

EMS Stair Chair Wheel Attachment

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THE PROBLEM

EMS providers are frequently required to move patients both up and down stairs but are poorly equipped when moving patients up stairs.



B

All of these devices require the providers to bear the patient's full weight for transport up stairs. Essentially, the current models redistribute weight for downstairs movement, but not at all for upstairs movement.

THE STATUS QUO

- Reeves Stretcher (A)
- Providers bundle and lift patient for movement • Effective movement of unconscious patients Scoop Stretchers (B)
- Detaches into 2 halves lengthwise
- Stair Chairs (C)
 - Controlled descent on stairs

CONSEQUENCES

- 11% of EMS provider injuries are due to lifting¹
- 25% of EMS providers suffer career-ending back

CURRENT STAIR CHAIRS

The same propensity for EMS personnel injury

NEEDS STATEMENT

A stair chair attachment that enables prehospital providers to move conscious and alert patients smoothly and easily up and down stairs during extrication from a prehospital scene.

OUR SOLUTION

5-wheel mechanical attachment that enables providers to smoothly pull a patient up stairs while maintaining contact with the stair surface

Each side of our device is attached via aluminum clamps. The axles and bike brakes are mounted on the clamps. When the brakes are pulled, the pads clamp down on the axis, braking the downward descent of the stair chair.

ABOVE: The complete stair chair

plus attachment

All materials (aluminum clamps &

hubs, polypropylene wheels) were

selected to minimize weight.

Weight: 30.2 lbs (60.2 lbs total)



ABOVE: Close up of the brake mount and mechanism system

BELOW: The device on stairs



DESIGN VALIDATION

EMS personnel at Monroeville Fire Department (right) tested our attachment and indicated that the attachment improved patient movement up stairs.

Likert Scale Ratings (1 = best rating)

- Intuitive Use: Avg. 1.5 (very intuitive or somewhat intuitive)
- Ease of Patient Movement: Avg 1 (very easy)
- Effort Required Compared to Current Models: Avg 1 (noticeably less effort)

REIMBURSEMENT

- Cost of extrication and patient transport is included in the base cost of an ambulance therefore, we introduce no additional cost
- Cost of purchasing the device will be negligible because of the 7 year life expectancy of the device

PATENTS

• Key features are novelty, utility, and non-obviousness \rightarrow five wheel rotary design of the machine for stair climbing for medical applications as mechanical device

COSTS

- Raw materials ~ \$150/chair
- Manufacturing ~ \$10/chair
- Assembly ~ \$2/chair

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References





- injuries within the first 4 years²
- Straps to secure patient in the seat
- Treads to rest the weight on the stairs and make a controlled descent
- Two provider lift and carry to go up stairs

persists when providers need to ascend stairs.

FACTORS TO CONSIDER

- Lightweight • Durable
- Low-cost
- Compact design

 Maximize smooth travel