The 10th TSME International Conference on Mechanical Engineering
10th – 13rd December 2019
Pattaya, Thailand

Three-Dimensional Finite Element Analysis of Stress Distribution and Displacement to Design of Patient Lifting Equipment

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Abstract. The patients with stroke, especially hemiplegia and paraplegia cases, need to transfer patients from bed to wheelchair or wheelchair to bed and transfer patients from wheelchair or bed to car or car to wheelchair or bed while the patient is admitted to the hospital or stay at home. The handling in movement required to be accurate according to the principles of physiology for increase safety of patient moving. The utilization of patient lifting equipment will improve patient handling patients more efficiently in health care for both of patients and staffs. Patient lifting equipment can help the lifting of patient movement completely. The basis of the strength analysis of the structure design to analyse the stress distribution and displacement of the device is still minimal due to computer program limitations. A comprehensive understanding of the fundamentals of strength analysis will help the recommendation to design of patient lifting equipment to lift patients for appropriate use in each situation. The objective of this research is to design spreader bar of patient lift equipment to support use for transferring from wheelchair or bed to car or car to wheelchair or bed. The detail regarding concept design and analysis the strength of structure is solved by finite element method (FEM) with three-dimensional model. The results obtained from the simulation solution are examined and compared with the analytical solution. The study focuses attention on the differences angle of spreader bar on the stress distribution and displacement at various points. It is found that the change in the angle adjustment of spreader bar will directly affect the change in the stress distribution and displacement. The maximum stress distribution and maximum displacement will be reduced when the degree increases. The obtained results can be helpful in determining basis for the guideline to design of spreader bar of patient lifting equipment to transfer patients to suit in each situation.

Keywords: Finite element method (FEM), Patient lifting equipment, Stress distribution, Displacement