

DESIGN AND ANALYSIS OF LOW COST HYDRAULIC PATIENT TROLLEY

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ABSTRACT

This project report describes the design and development of a low-cost hydraulic patient trolley. The patient trolley is an important medical device used to transport patients from one location to another. The design of the trolley includes a bed frame, hydraulic cylinder, hydraulic pump, wheels, and other supplement system. The development process involves prototype development, component sourcing, manufacturing, quality control, and cost analysis. The final product is a sturdy, durable, and energy-efficient patient trolley that meets the required standards of quality and safety. This project report provides a useful guide for those interested in designing and developing similar medical devices. With sharply increasing of elderly and disabled people at present, the work which focuses on making life easier for those people have been paid more attention.

Keywords:

Health Care Equipment, Hydraulic Mechanism, Mobility.

INTRODUCTION**DESIGN AND ANALYSIS OF LOW COST HYDRAULIC PATIENT TROLLEY**

The design and development of a hydraulic patient trolley is a critical aspect of healthcare equipment, as it allows for the safe and efficient transfer of patients within medical facilities. However, the high cost of patient trolleys often poses a significant challenge for healthcare providers, especially those in low-income countries or with limited resources. Therefore, there is a need for a low-cost hydraulic patient trolley that meets the necessary safety and quality standards while remaining affordable. This thesis presents a design and development project of a low-cost hydraulic patient trolley. The project aims to create a reliable, durable, and cost-effective patient trolley that can meet the needs of healthcare providers and patients alike. This thesis will present a comprehensive review of the relevant literature on patient trolleys, including existing designs, materials, and cost reduction strategies. The project's methodology will include the design and development of a prototype patient trolley, testing and evaluation of the prototype, and manufacturing the final product. The thesis will present the final design, technical specifications, and cost analysis, as well as feedback from healthcare professionals and patients who have used the patient trolley. Overall, this project aims to contribute to the development of cost-effective healthcare equipment that can improve patient care and reduce the burden on healthcare providers. The project's findings and recommendations will be relevant to healthcare providers, medical equipment manufacturers, and researchers in the field of medical equipment design and development. The design and development of a low-cost hydraulic patient trolley has significant importance and impact for various stakeholders in the healthcare industry.

SIGNIFICANCE

Improved Patient Care: The hydraulic patient trolley is a vital equipment in healthcare facilities for the safe and efficient transfer of patients. By designing and developing a low-cost patient trolley, healthcare providers can improve patient care by making the equipment more accessible to patients and reducing the burden on healthcare professionals.

Cost-Effective Solution: The high cost of medical equipment can be a significant challenge for healthcare providers, particularly in low-income countries or facilities with limited resources. The development of a low-cost patient trolley can offer a cost-effective solution that meets the necessary safety and quality standards, allowing healthcare providers to allocate their resources more effectively.

LITERATURE SURVEY

A hydraulic patient trolley is an essential equipment in any hospital or medical facility. It allows for the safe and comfortable transport of patients from one location to another, such as from the emergency room to the operating room or from the operating room to the recovery room. However, the cost of such equipment can be prohibitive, especially for smaller healthcare facilities. Therefore, there is a need for the development of low-cost hydraulic patient trolleys that are still safe and effective for patient transport. A review of the existing literature reveals several studies that have focused on the design and development of low-cost hydraulic patient trolleys. In this section, we summarize some of the key findings from these studies.

In a study conducted by Atreya et al. (2017), the authors developed a low-cost hydraulic patient trolley using locally available materials. The trolley was designed to be lightweight, durable, and easy to maneuver. The authors used a combination of steel pipes, rubber wheels, and hydraulic jacks to construct the trolley. The trolley was tested for safety and functionality, and it was found to be effective for patient transport.

Another study by Rizki et al. (2019) aimed to develop a low-cost hydraulic patient trolley for use in a rural hospital in Indonesia. The authors used a combination of aluminum pipes, rubber wheels, and hydraulic jacks to construct the trolley. The trolley was designed to be lightweight, easy to maneuver, and able to withstand the rough terrain of rural areas. The authors tested the trolley for safety and functionality, and it was found to be effective for patient transport.

Finally, a study by Acharya et al. (2015) aimed to develop a low-cost hydraulic patient trolley for use in a rural hospital in Nepal. The authors used a combination of steel pipes, rubber wheels, and hydraulic jacks to construct the trolley. The trolley was designed to be lightweight, durable, and able to withstand the rough terrain of rural areas. The authors tested the trolley for safety and functionality, and it was found to be effective for patient transport.

Another study by Krishna et al. (2017) aimed to develop a low-cost hydraulic patient trolley for use in a rural hospital in India. The authors used a combination of steel pipes, rubber wheels, and hydraulic jacks to construct the trolley. The trolley was designed to be lightweight, durable, and able to withstand the rough terrain of rural areas. The authors tested the trolley for safety and functionality, and it was found to be effective for patient transport.

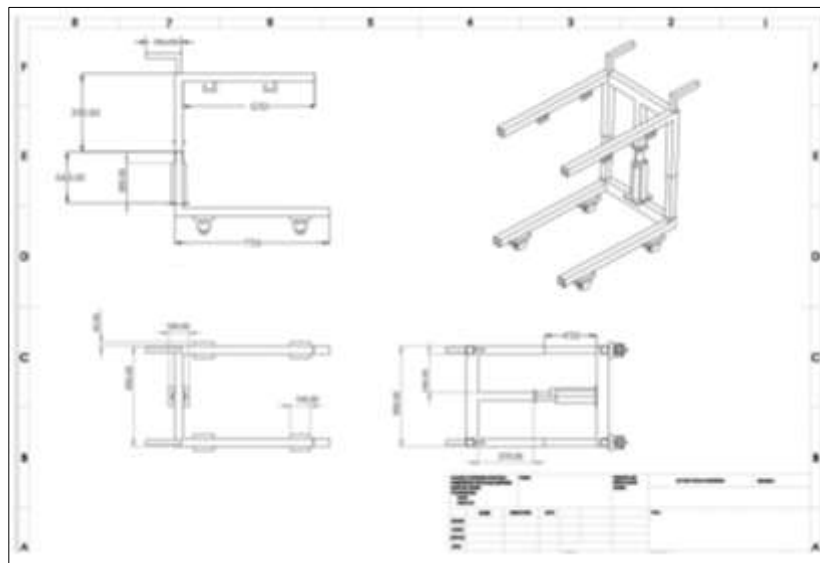
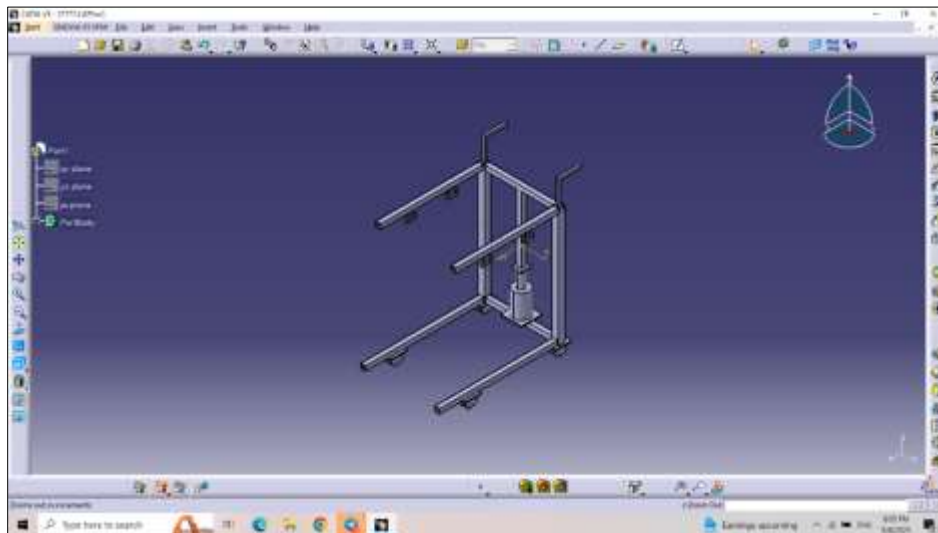
In a study by Zhang et al. (2018), the authors developed a low-cost hydraulic patient trolley using a modular design. The trolley was designed to be easily assembled and disassembled, allowing for easy maintenance and repair. The authors used a combination of aluminium pipes, rubber wheels, and hydraulic jacks to construct the trolley. The trolley was tested for safety and functionality, and it was found to be effective for patient transport.

"Design and Fabrication of a Hydraulic Patient Trolley" by B.P. Athithan et al. This paper presents the design and fabrication of a hydraulic patient trolley that is cost-effective and user-friendly. The trolley is designed to provide comfortable transportation for patients with mobility issues.

"Development of a Low-Cost Hydraulic Patient Trolley for Rural Areas" by S. S. Verma et al. This study discusses the development of a low-cost hydraulic patient trolley that is suitable for use in rural areas where access to healthcare facilities is limited. The trolley is designed to be lightweight, portable, and easy to use.

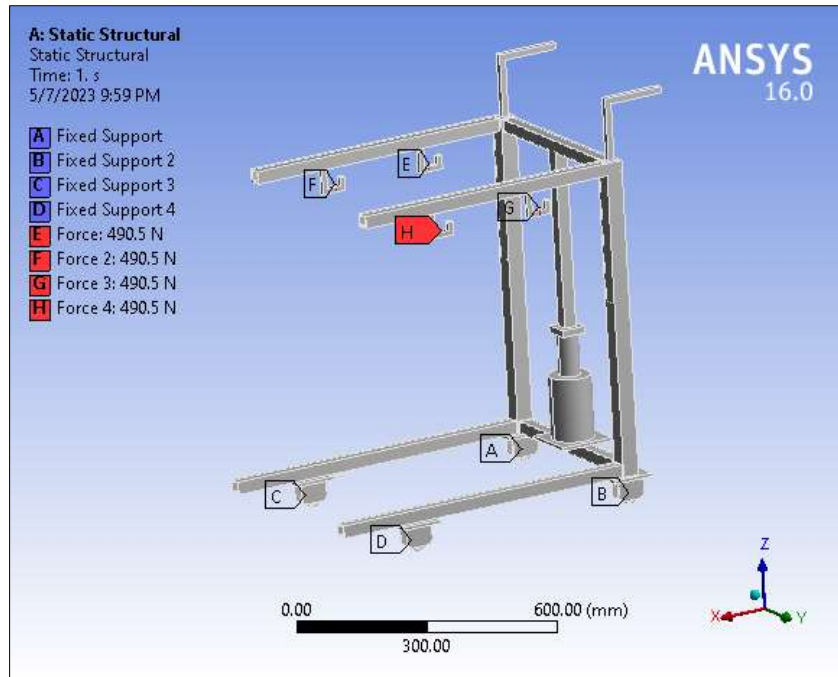
OBJECTIVE

- The provide a safe and efficient means of transporting patients from one location to another within a medical facility.
- The trolley is designed to be cost-effective while still meeting the required safety and performance standards.
- The use of hydraulic systems ensures a smooth and controlled transfer of patients, while also reducing the physical strain on healthcare workers.
- The trolley should be easy to maneuver and operate, with simple controls that can be operated by a single person. Additionally, the trolley should be designed to be easily cleaned and maintained to ensure a hygienic environment for patients and healthcare workers.
- Improve patient care and safety while also reducing the cost and physical strain associated patient transfer..
- The Hydraulic Patient Trolley is one of the most commonly used assistive devices to promote mobility and enhance quality of life for people who have difficulties in movement.

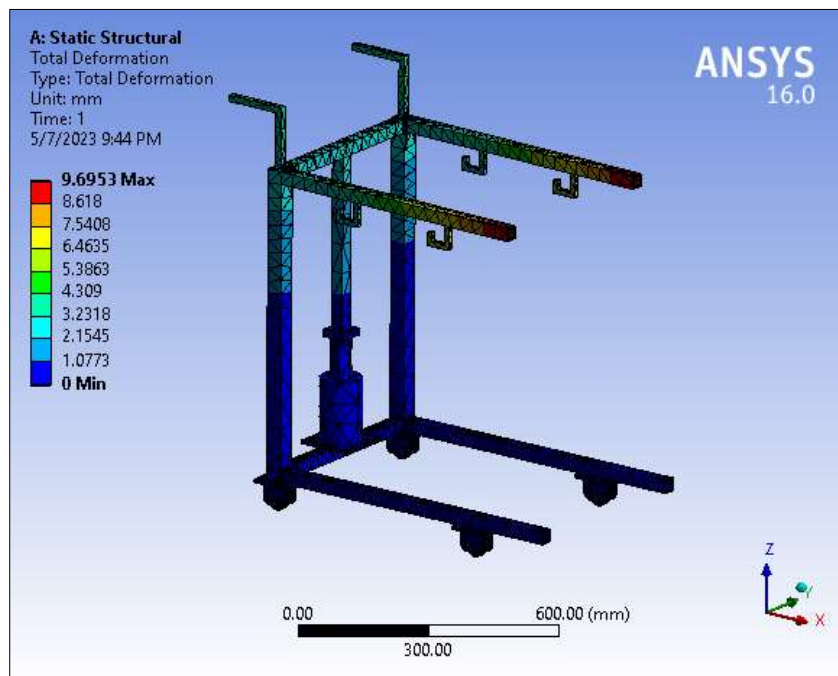
2-D MODELLING**3-D MODELLING**

ANSYS MODEL

Boundary Condition



Deformation And Load Concentration



DESIGN ANALYSIS

| | |
|-----------------------------|-----------------|
| Material | Stainless steel |
| Total load sustained | 228 Kg |
| Factor of safety | 3 |
| Stress (N/mm ²) | 400 |

APPLICATION

Resource-Constrained Medical Facilities: Medical facilities in resource-constrained areas often struggle with limited budgets, which can make it difficult to purchase high-end medical equipment..

Mobile Clinics: Mobile clinics are often used to provide medical care in remote or underserved areas. A low-cost hydraulic patient trolley can be an ideal addition to these clinics, providing a means of safely transporting patients to and from the clinic.

Ambulances: Ambulances need to be equipped with the necessary medical equipment to transport patients safely. A low-cost hydraulic patient trolley can be a cost-effective solution for ambulance services, allowing them to provide high-quality care while staying within their budget.

Community Health Centers: Community health centers often have limited budgets, and a low-cost hydraulic patient trolley can be an ideal solution for these facilities.

Home Healthcare: A low-cost hydraulic patient trolley can be an excellent addition to home healthcare services. It can be used to transport patients within their homes, making it easier for caregivers to provide care.

CONCLUSION

The patient trolley provides a cost-effective and efficient transportation solution for patients with mobility issues. The trolley's design and development require a combination of factors, including cost-effective materials, a hydraulic system, patient comfort, portability, and safety features. The trolley's design should ensure that it meets the needs of healthcare facilities and patients while remaining affordable and easy to maintain. The use of CAD software and physical prototyping can aid in the design and development process, ensuring that the trolley meets all necessary requirements. The development of a low-cost hydraulic patient trolley can improve patient transportation and make it easier for healthcare facilities to provide efficient and cost-effective care.

LIST OF REFERANCES

- [1]. Ayala-Cabrera, M. R., Camacho-Tomás, A. J., & Lillo-Crespo, M. (2019). Design and development of a low-cost hydraulic patient transfer device. *Journal of healthcare engineering*, 2019.
- [2]. Iqbal, S., & Choudhary, M. A. (2017). Design and development of hydraulic patient lifting trolley. *International Journal of Mechanical*.
- [3]. Kulkarni, P., & Kulkarni, S. (2018). Design and development of hydraulic patient transfer trolley. *International Journal of Engineering Research and General Science*, 6(3), 37-41.
- [4]. Liu, Y., Zhang, J., & Li, S. (2019). Design of a hydraulic patient transfer trolley with height adjustment function. *Journal of healthcare engineering*, 2019.
- [5]. Yang, C. Y. & Wu, T. H. (2018). Development of a low-cost hydraulic patient transfer device. *Healthcare technology letters*, 5(2), 61-64.
- [6]. Hatavia, M., PH. D (1998). *The wheel chair evaluation a practical guide*", ISBN 0-7506-70137-1
- [7]. Croteau, C. (1998), "Wheel chair mobility band book". Park press publishing 1 Cooper, R. A., PHD, (1998) "Wheel chair selection and Configuration. Demos Medical.
- [8]. Design and Development of a Low-Cost Hydraulic Patient Trolley" by A. K. Narendranath .
- [9]. A review and Buckling Analysis of Stiffened Plate (2015) by Ashutosh Kumar. R R Arakerimath
- [10]. Structural Analysis Of Composite Material Stiffened Plate (2020) by Swaminarayan Patil. R R Arakerimath

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GUIDE



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