design as per required patient transfer.

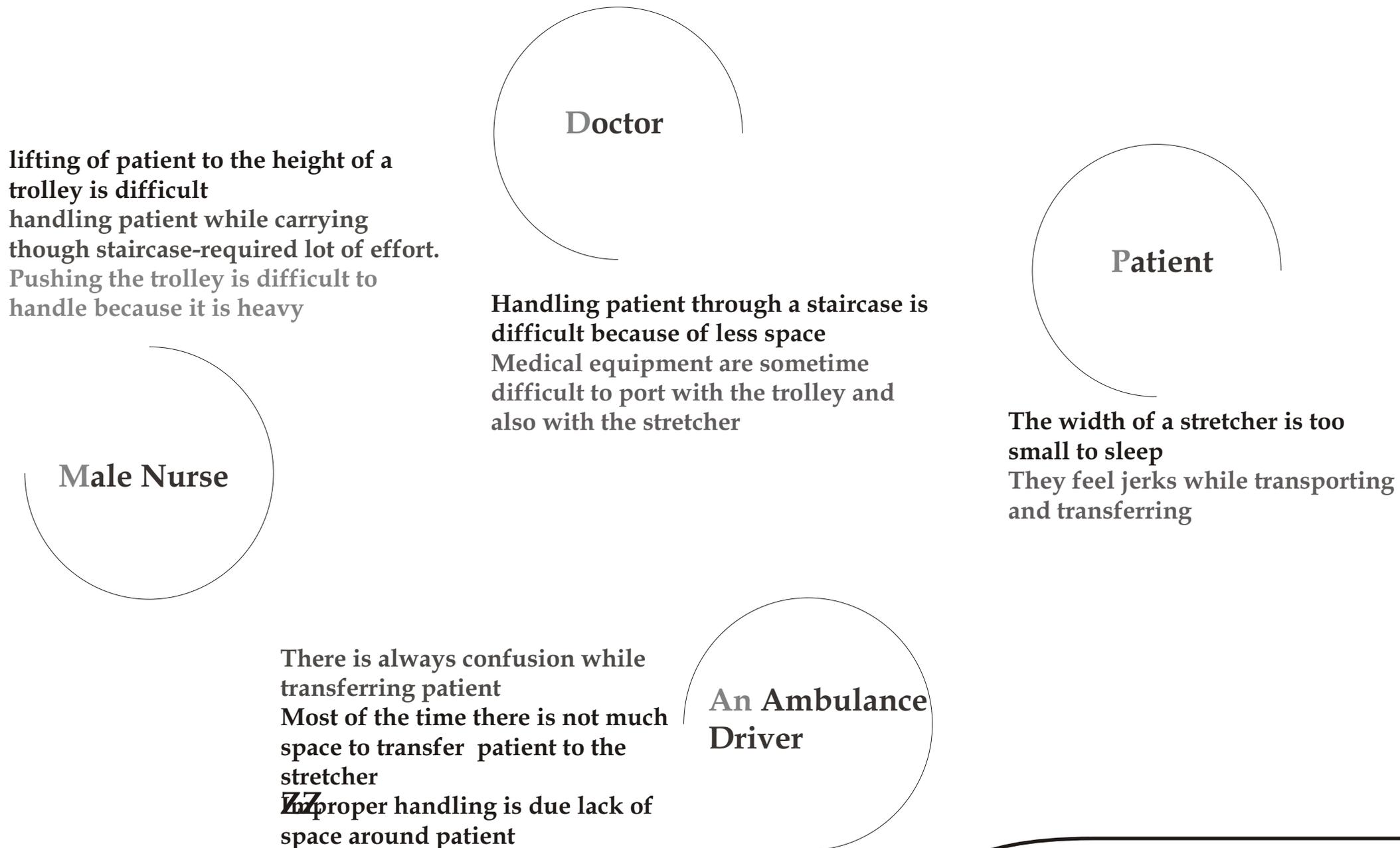


## Inside The Hospital

Patient is always shifted from one surface to various department beds for different tests and examinations .



## Problems faced by the caretaker in existing system



## Scenario 1:- Patient transfer from apartment to the ambulance



**Situation 1 :-**

**Patient is transfer on the stretcher**

**Problem:-**

patient on the bed which is placed along the wall hence the approach to the patient is only from two sides.

The stretcher is placed onto the edge of the bed  
Two caregiver has to support the stretcher from led end and head end

While two more caregiver has to bend forward and place the hand below patient .

Lifting of the patient causes further problems to a patient

**inferences:-**

Rolling and pushing of a patient should be avoided  
Patient should be transfer as a single unit.



**Situation 2:-**

**Inside the apartment the patient taken from a staircase**

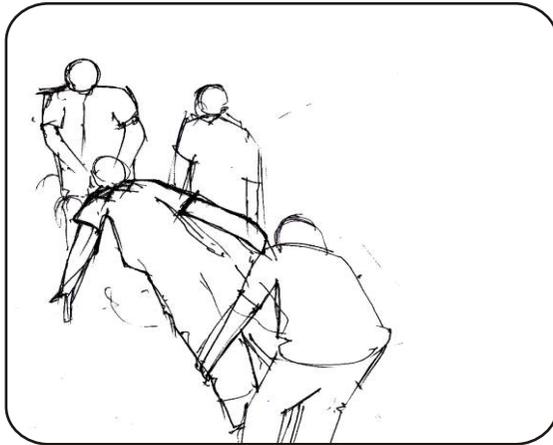
**Problem:-**

Is difficult to balance a patient

**Inferences :-**

The patient should be intact with the stretcher  
Good grips should be provided for the caregiver to balance the stretcher

**Scenario 2:- Patient is transfer from accident site to the ambulance**



**Situation 1:-**  
road accident or person faints on the road side or  
person faints in the apartment

**problem :-**

the situation of patient become worse because he  
has been shifted by the road sider or by the non  
technicians

**inference:-**

Patient situation changes and sometime it become  
worse so no assumption regarding patient situation  
should be made .

**Scenario 3 :- The stretcher is taken out from the ambulance  
and a patient transported inside the ambulance**



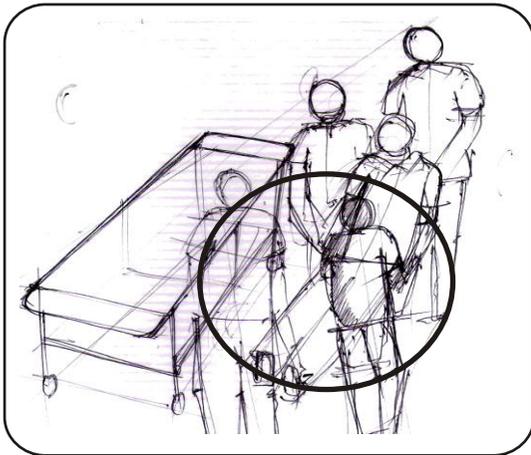
**Situation 2 :-**  
The ambulance reaches the site and the stretcher is  
taken out

**Problem :-**  
too many locking systems in removing the stretcher causes  
delay an

complicate the emergency process

**inference:-**

equipment should be less complicated and should not



**Situation 3:-**  
patient transfer on the stretcher

**Problems:-**

Patient lifted by four people ( male ward boy , doctor, ambulance driver and relative) two onto the shoulder side of patient and other two are holding his legs.

**Inferences:-**

Lifting of a patient should be avoided

**Situation 4:-**  
While taking out the patient and placing on the hospital trolley



**Problem :-**

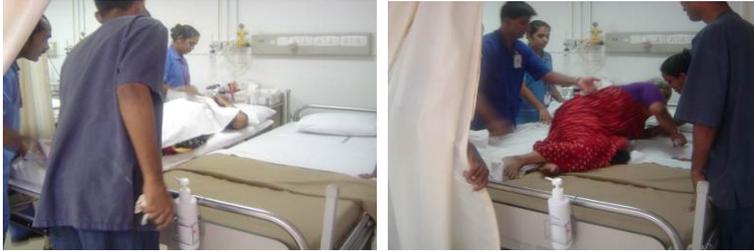
While shifting the patient lot of confusion is happening between the caretaker

**Inferences :-**

The stretcher should be easily removed from the ambulance

## Situation5 :- shifting to the hospital or casualty bed

1:-  
Patient is rolled down when the patient is  
conscious



2:-  
Patient is lifted manually by the caretakers



3:-  
Patient is lifted by using clothe on  
which patient was lying

Inferences :-  
Patient should not be rolled down and the equipment  
should facilitate the lateral transfer of the patient

-The initial transfer of patient from surface to stretcher, ambulance and various department beds and vice versa has increases or causes lot of injuries to the patients as well as always required a work force to transfer patient.

-Most of the time transferring persons or caretakers are in confusion to transfer patient Because the existing transfer system is done by manually or by the old method of using clothe. Also, the new equipments are not used very efficiently.

**While initial transferring of patient onto the stretcher**

-Approach too patient not always from all sides so they try their own way of transferring patient not the appropriate method of transfer

-Usually head of patient get affected more during patient transfer

- Patient not transferred as a one unit from one surface to the other (bed, ambulance, O.T table.)

### Conclusion :-

- 1.The transferring devices which can be incorporated in all scenarios, i.e., transfer from an accident site or the apartment bed to the stretcher, hospital bed, department beds and vice versa.**
- 2.The basic problem of safe and easy transfer of patient from surface to surface will be solved efficiently**
- 3.The device which has include market potential and cope up with the other product available in the market.**
- 4.The device should be easily and quickly operate by the caretakers.**



Market study



## The Stretcher

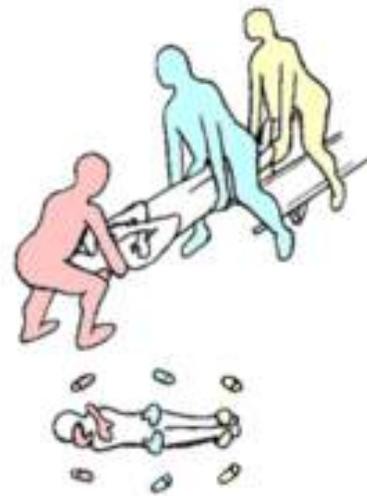
The most common type of stretcher used in the ambulance is the stretcher with the wooden poles and canvas material for holding the patient .

The practical values of stretcher are :-

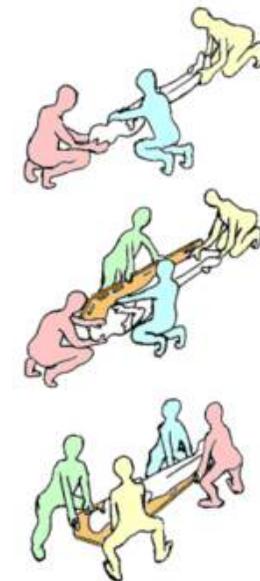
- 1)length of pole - 7ft -9inch(230cms)
- 2)length of canvas - 6ft (180cms)
- 3)total width - 1ft - 11inch(57cms)
- 4)height above ground - 0ft - 6inch (15cms)
- 5)weight - 30ibs.0 to 32 ibs (14kgs)



Simple lift

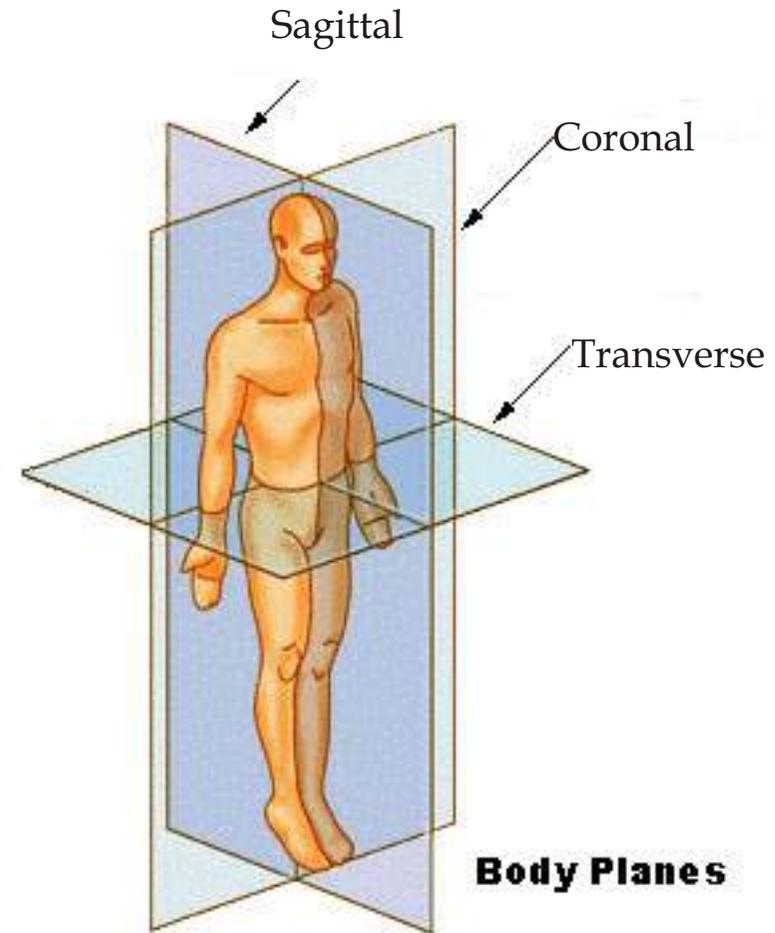
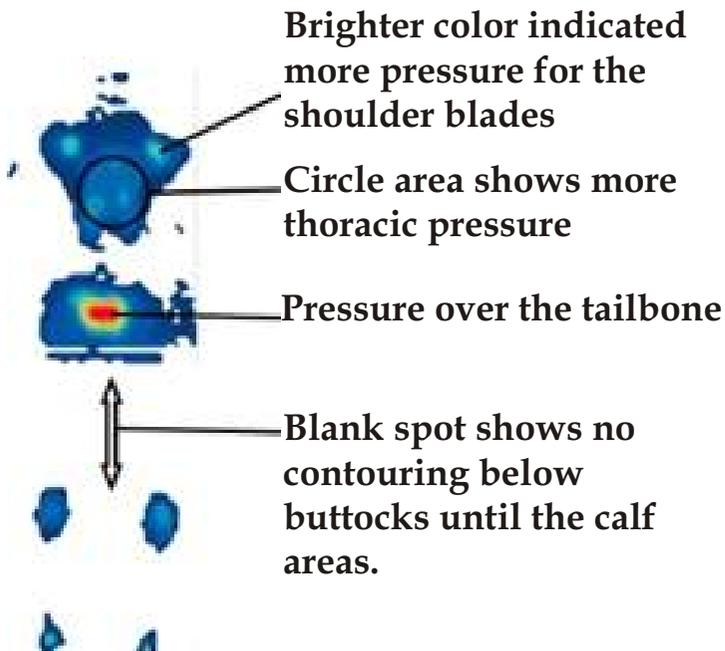
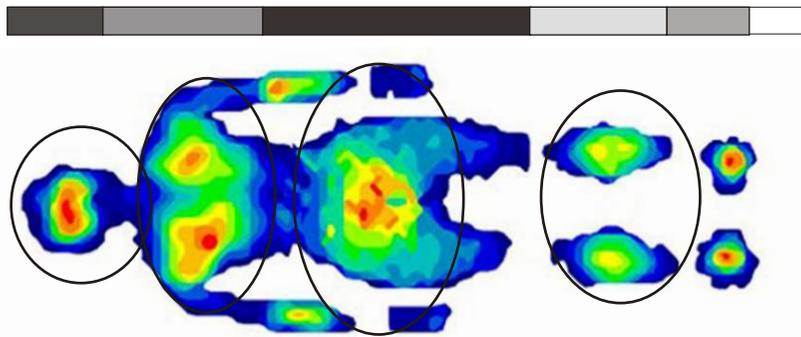


Translation lift



Log roll method

Method of lifting



Above figure shows the pressure areas of the

Various planes shows the body planes in different directions

The major plane is sagittal for the patients lateral

**Product brief: -**

--The device is used to transfer the patient from accident site or apartment to the ambulance, to the casualty bed, to the operation table and x-ray table.

--The device helps in stabilising the position of patient while carrying

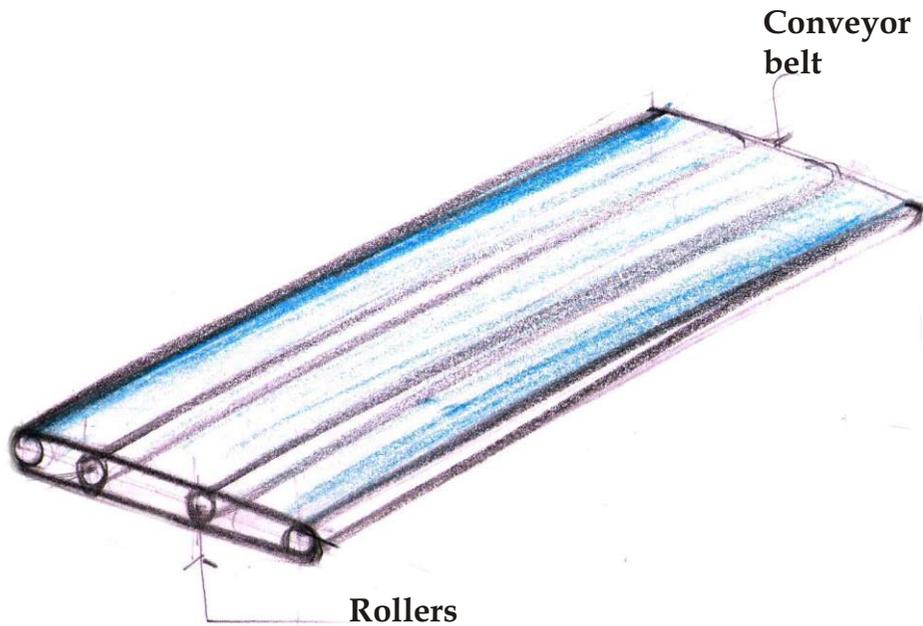
--The device is light in weight and easy to operate.

--It is provided with the good grip for the care taker and will be operated by fewer caretakers.

--It will be compatible to other existing product.

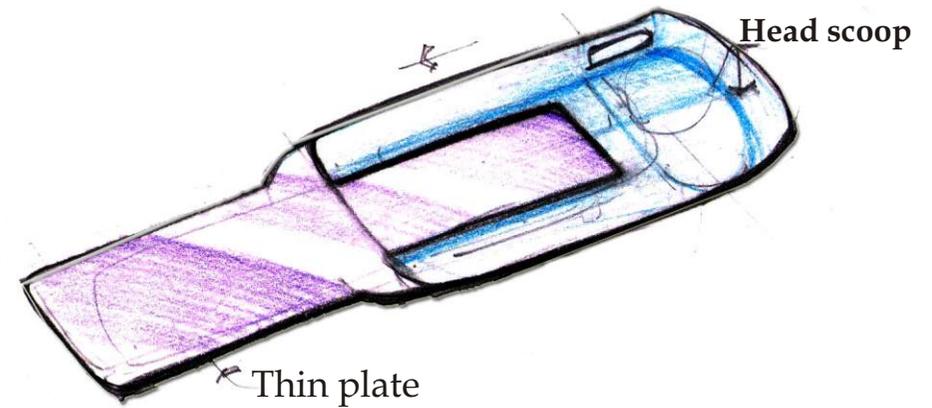
Following points were considered important and formed the guidelines for generation of ideas and concepts

- Easy to transfer patient from one surface on to the equipment with minimum movement of patient
- Patient transferred as a single unit
- Light weight and easy to operate
- The care giver should operate the device comfortably
- Immobilizing aids
- Should not be costly
- Details of various function for easy and quick operations
- Local material used for the manufacturing the device



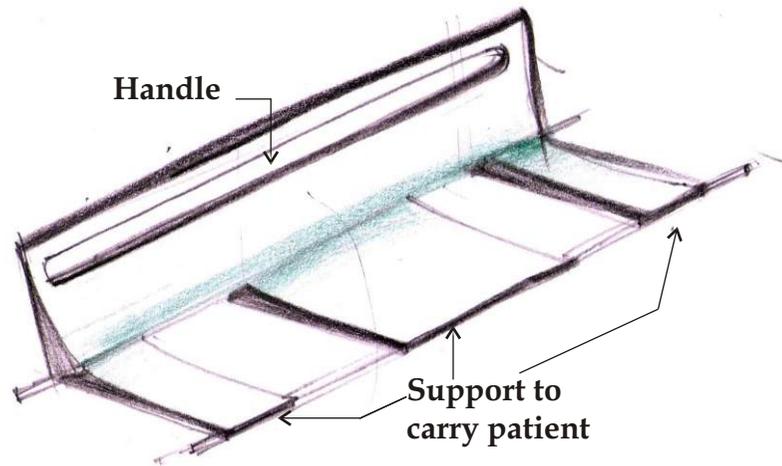
### Idea 1:-

The concept was for lateral transfer of the patient . The conveyor belt along with the board is align with the patient . The board is inserted below the patient and the conveyor rotates on roller and shift the patient on the stretcher.



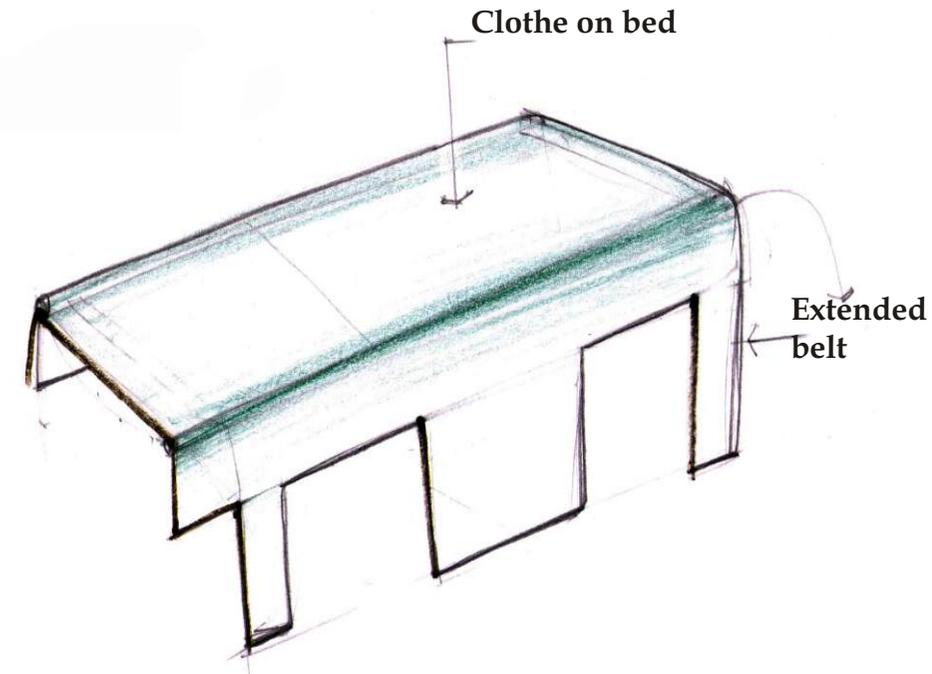
### Idea 2:-

The concept was for transferring patient without changing his position i.e the patient is transferred as a single unit . The device include two parts ,one part enters the from head side of the patient and the second is slided below from the leg side of the patient . The two parts are snapped together to act as single unit then the patient is transported to the ambulance or hospital bed



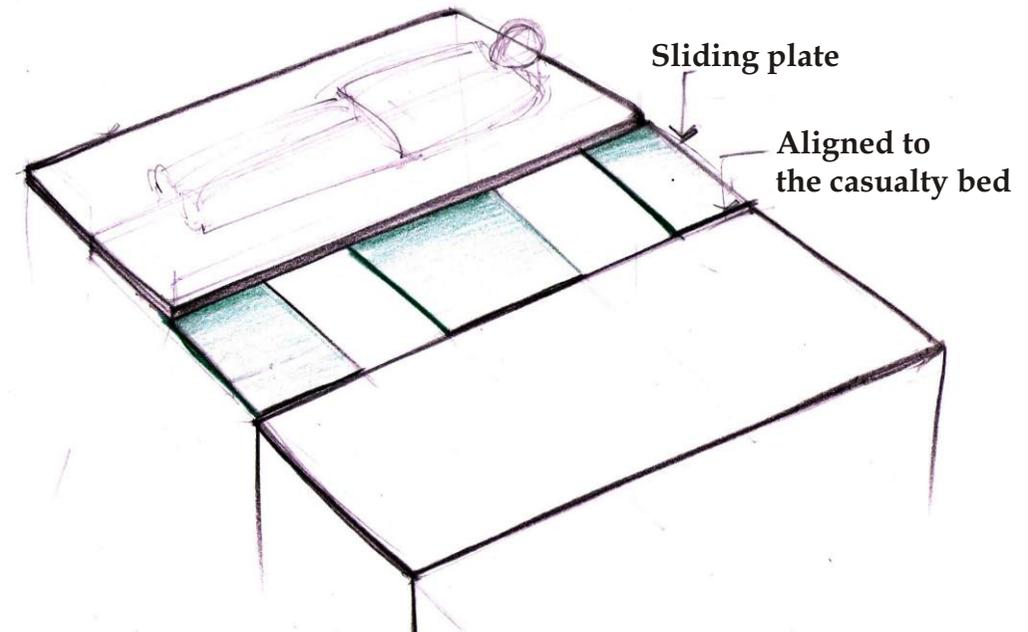
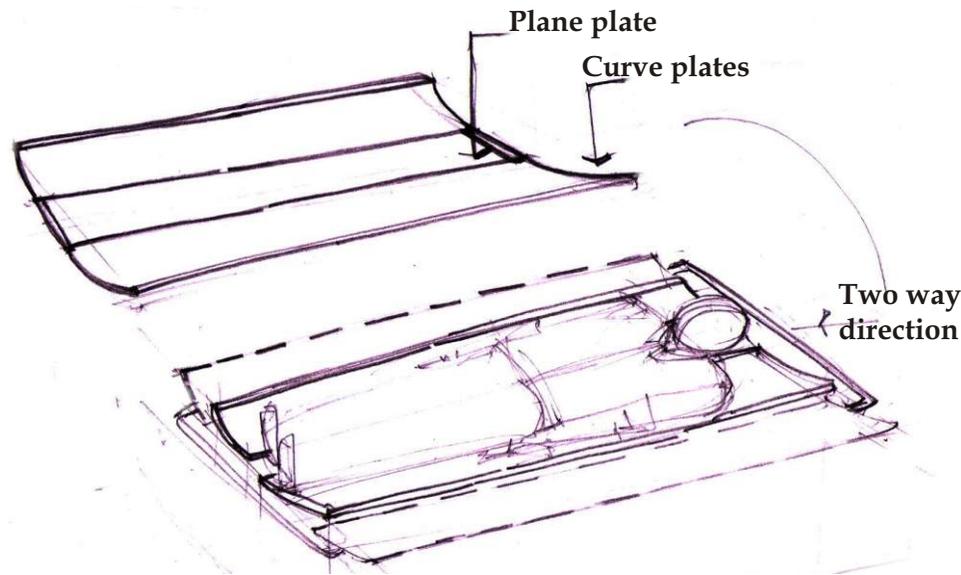
## Idea 2: -

The concept was like to scoop patient from one side. The scoop was provided only in required areas where support is required to carry patient. In this case patient is carried as a single unit.



## Idea 3:

-  
The concept of transferring patient is done by using clothe which is readily available. The clothing is provided with the extended belts. These belts are inserted below patient and the belts are pulled to transfer patient on the stretcher.



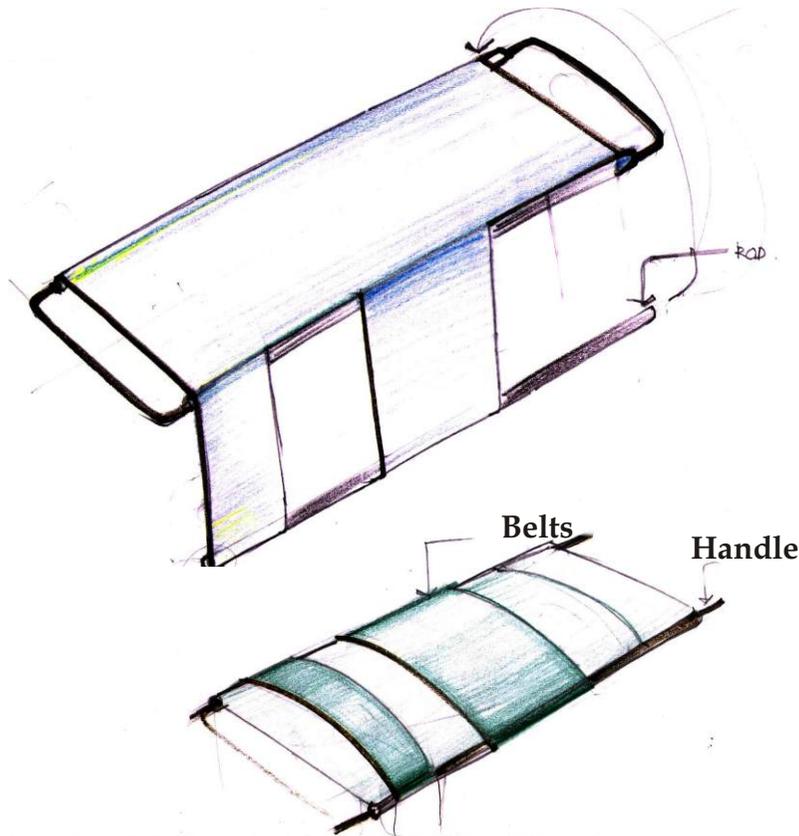
## Idea 5:

-

The concept include two plates where these plates are inserted below the patient and these are snapped together . Patient is transferred without changing the position of the patient .

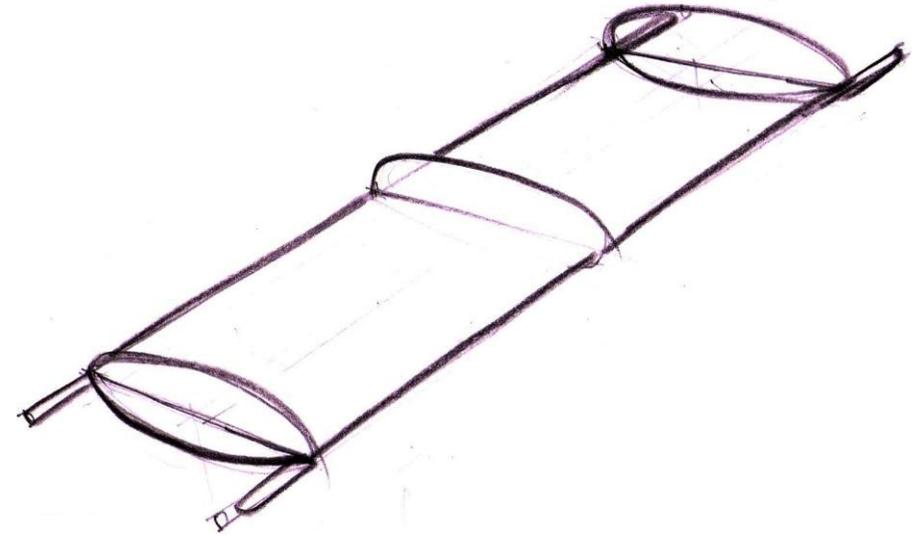
## Idea 6 :-

The concept include moving plates where the some of the plates are inserted below the patient and the they are transferred to slightly by the plated which are operated mechanically .



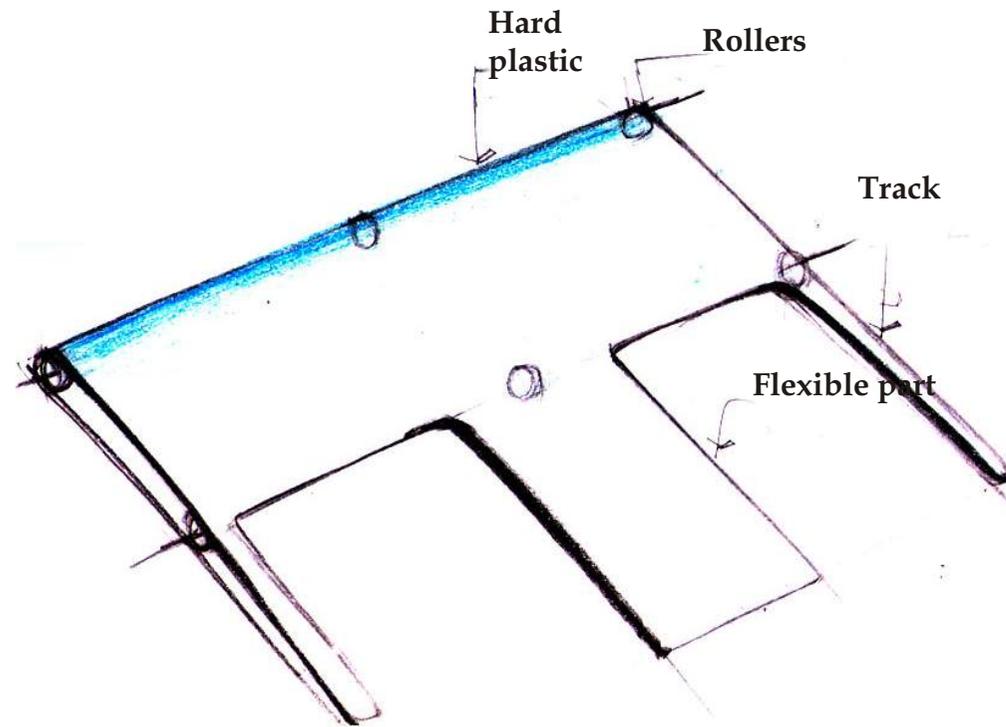
### Idea 7:-

The cloth which is readily available was provided with extended conveyor belt and rollers. The patient is slide onto the stretcher and the extended part placed over patient. Which act as a belt to immobilize patient while carrying.



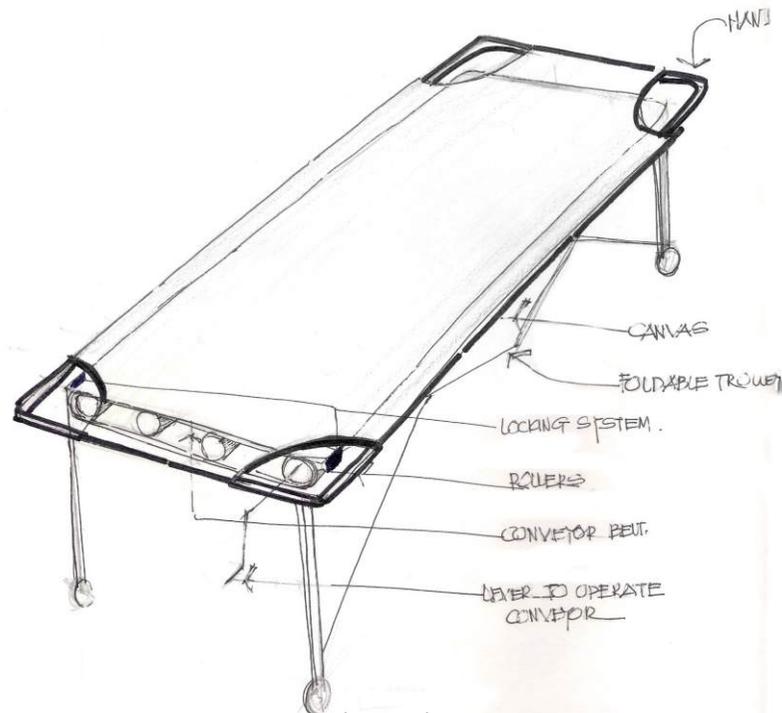
### Idea 8: -

Rocking scoops was to carry patient and also transfer him to different surface level. The rocking scoops also act as a tray which avoid the unnecessary movement of patient during transferring.

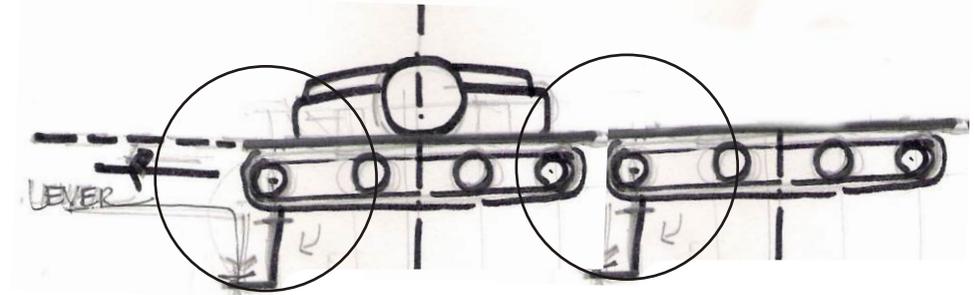


**Idea 7: -**

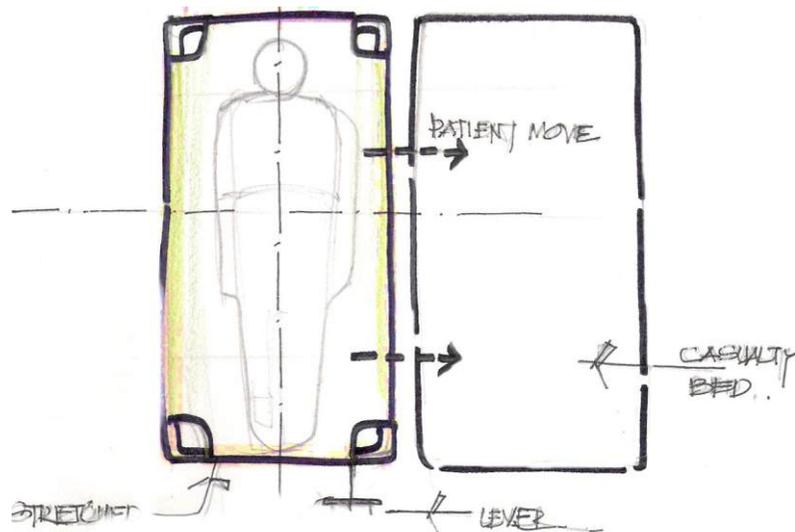
**The concept of a conveyor was provided with the inclination and extended flexible belts. These extended belts were used to transfer patient on the stretcher. The inclined position of the scoop provides in directing the patient and easy transfer of patient.**



Perspective view



Front view



Top view

### Concept 1 conveyor belt

#### Merits

Patient is transferred without lifting and is transferred as a one unit

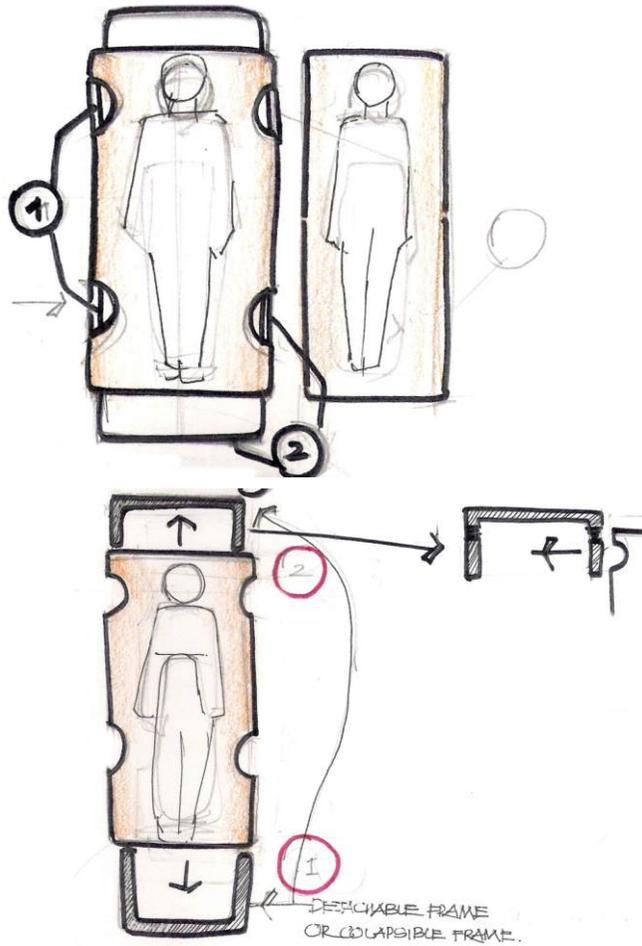
#### Draw backs

The canvas has to place below patient

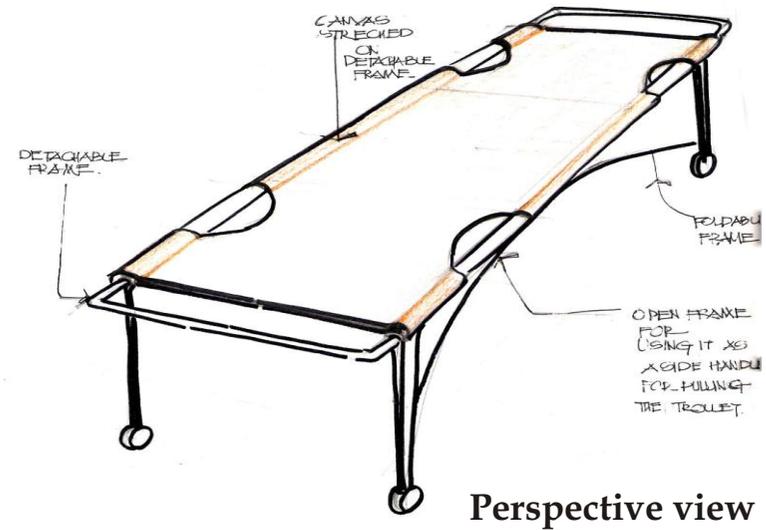
Both bed and the stretcher needs to be on the rollers

The level of a stretcher has to be in the same level of the bed of the casualty

In case of the heavy patient the rolling will be difficult



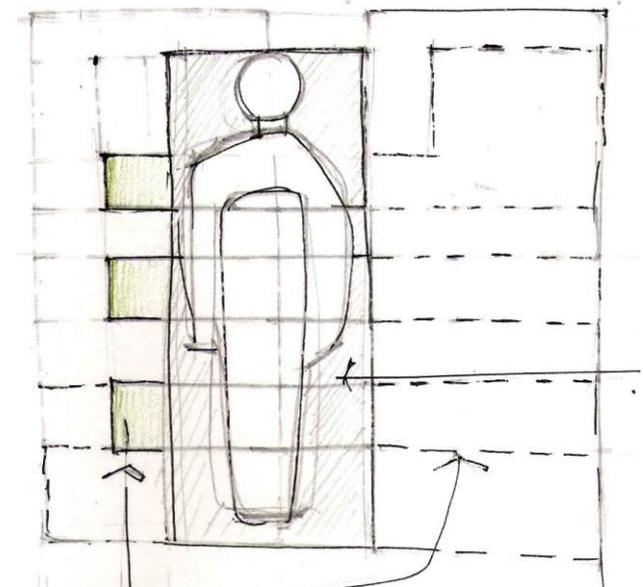
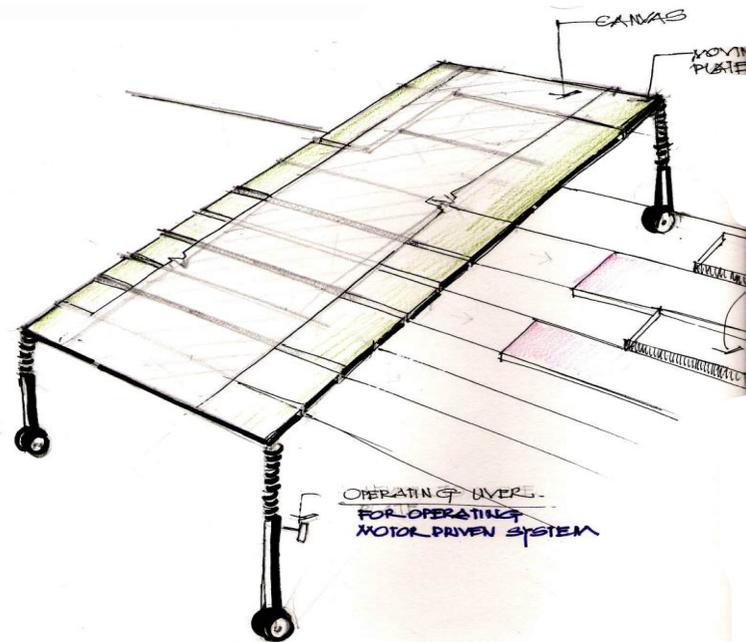
Top view



**Concept 2 :-  
Detachable Frame**

**Merits**  
 Economical and efficient  
 Light in weight

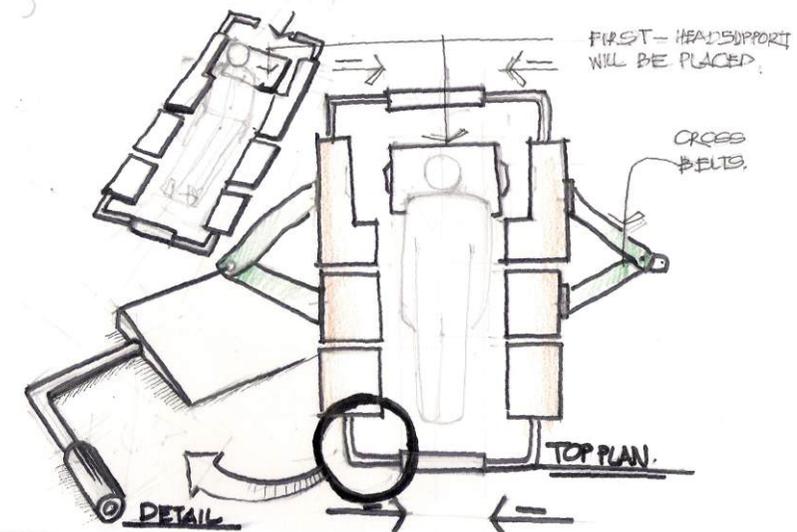
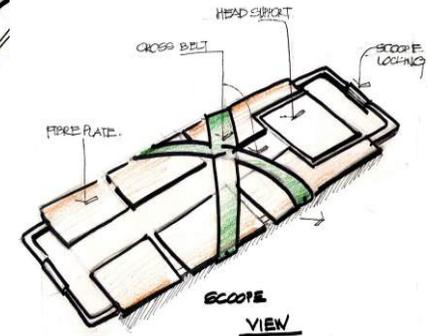
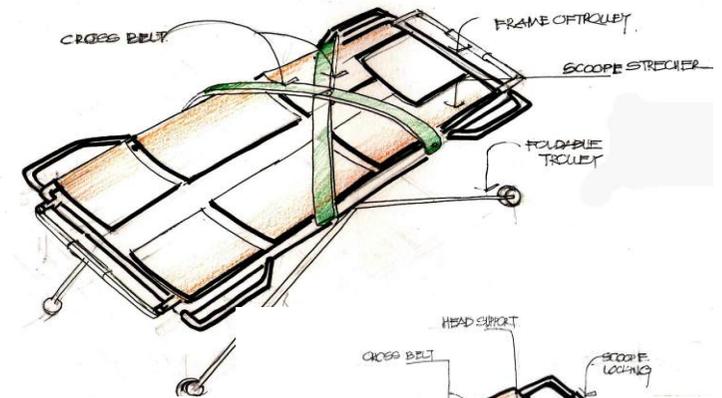
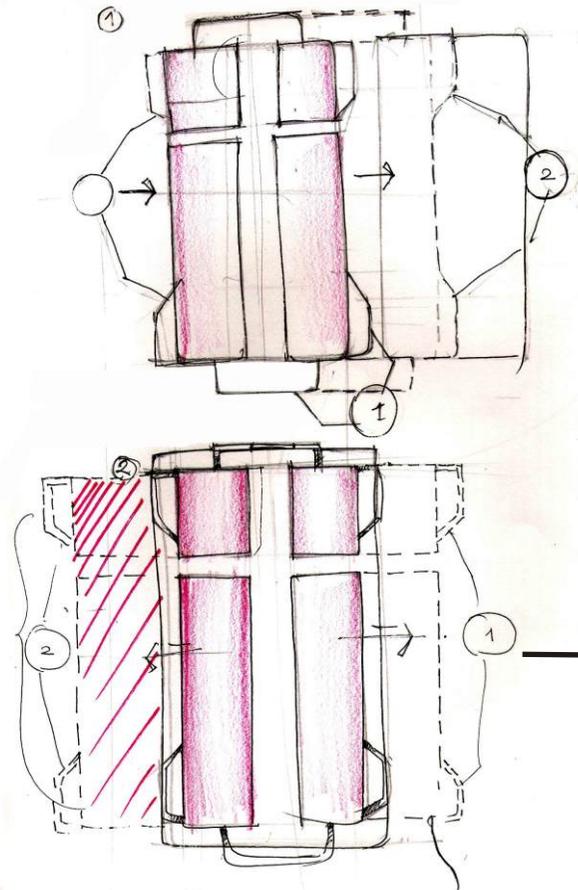
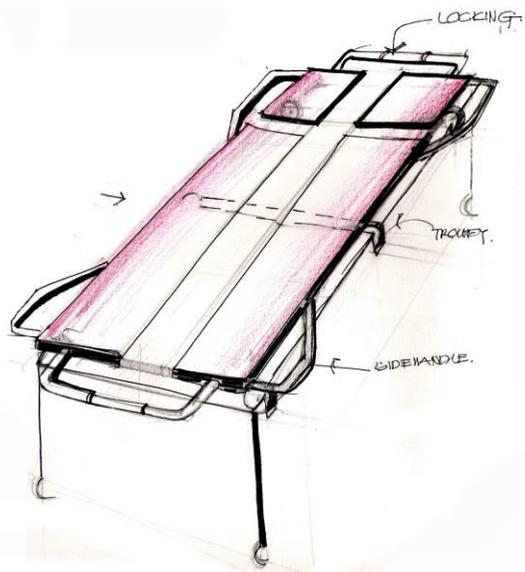
**Drawbacks**  
 Difficult to maintain because it may get blood stains  
 To remove the frame from the canvas required more area which is not available because the bed is attached with the wall.



**Concept 3:-  
Moving plates**

**Drawbacks:**

- 
- The device requires lots of mechanisms which will increase the cost of manufacturing, installation etc.
- The casualty bed has to be design according to the device
- The whole device becomes very heavy due to lots of mechanisms



## Concept 4:-

The device consists of two parts

### Merits :-

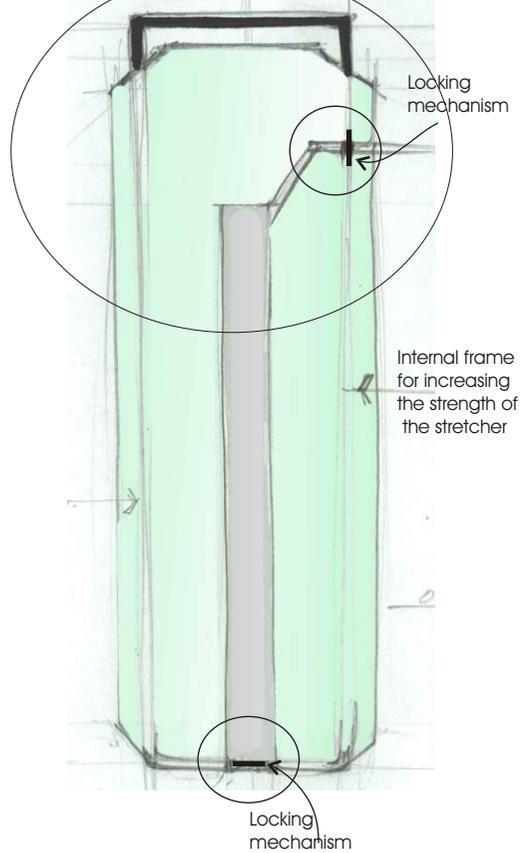
Patients is transferred as a single unit

It required fewer persons to operate and placed patient

It is light in weight

It is efficient method to transfer

## Initial idea sketching



## Concept variation 1:-

The device by made less complicated

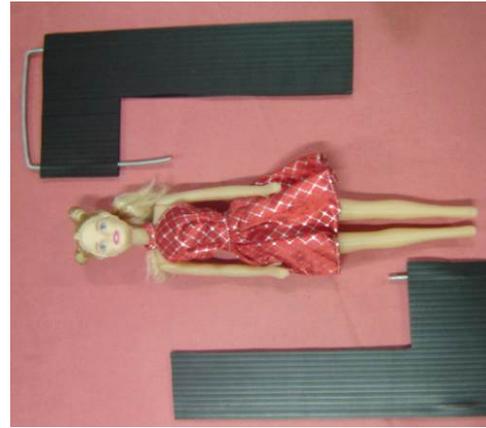
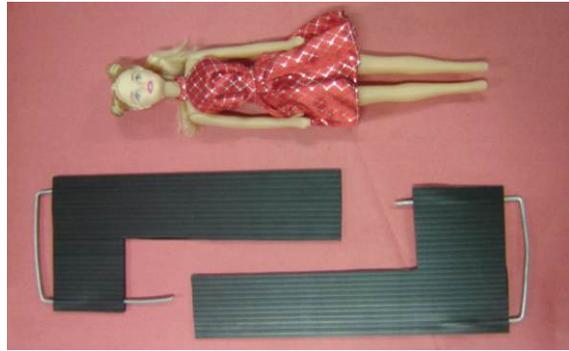
### Drawbacks :-

It requires lots of space around patient

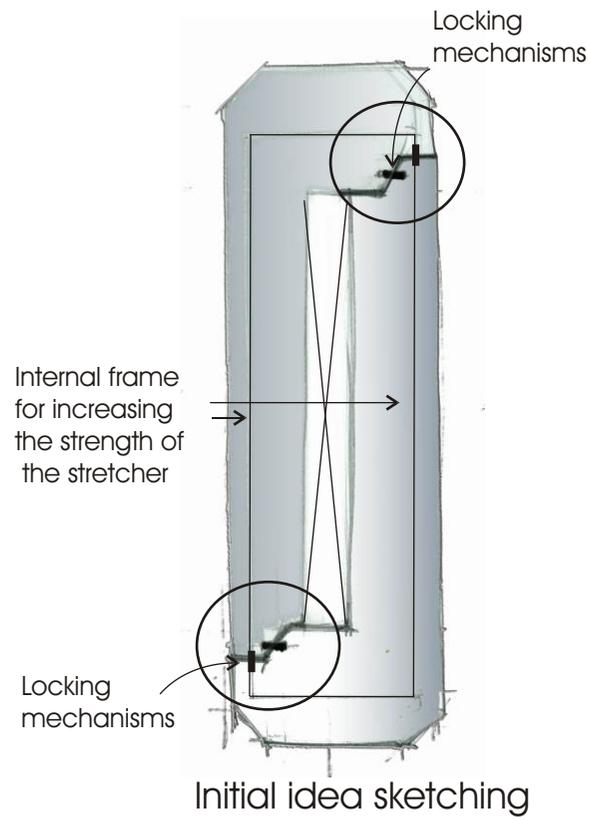
Always the orientation of the stretcher has to be maintained  
Unnecessary tilting of patient was happening which is not desirable

The whole process of transferring was time consuming





4



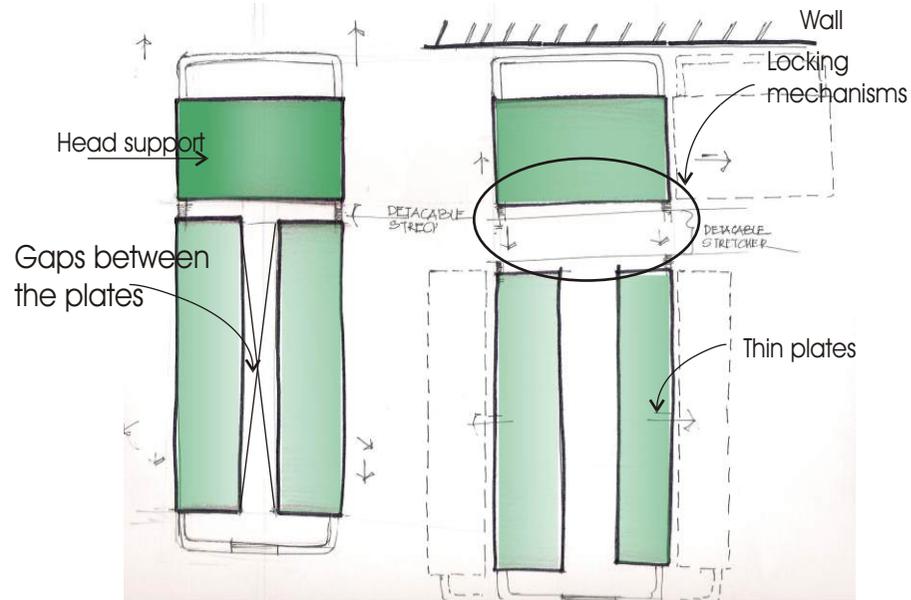
**Concept variation 2:-**

**Drawbacks :-**

The whole device require lot of space.

The device become complicated for the caretaker as it has very complicated locking mechanism

## Initial idea sketching

**Concept variation3: -**

## Detachable Frame

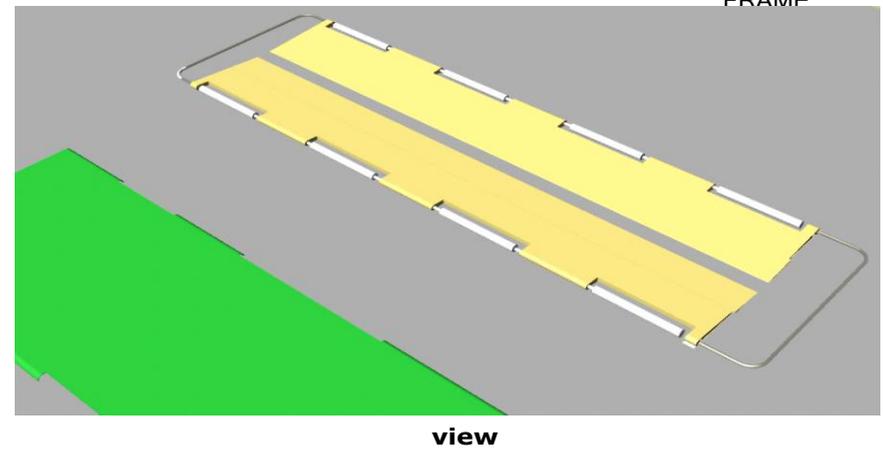
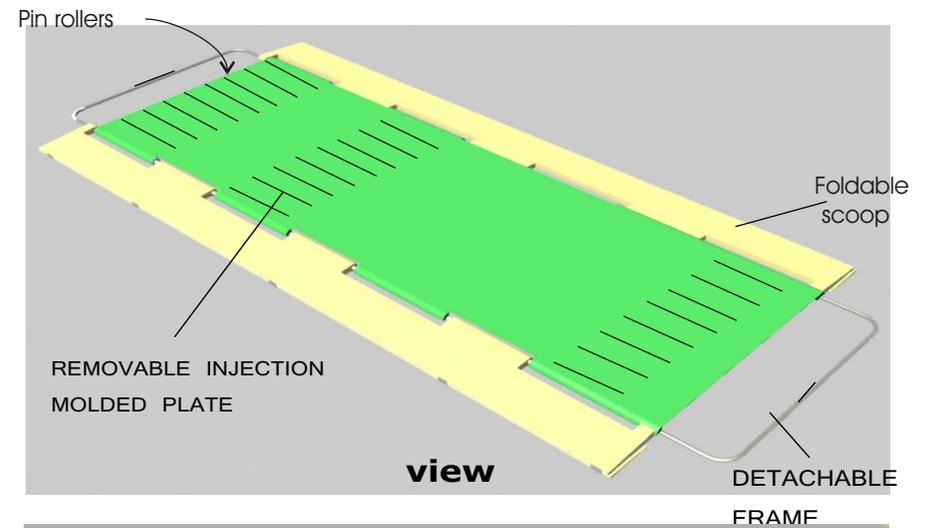
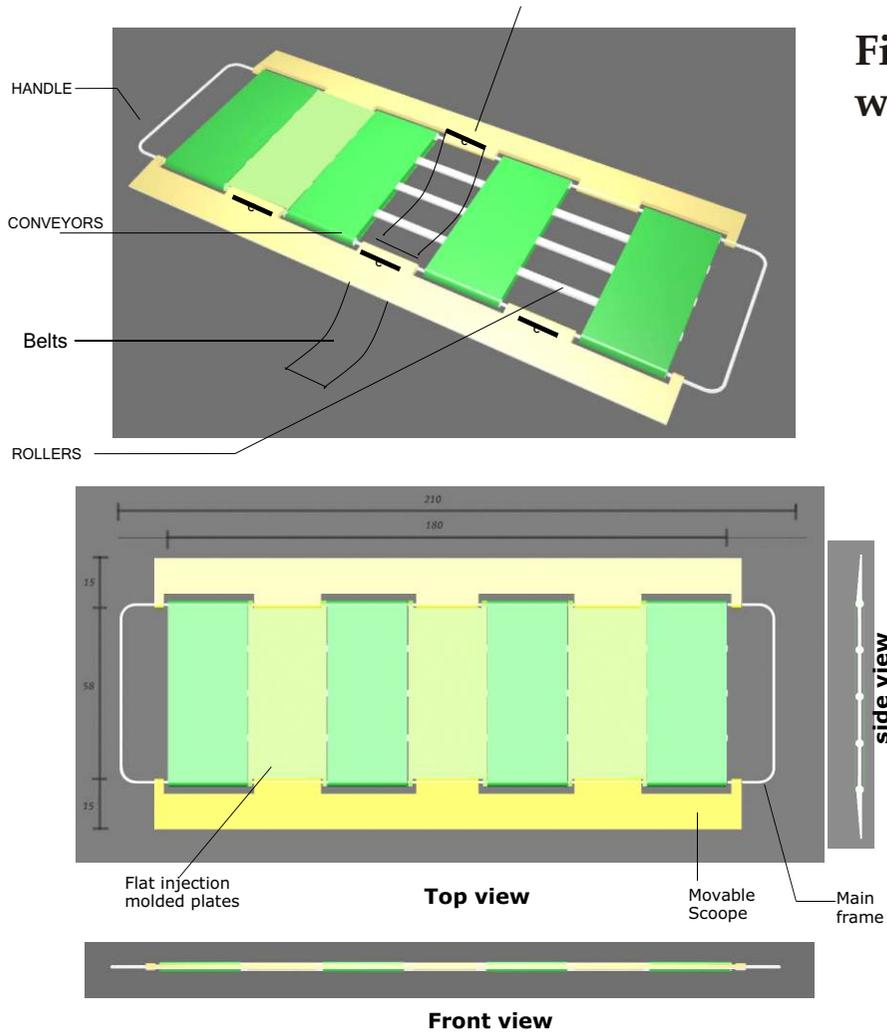
## Merits :-

The patient is more stable due to the initial head supports

**Drawbacks of the concept**

- With obese patients, the possibility exists of accidentally pinching the patient's back while closing the device, which causes uncomfortable situations for patient.
- In this method of transferring patient is not transferred as a single unit

**Final concept :- Concept 1(conyeour) was integrated with the scoop concept**



Generally patients are placed on the bed, this device is inserted below the clothe on which patient is lying and the clothe is pulled along with the patient onto the device

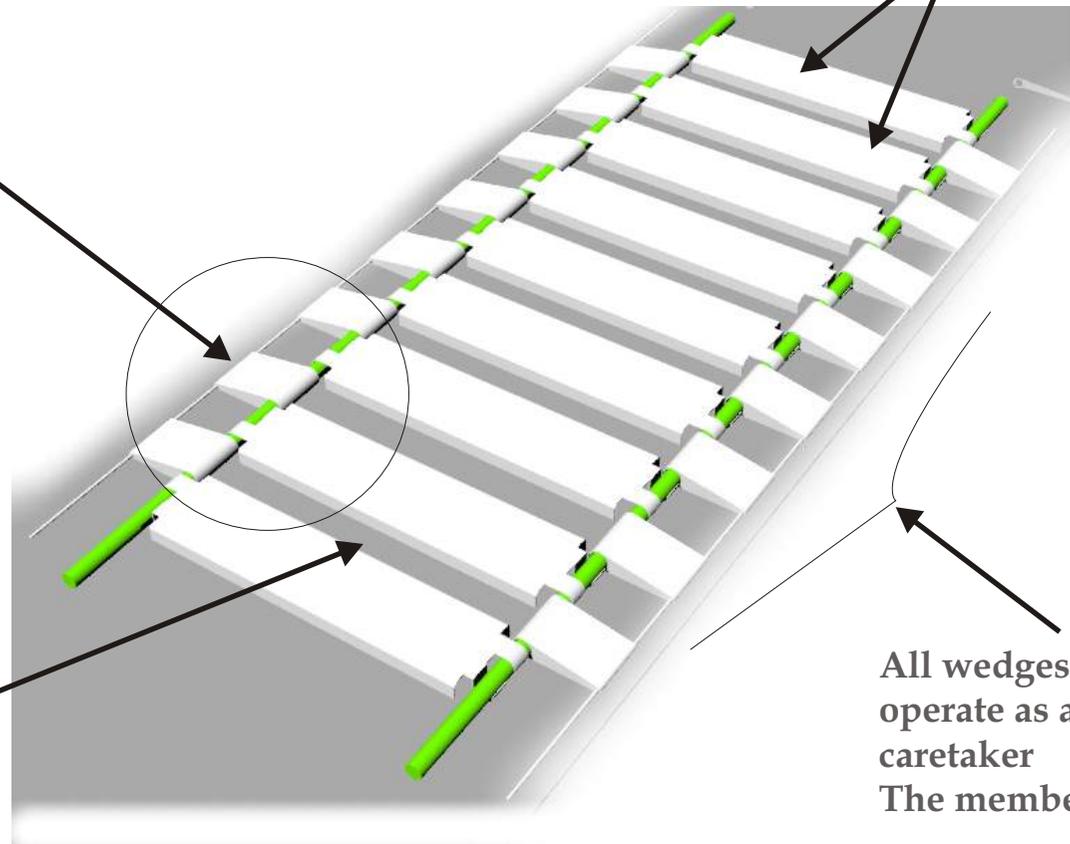


In order to make it lightweight and economical the device was further modified as follows

The wedges were breakdown and there were used as a spacer between the

The single central sheets of the device was breakdown into small plates which is mass produced

The spacing between the central plates where taken as 0.5m



All wedges were join together to operate as a single unit by the caretaker  
The members were resting on the

Situation :-Patient on the bed is transferred to the stretcher



Stage :1  
The stretcher is placed  
below the clothe of patient



Stage :2  
The two caretaker or carrier  
pull the clothe along with



Stage :3  
Patient is pulled along the  
direction of the caretaker



With the help of dimensional data  
various other aspect of the stretcher  
were studied and the lateral transferred  
of the patient was tested.

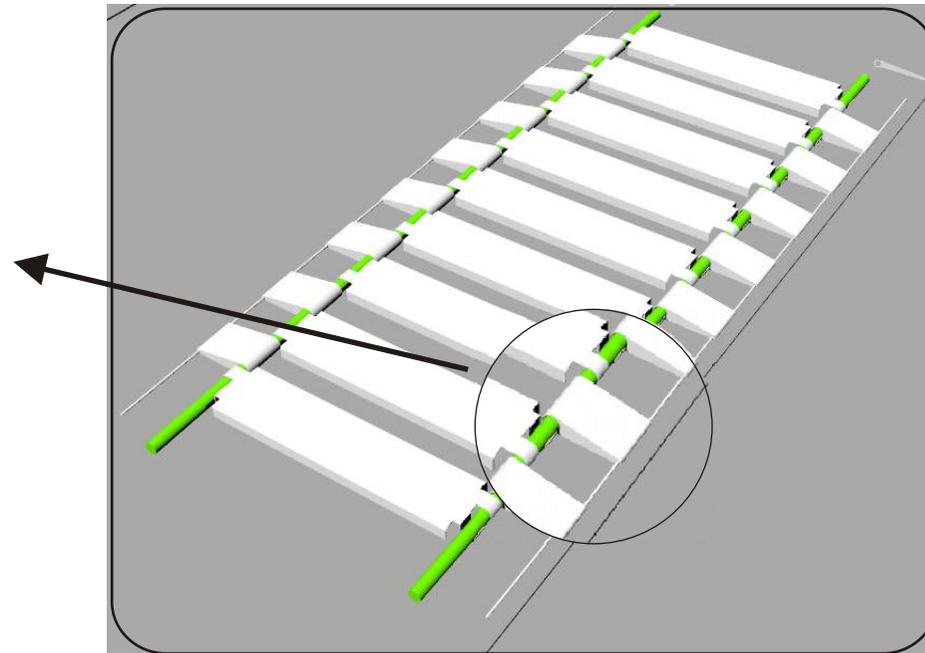


Stage :3  
Patient is transferred on the  
stretcher

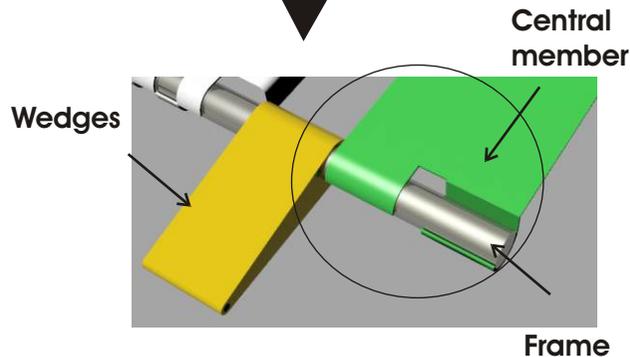
Joiners were detailed out for easy installation of the members on the frame.



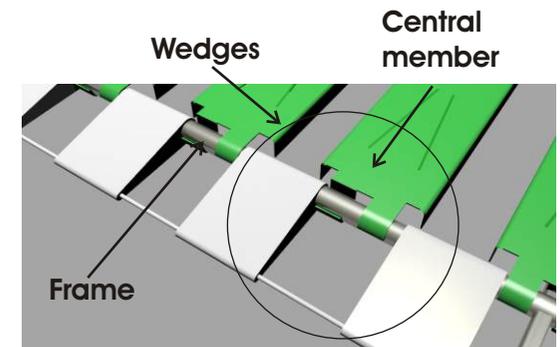
Joinery detail 1



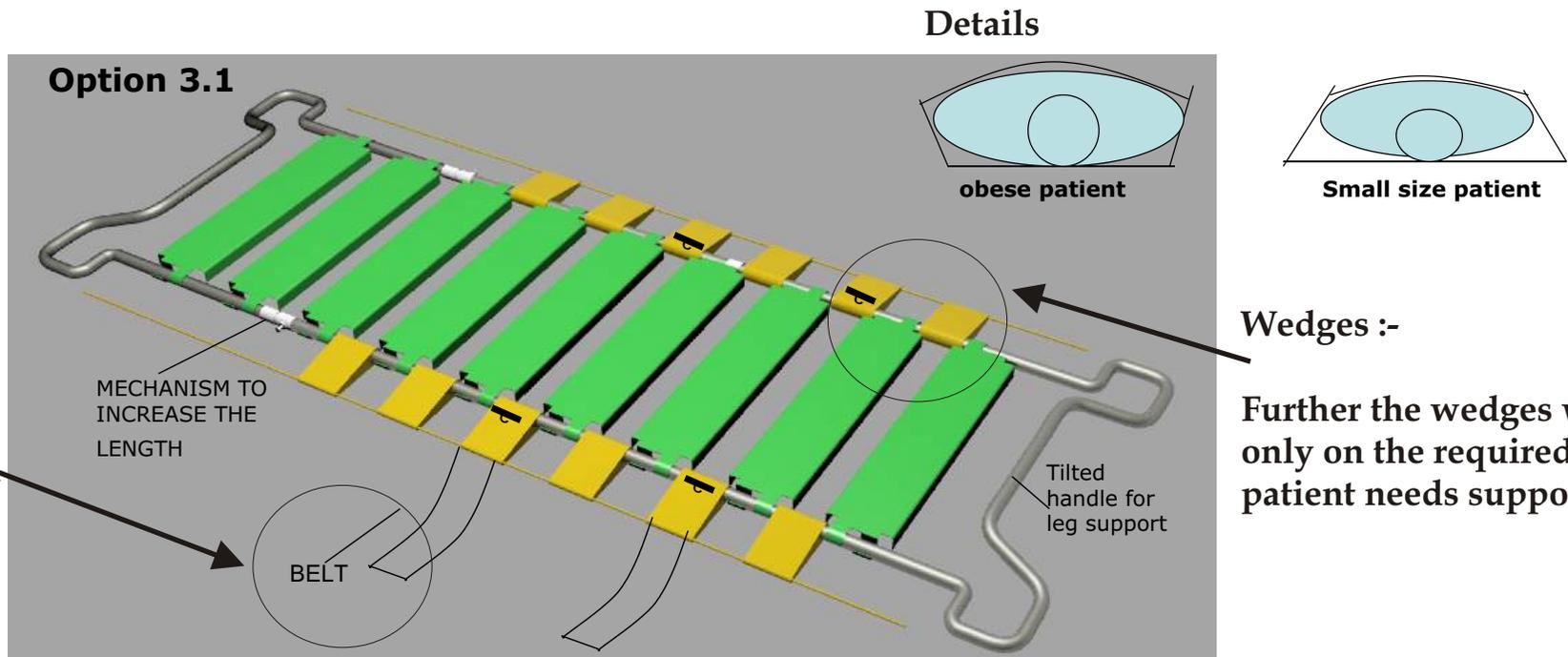
The joinery details were worked out in (1:1 scale) mockup models



Joinery detail 2:-

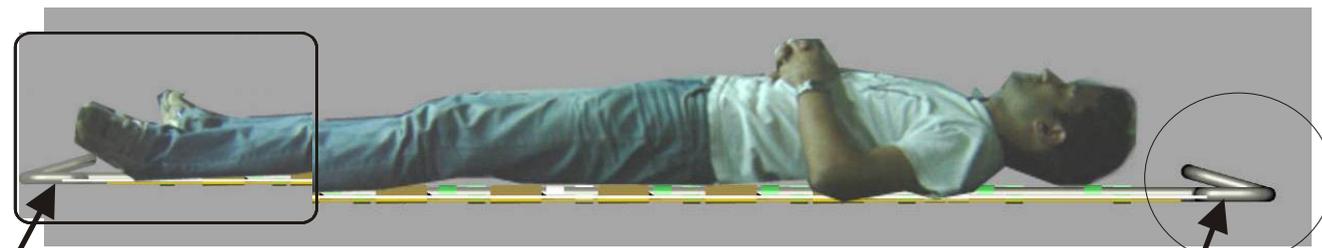


Joinery detail 3:- further the central member was modified as shown in the figure where the width of the wedges were increased. The increased width of the wedges provide more support area to the patients body



Further the wedges were provided only on the required areas where patient needs support

**Belts :-**  
Belts were provided for maintaining the position of patient on the equipment.

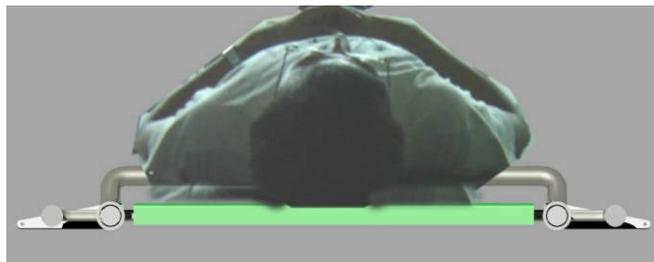
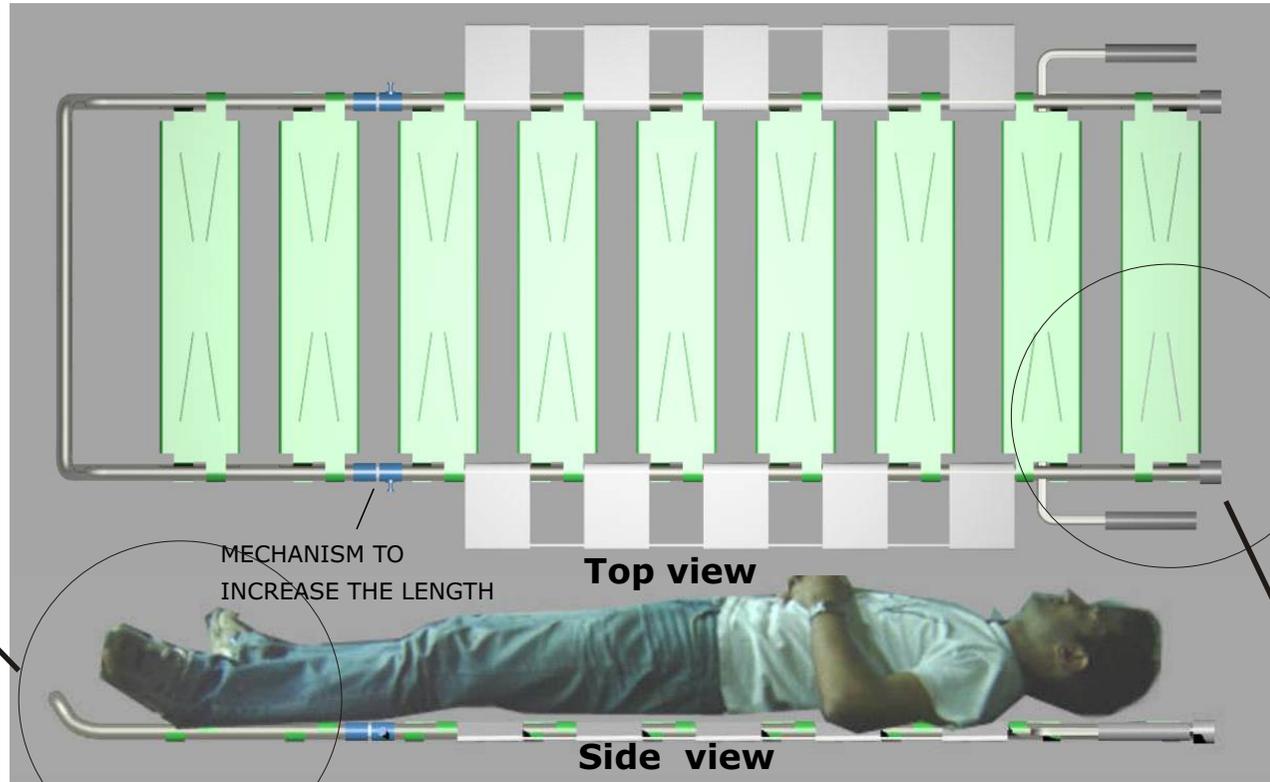


The raised handle provides leg support to patient and restrict the slipping of patient while carrying through a staircase

**Handles :-**  
Handles are provided such that the caretaker can get closer to patient and keep the load close to his body. This helps him in balancing patient easily while carrying patient

Concept variation :-  
The handles were modified and made simpler

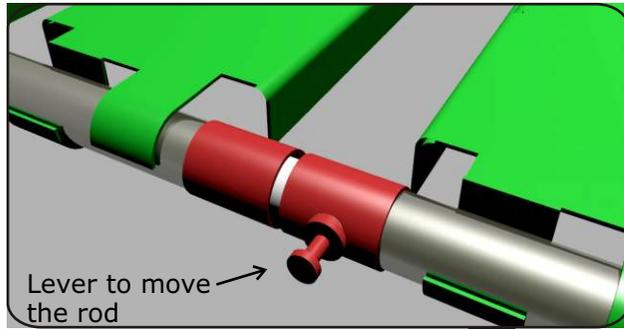
The stretcher the handle is projected upward which helps in restricting the downward movement of patient while carrying through the staircase.



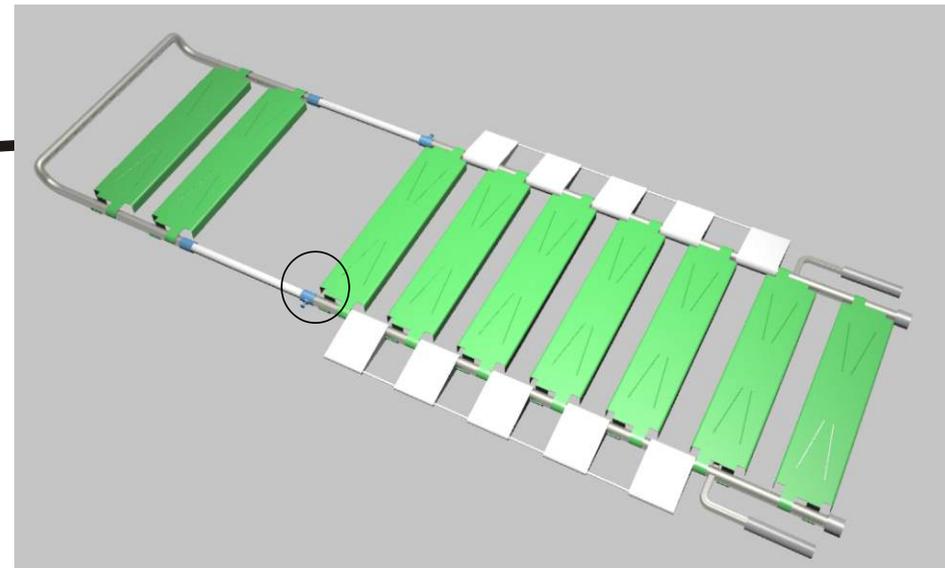
Front view

The handles provided very close to the body of the patients so that the heavy part of the patient's body is balance firmly by the caretaker.

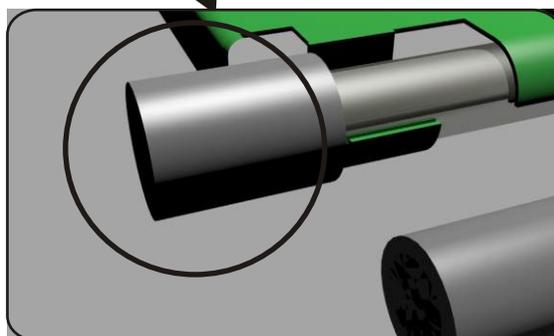
Details  
Adjusting length



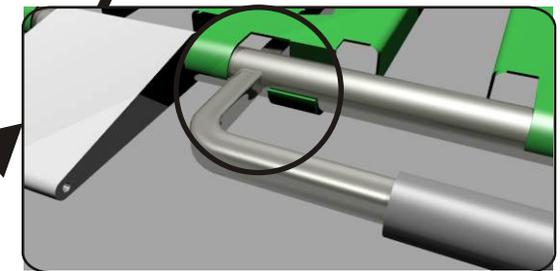
The length of the stretcher can be increased according to the height of the patient by using the lever provided on the frame .



View showing of the stretcher for 95th percentile

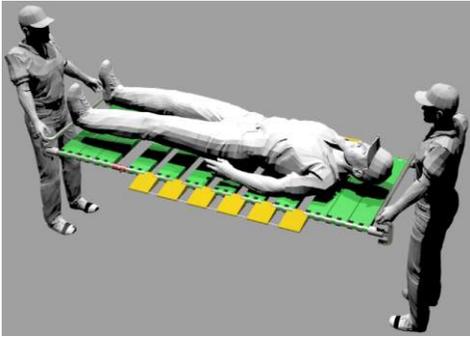


On to the end of the rod rubber stopper is provided which restrict the movement of the central member



The handle is in square section which is inserted in the circular frame section.

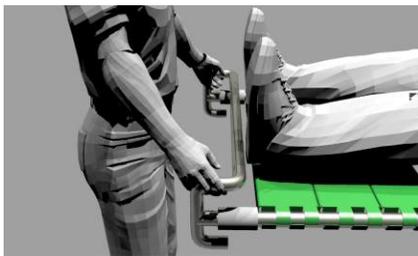
This square sections of the handle to the circular section of the frame restrict the movement of the handle



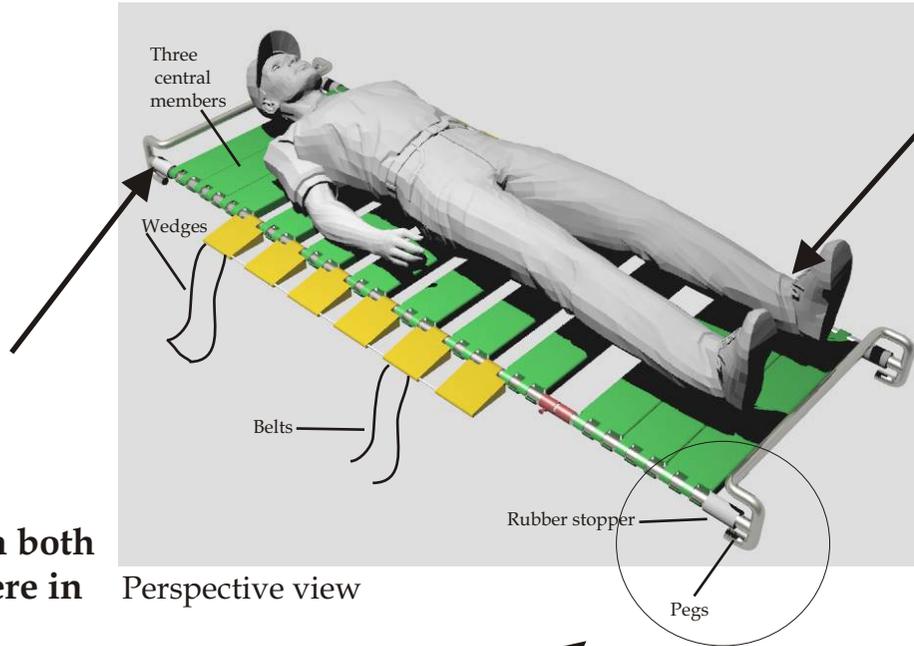
Hand position of the caretaker while carrying the patient

**Handles:-**  
Single a piece member

The stretcher can be oriented in both the direction which was not there in initial concept



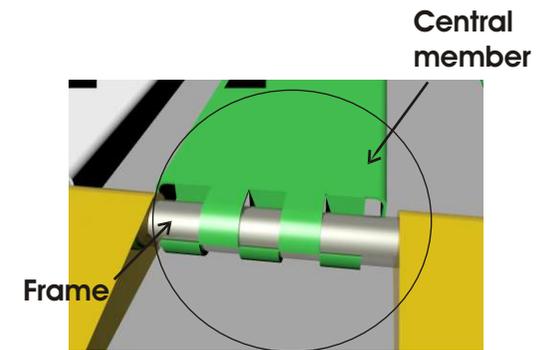
Handle detail



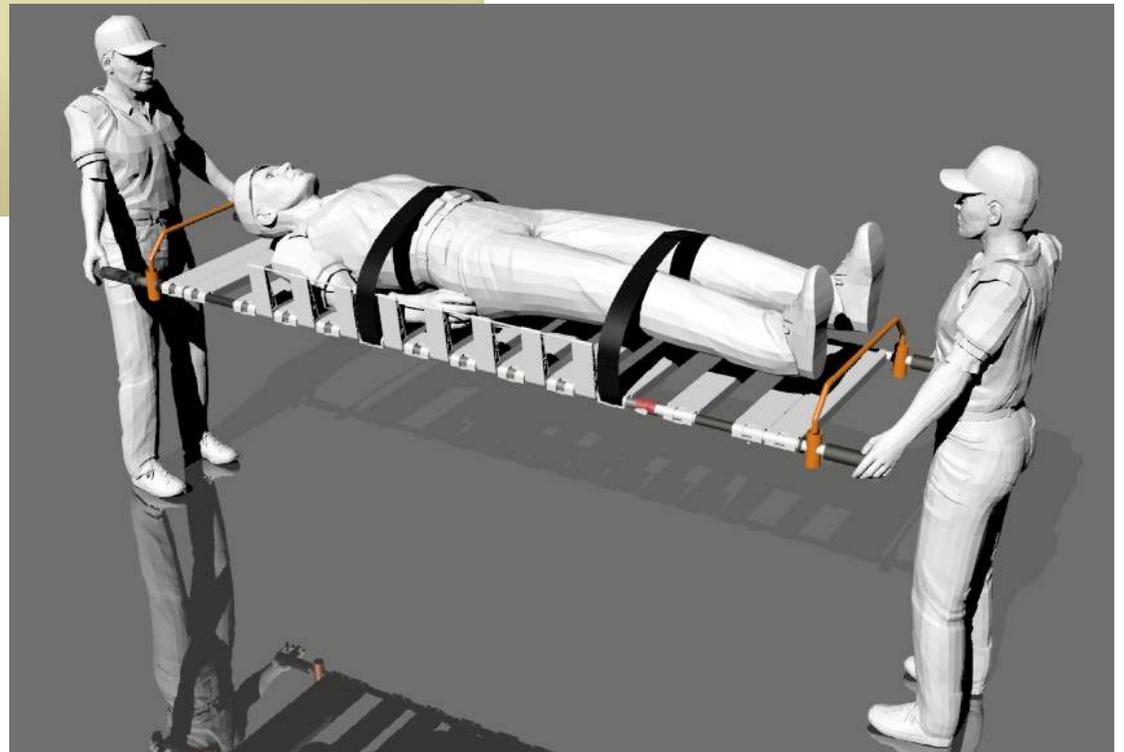
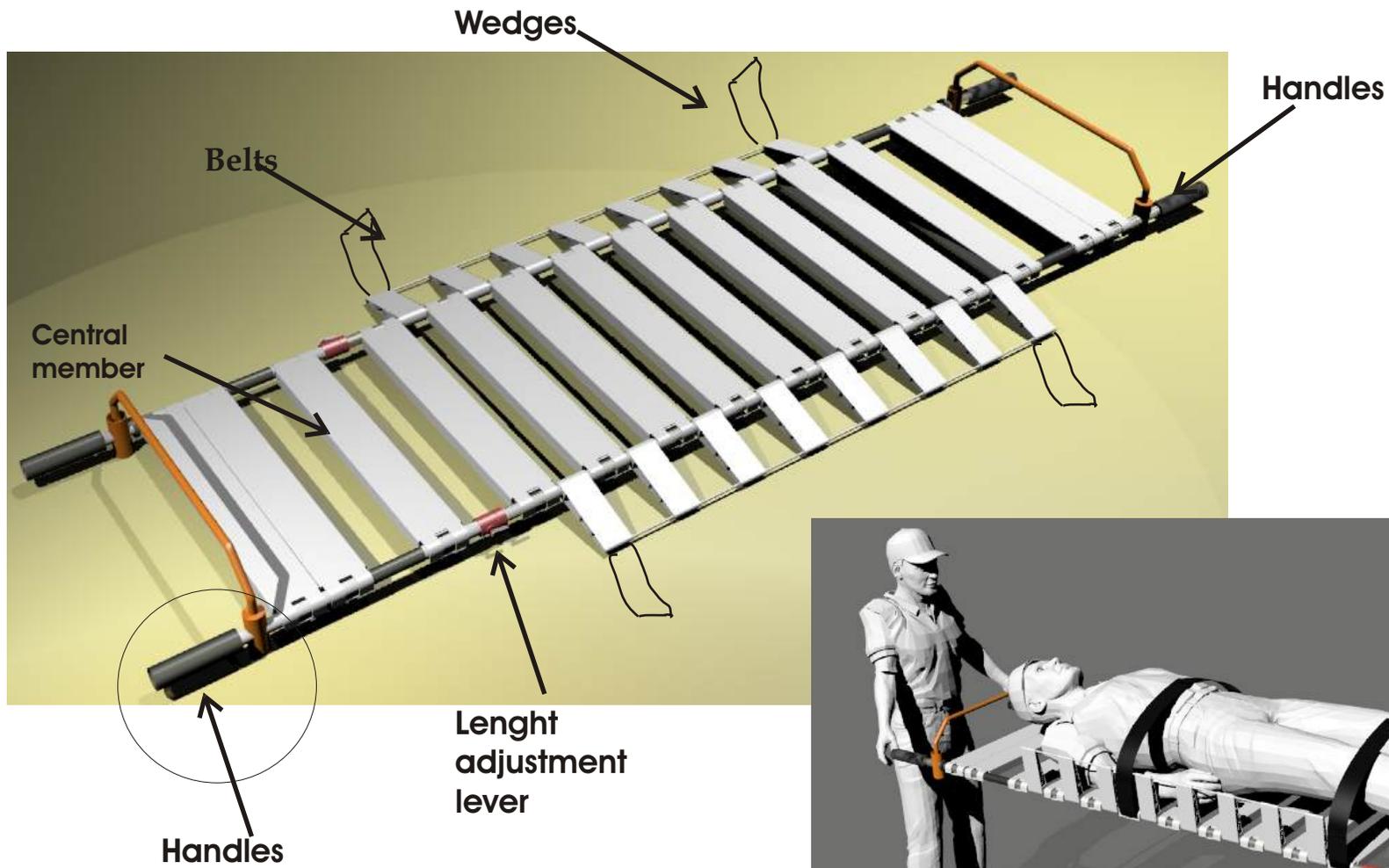
Perspective view

**Central members:-**  
For better head support for patient the three central members were join together

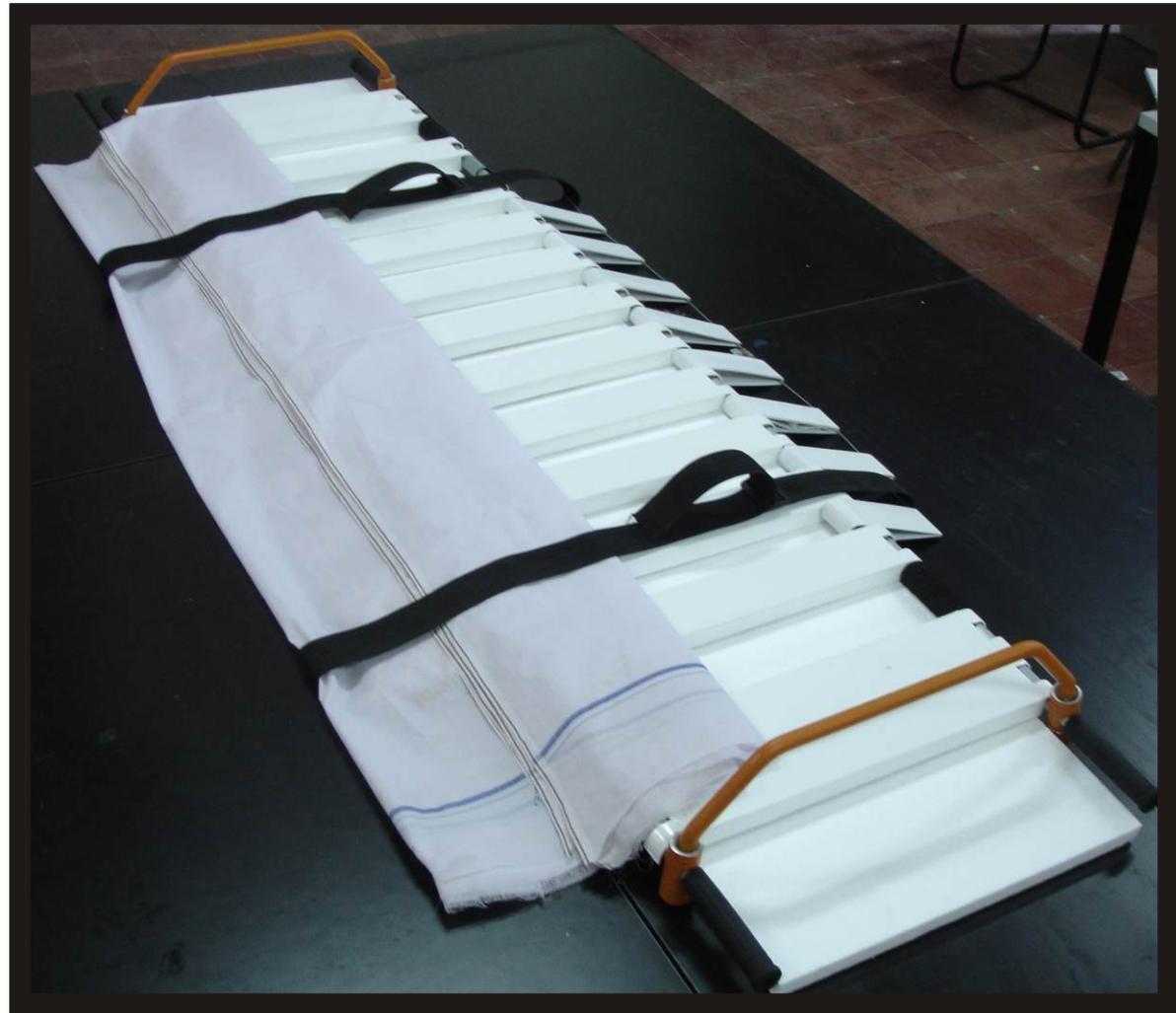
**Wedges :-**  
Wedges are provided with the flexible pin rod at the end so that the wedge will take the form of the patients body



Manufacturing joinery details



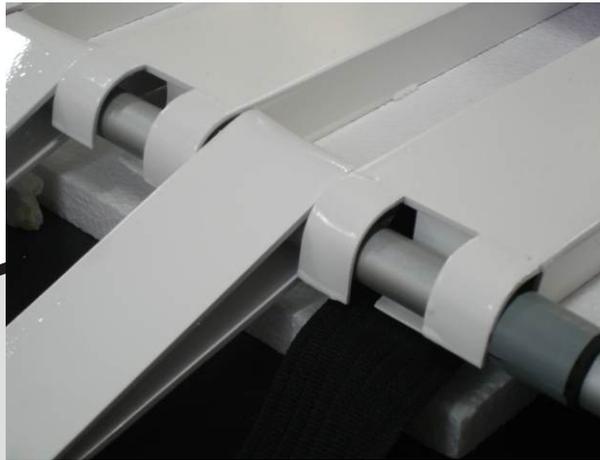
Perspective view of the final concept (rhino modelling )



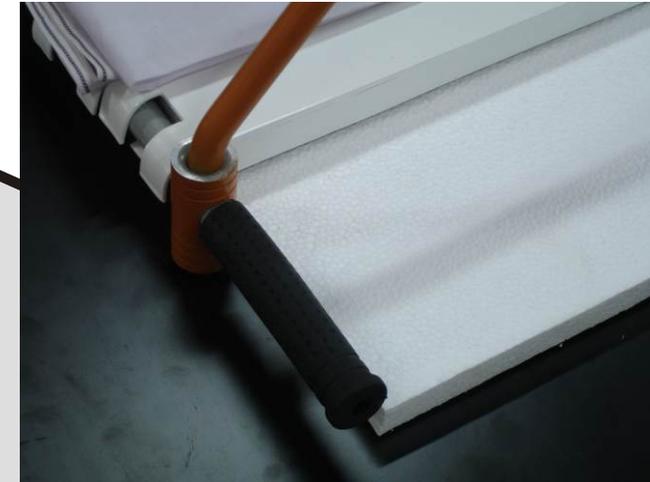
Prototype model scale 1:1



**Belts**



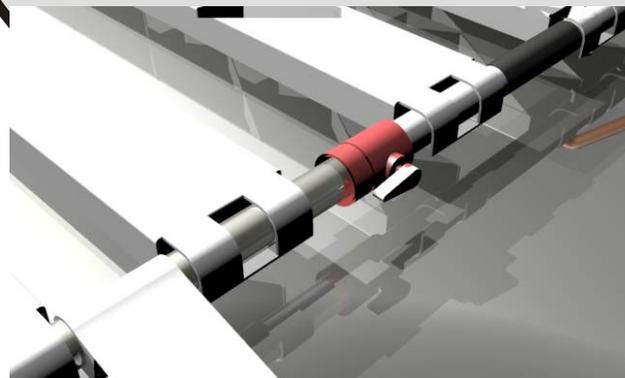
**Joinery details**



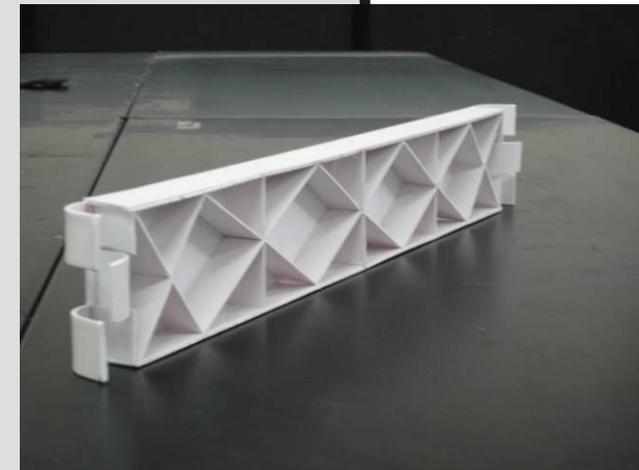
**Handle Details**



**Wedges details**

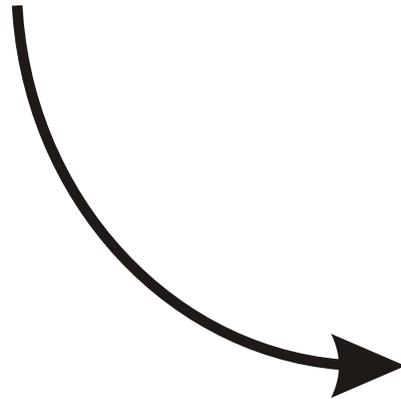


**Length adjustment lever**



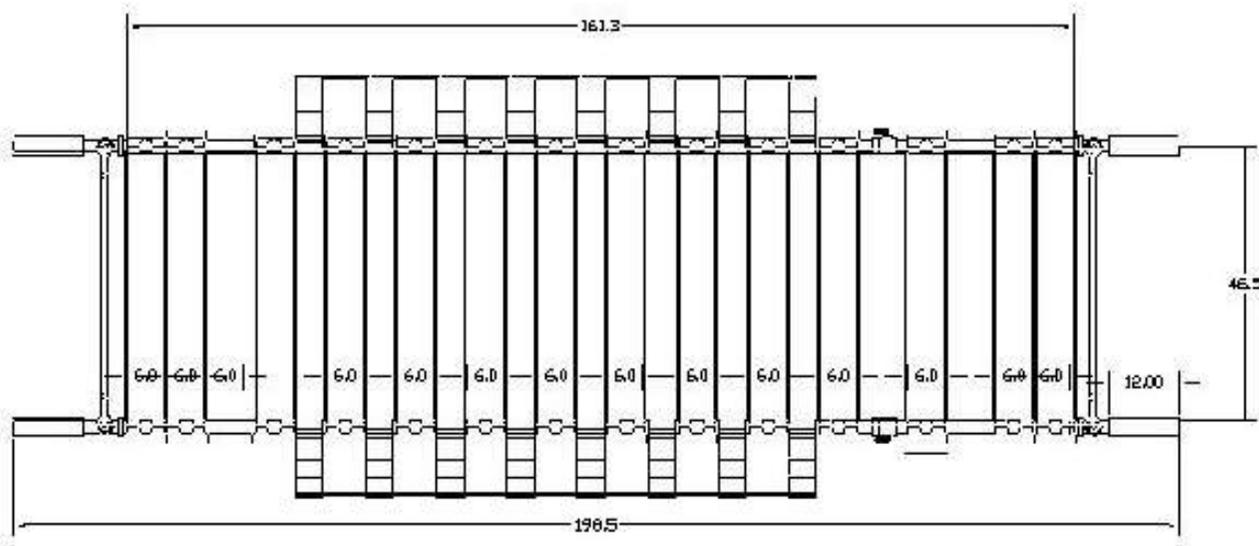
**Central member Details**

Scenario :1 patient is transfer from bed

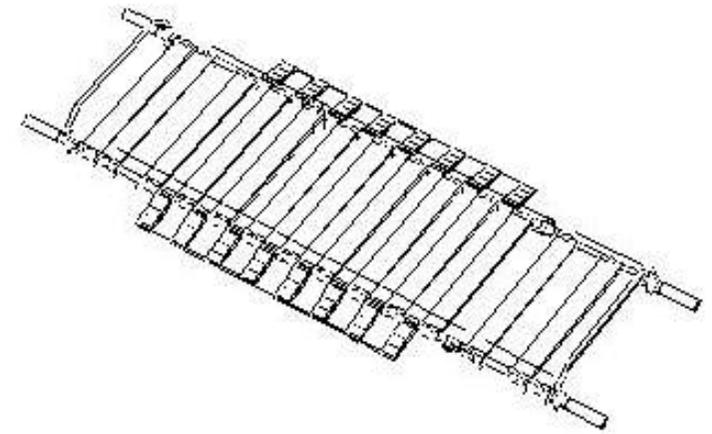


Scenario :1 patient transfer from stretcher to bed





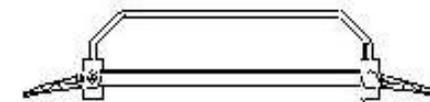
Plan



Perspective view



Front view



Side view