International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 15; Issue: 3; March 2025
Website: www.ijhsr.org
Case Study *ISSN: 2249-9571*

The Mobile Multifunctional Commode Chair: A Unique Transferring Device for Wheelchair Users

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DOI: https://doi.org/10.52403/ijhsr.20250316

ABSTRACT

Individuals with spinal cord injury use the wheelchair for their day-to-day activities and they are fully dependent on it. Maximum of this population use manual wheelchair which is either propelled by themselves or by the caretaker. Except mobility, for other activities the individuals have to transfer from the wheelchair to different platforms like bed, sofa, toilet commode etc. Transfer from wheelchair to another platform or from other platform to wheelchair is a difficult and risky task for both the wheelchair user and the caretaker. Again, different platforms having varying heights is a challenge for transferring. Along with-it passing bowel and bladder requires special designs. The mobile multifunctional commode char resolves all the problems with its unique design and mechanisms with a light weight and low-cost budget.

Keywords: Spinal cord Injury, Wheelchair, Transfer, Wheelchair Commode, Multifunctional

INTRODUCTION

Spinal cord injury (SCI) is the damage to the spinal cord resulting from trauma (e.g. from falls and road traffic injuries) or non-traumatic causes like tumours, degenerative and vascular conditions, infections, toxins or birth defects. It results in complete or incomplete loss of sensory and/or motor functions below injury level and can diminish the capacity to perform daily activities, including walking, using one's hands, physiological emptying of bowel/bladder or washing and dressing oneself. Inappropriate management of SCI related impairments and secondary conditions often causes premature mortality. Limitations faced by the patients are compounded by misconceptions, negative attitudes and physical barriers to basic mobility, restricting independence and full societal participation. Many restrictions encountered by the patient in performing daily activities and participating in meaningful life areas are not from the condition itself, but from insufficient or inadequate medical care, rehabilitation and assistive technologies access, a high economic burden, and from barriers in the physical, social and policy environments. Global estimates suggest that in 2021, approximately 15.4 million people were living with SCI and according to WHO

report, only 5–35% of this population have wheelchair access.

Life expectancy in people with SCI strongly correlates with neurological impairment and preventable secondary conditions through rehabilitation. People with SCI often die earlier because of health system factors such as insufficient access to or poor-quality health services and inappropriate access to the mobility and assistive technologies.

The wheelchairs are the essential tool of mobility for most people with spinal cord injuries. One of the most important recommendations for people with spinal cord injuries is the type of wheelchair and the accessories needed to enable maximum functionality, including maximizing independent mobility, maximizing independent functioning, preventing and minimizing deformity or ensuring stable positioning, and projecting a healthy, vital, and attractive body image. When the capacity and fit of a wheelchair are matched to the needs and abilities of individuals with spinal cord injuries, health, function, community participation, and quality of life can be maximized. [1,5]

After spinal cord injury the individuals spend majority of time in sitting either on wheelchair or on any other platform. To live an active life, they need to transfer between various surfaces, for example transfer between wheelchair and bed, wheelchair and car seat, wheelchair to chair etc. Similarly for performing the daily activities they also require transfers from the wheelchair to platforms, for example they transfer themselves from wheelchair to commode for latrine etc. these transfers do not seem easy and the individuals become dependent on others or it becomes more cumbersome particularly when the environment is not up to the mark. Most of the individuals use either a non-foldable wheelchair or a foldable wheelchair, which causes difficulty in transfer. Though there are advancements in development of moving and lifting devices (total body lifts and sit-to-stand lifts) however, because of the expensiveness most of the individuals can not avail the benefits of these devices.[2] And for the individuals with SCI who are dependent on caretakers, the caretakers may have a chance of injury due to lifting the wheelchair user manually while transferring from wheelchair to different platforms and vice-versa. There is requirement of simple transferring mechanism with low expenses which can assist wheelchair users in easy transfer and mobility [3,4].

MATERIALS AND METHODS

Aim:

The aim of this study is to design an effective wheelchair to achieve a hassle free and easy mean of transfer from wheelchair to bed, bed to wheelchair with minimal effort required by the attendant.

Objectives:

- To ease accessibility of the individual with SCI.
- To reduce the effort of the caretaker/attendant of the individual with SCI.
- To provide an easy transfer method.
- To Prevent pressure sore
- To provide easy system for latrine and urinal.

Description:

For transfer of individuals with spinal cord injury (specifically paraplegics) from bed to wheelchair or wheelchair to bed or bed to any other platform is very cumbersome task either by the individual itself or by the caretaker/attendant. To tackle these issues the and to make the urinal and latrine easier, the combination of commode chair and wheelchair was considered with certain mechanisms to make the accessibility easier than ever. The fabrication of the mobile multifunctional commode chair was done utilizing various components and mechanisms and to further generalize it ergonomical principles were also applied to the components.

Caster wheels with brakes:
With the primary function for providing movement (from one place to another place) and controllability (control the direction) the caster wheels are made up of rubber, plastic and nylon. The caster wheels are mounted to the base of large rectangular frame of the mobile multifunctional commode chair and is ergonomically designed for operating environment. The individual brakes are installed to front caster wheels (Diameter-4cm) for safe transferring and can be engaged to preventing unnecessary movements. Rear caster wheels (Diameter-3cm) help to change the direction due to swivelling in nature, where front wheels provide stability during transfer.

Foot rest:
The foot rests are attached to the lower and front of the frame and consist of a support bracket with a swing away mechanism. This mechanism can set footrests vertical to floor by folding up to 90 degrees upward to permit easy access by the individual to the chair who wish to stand.
Pivots and slide tubes are attached to it to switch the footplates easily. The main function of the footrests is to keep the foot off the floor preventing dragging of the feet and hold the posterior aspects of distal thighs of paralyzed individual at a height from the front edge of seat without restricting circulation.

Frame:
The Frame of the chair is made up of high strength aluminium and cast iron to make it light in weight and strong enough to bear the individual's body weight. It is consisting of two adjustable uprights to carry individual's axial load. The adjustable feature of the uprights allows height adjustment facility keeping the foot flat on the foot rest and distributing uniform pressure on buttocks and thighs. The frame also allows easy transfer of individual from one place to other. The detachability and portability features of the components provide an easy method to do that. It can be assembled and dismantled within no time. 15 kg weighted frame can bear the individual up to 125 kg.

Push handle:
It is the curved and extended part of the aluminium adjustable upright and is attached with a plastic or rubber palm grip which faces towards caretaker/attendant. It provides a means of transportation to the caretaker by pushing it.

Seat:
The seat is designed in such an innovative way that, it allows splitting of the seat in two halves thus permitting easy entry of the individual without lifting itself for transfer. Seat height can be adjusted by adjustable upright of the rectangular frame and the commode design allows the individual for discharge of their bowel by direct wheeling over commode. The individual can avail comfortable seating by means of a foam cushion added to the seat. It is much more hygienic and convenient than the normal wheelchair.

Backrest with locking mechanism:
The backrest is designed in such a way that it supports the back of the individual seating on it with a height providing support without limiting the motion and not too low that scapula can hang causing discomfort.it keeps the trunk in erect position and splits in two halves permitting entry of the individual inside the chair. Two types of locks are used for keeping the backrest intact during sitting and movement of the chair. Seatbelt with the frame provides more safety to the individual during movement.

Assembly of components:
First the base of the frame (of high strength cast iron) was prepared by welding three rectangular iron pipes by making it like a "U" shape. Then two vertical cylindrical pipes were mounted vertically on the base through welding, then another two cylindrical pipes with less diameter was put inside the vertical pipes fixed with the base to provide telescopic length adjustment mechanism.

Adjustable holes with a regular interval of 1 inch were made on both outer and inner cylindrical pipes to maintain a proper height of the commode chair and thumb screws were installed to fix the height at certain level. Height is fixed through inserting a vertical locking bolt. Then the vertical pipe was extended and bent at the proximal end to make it the push handle gripped by a rubberised covering. Then the seat of the chair was prepared from metal sheet of cast iron, by cutting it into a split commode design for easy toileting activities, after that it was fixed to the rigid frame of cylindrical pipes. On the back there was a further extension of back-rest by welding flat rods. After that the seat and backrest were cut symmetrically in the middle to allow opening of the commode chair on posterior aspect for easy entry of the individual. Two locking mechanisms were incorporated on the posterior aspect to hold the frame in a stable manner. Pair of foot rest with pivot mechanism was welded on the lower and front part of the frame. Distally four caster wheels were attached on the front and back respectively, and the front one is fixed with breaking mechanism, and the rear one is the multidirectional allowing change in direction. After finishing of all the mechanical work, it was coloured with synthetic colour to prevent it from corrosion and providing a pleasing appearance. Removable waterproof hypoallergic cushion was provided for comfort during mobility with a mechanism to be removed during toileting activities.

DISCUSSION

The challenging part for an individual with spinal cord injury using wheelchair is transfer from the wheelchair to other platforms and vice-versa. Though the caretaker transfers the individual with different methods but there is a high chance for the both to encounter injury during transfer activity. Again, discharging bowel and bladder with the wheelchair is a very difficult task. With the help of this mobile multifunctional commode chair the individual can be carried out easily and the transfer process is quite easy irrespective of the height of the platform from which the individual has to be transferred. Along with the easy transfer facility, the commode system enables the user to direct discharge the bowel and bladder over the commode. This device not only reduces the risk of injury and effort of the caretaker to transfer the user but also provides an easy way of transferring the user and accessibility to washrooms to discharge the bowel and bladder.

Figures:

Figure 1: Caster with Brake

Figure 2: Footrest

Figure 3: Frame of Mobile Multifunctional Commode Chair

Figure 4: Push Handle

Figure 5: Front and Top view of Splitting Seat

Figure 6: Backrest with Locking Mechanism

REFERENCES

1. Michael, E., Sytsma, T., & Cowan, R. E. (2020). A primary care provider's guide to wheelchair prescription for persons with spinal cord injury. *Topics in Spinal Cord Injury Rehabilitation*, *26*(2), 100–107. https://doi.org/10.46292/sci2602-100
2. Patient Transfers and Mobility. In: Dutton M. eds. *Introduction to Physical Therapy and Patient Skills*. McGraw-Hill Education; 2014. Accessed February 18, 2025. https://accessphysiotherapy.mhmedical.com/content.aspx?bookid=1472&sectionid=86198760
3. E. W. Abel. The design of attendant propelled wheelchairs. The Journal of the International Society for Prosthetics and Orthotics. 1991; 15: p.38-45.
4. Bennett Wilson, Jr. Wheelchairs for Paraplegic Patients. Clinical Prosthetics & Orthotics. 1987, 11(2), p. 82- 88.
5. C.M. van Koningsbruggen. Effect of push handle height on net moments and forces on the musculoskeletal system during standardized wheelchair pushing tasks. The Journal of the International Society for Prosthetics and Orthotics. 1995; 19(3): 188-201.

How to cite this article: Swarup Samal, Meelenee Mantry, Priyadarshini Monalisha Dash, Ritikesh Pattanaik. The mobile multifunctional commode chair: a unique transferring device for wheelchair users. *Int J Health Sci Res.* 2025; 15(3):98-103. DOI: *https://doi.org/10.52403/ijhsr.20250316*

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