

Model development and simulation process of customized numerical Human Body Models for the study and analysis of healthcare products

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ABSTRACT

Currently, there has been an increase in using Finite Element (FE) Human Body Models (HBMs) as a tool to develop and study healthcare products. There are many advantages of using FE HBMS for healthcare product development. FE HBMs can help to gain an understanding of how the product's design interacts with the human body. Parametric studies by changing some parameters can also be possible using FE HBM due to the relatively lower cost of running simulations compared to conducting physical experiments. The results from FE HBMs simulation can also be used for marketing purposes to illustrate the product benefits. Despite these advantages, many challenges still exist nowadays when using FE HBMs in the healthcare sector, one of them being the complexity of human anatomical and physiological properties.

Humans are very complex in terms of anatomical and physiological properties. It is almost impossible to have a model that fully represents the human population. Huge variations in human size or anthropometrics have also been reported in the literature. Not only variations in gross anatomical size such as Body Mass Index (BMI) but also local anthropometric variation, such as variation in pelvic bone geometry, have created a tremendous challenge in FE human body modeling. Therefore, a customized FE HBM is needed to account for the specific purpose of each study.

The main objective of this presentation is to give an overview of the model development and simulation process of customized FE HBMs. The area of applications was emphasized in the study and analysis of various healthcare products. Several examples from real-business cases were presented, highlighting the important steps that need to be taken to be successfully conducting the simulations. In each step, the challenges and how to approach them were listed and discussed.