

Customized Athletic Shoe Midsole Development to Address Plantar Heel  
Pain  
(Technical Report)

Rising Drug Prices and the Strain on the American Healthcare System  
(STS Research Paper)

An Undergraduate Thesis Portfolio  
Presented to the Faculty of the  
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In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Biomedical Engineering

by

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## **Preface**

How can the cost of American health care be reduced?

How can a shoe midsole be individually optimized to relieve overuse injuries, such as plantar fasciitis? One in ten adults will experience plantar fasciitis in their lifetime, causing indirect medical costs of \$390 million per year in the United States. To treat patients afflicted with plantar heel pain more cost-effectively and accessibly, the research team developed an algorithm and design process for fabricating customized midsoles suited to patient-specific biomechanical factors. Finite element analysis and material testing in CAD software were used. The 3D printed midsoles provide optimized cushioning around the heel and ball of the foot, relieving stresses in the plantar fascia during the gait cycle. Future researchers may conduct patient motion analysis to determine the midsoles' effect on patients' gait pattern, ankle angle, and stride length.

How are interest groups competing to influence drug prices in U.S. healthcare? In the United States, high and rising drug prices impose financial burdens and limit access to health care. Pharmaceutical companies, pharmacy benefit managers, and health insurance providers have blamed each other; none accepts responsibility for its respective role in rising drug prices. Transparency in drug pricing and distribution can reveal factors driving the escalating out-of-pocket costs, and help hold the major participants in drug pricing accountable.

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