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Engineering & Scientific Consulting

William Torres, Ph.D.

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Professional Profile

Dr. Torres specializes in the use of combinatorial quantitative techniques including computational modeling and complementary benchtop evaluations to promote the effective design of medical technology. He has expertise in the use of finite element analysis, computational fluid dynamics, and three-dimensional anatomical reconstruction for the mechanical, thermal, and/or electromagnetic analysis of the interaction between biological tissues and medical devices in support of in-silico clinical trials. These experiences in computational modeling tools are a complement to Dr. Torres' benchtop experimental capabilities of implantable medical devices and a variety of human tissue types for the validation of computational models or the characterization of unique and challenging loading modalities.

Furthermore, he has extensive experience in the use of computational and experimental techniques to evaluate MRI safety and compatibility of both active and passive medical devices. This expertise includes a comprehensive understanding of the methodologies and requirements detailed in standards and regulatory guidance documents such as ISO/TS 10974, the FDA's guidance document on Testing and Labeling Medical Devices for Safety in the Magnetic Resonance (MR) Environment, and several others.

Throughout the course of his doctoral research at the University of South Carolina, Dr. Torres worked extensively with unique large animal models of heart failure to characterize the rate and extent of adverse remodeling secondary to different phenotypes of heart disease using non-invasive echocardiographic imaging and multi-photon histological analysis. This work motivated the intelligent design of targeted biomaterial-based therapeutics for post-myocardial infarction care to mitigate these adverse outcomes. Furthermore, he invented a clinically translatable tool for the advanced biomechanical analysis of the human heart from readily available echocardiographic imaging.

Academic Credentials & Professional Honors

Ph.D., Biomedical Engineering, University of South Carolina, 2019

B.S., Biomedical Engineering, University of South Carolina, 2014

National Institute of Health Research Supplement to Promote Diversity in Health-Related Research Recipient, 2015-2019

National Science Foundation I-Corps Recipient and 1st place in the start-up pitch competition, University of South Carolina, 2018

Academic Appointments

External Advisory Board (EAB), University of South Carolina, Biomedical Engineering Program, 2022 - present

Prior Experience

Co-Founder and Director of Consulting, Torres-Prim Biomedical, LLC, March 2017 – December 2019

Graduate Research and Teaching Assistant, University of South Carolina, August 2014 – March 2019

Research Intern, Wake Forest University – Virginia Polytechnic Institute, May 2013 – August 2013

Professional Affiliations

Society of Hispanic Professional Engineers

National Biomedical Engineering Society

Patents

US Patent 11969293: Non-Invasive Estimation of the Mechanical Properties of the Heart, April 2024 (Torres WM, Spinale FG, and Shazly TM).

Publications

Shazly T, Torres WM, Secemsky EA, Chitalia VC, Jaffer FA, Kolachalama VB. Understudied factors in drug-coated balloon design and evaluation: A biophysical perspective. Bioengineering & Translational Medicine, 2022; e10370.

Torres WM, Barlow SC, Moore A, Freeburg LA, Hoenes A, Doviak H, Zile MR, Shazly T, Spinale FG. Changes in myocardial microstructure and mechanics with progressive left ventricular pressure overload. JACC: Basic to Translational Science, 2020; 5(5): 463-480.

Torres WM, Spinale FG, Shazly T. Speckle-tracking echocardiography enables model-based identification of regional stiffness indices in the left ventricular myocardium. Cardiovascular Engineering and Technology, 2020; 11: 176-187.

Azar D, Torres WM, Davis LA, Shaw T, Eberth JF, Kolachalama VB, Lessner SM, Shazly M. Geometric determinants of local hemodynamics in severe carotid artery stenosis. Computers in Biology and Medicine, 2019; 114: 103436.

Torres WM, Jacobs J, Doviak H, Barlow SC, Zile MR, Shazly T, Spinale FG. Regional and temporal changes in left ventricular strain and stiffness in a porcine model of myocardial infarction. American Journal of Physiology: Heart and Circulatory Physiology, 2018; 315(4): H958-H967.

Conference Papers and Abstracts

Torres WM, Mealy JE, Jacobs J, Doviak H, Barlow SC, Burdick JA, Shazly T, Spinale FG. Biomaterial-based delivery of a small molecule matrix metalloproteinase inhibitor limits adverse biomechanical changes throughout the left ventricle following myocardial infarction. Journal of Cardiac Failure, 2018; 24(8): S40.

Mealy JE, Barlow SC, Doviak H, Jacobs J, Torres WM, Burdick JA, Spinale FG. Targeted delivery and controlled release of a small molecule matrix metalloproteinase inhibitor using a self-assembling hydrogel following myocardial infarction. Journal of Cardiac Failure, 2018; 24(8): S17.

Conference Presentations

Holyoak D, Torres WM, Siskey R, Pearle A, Su E. A combinatorial approach to evaluate fixation methods in cementless unicompartmental knee replacements. Poster Presentation, Orthopaedic Research

Society, 2023.

Holyoak D, Dillon A, Torres WM, Bullard A, Siskey R. Analysis burden and accuracy for evaluating RF-induced heating of medical devices in MRI scanners. Poster Presentation, Orthopaedic Research Society, 2023.

Torres WM, Dillon A, Holyoak D, Bullard A, Siskey R. Variability in the Analysis Burden for Evaluating Radiofrequency Induced Heating of Implanted Medical Devices. Podium Presentation, Biomedical Engineering Society Annual Conference, 2022.

Torres WM, Holyoak D, Siskey R, Pearle A, Su E. Evaluation of Fixation Methods in Cementless Unicompartmental Knee Replacements Using a Combinatorial Approach. Posterior Presentation, Biomedical Engineering Society Annual Conference, 2021.

Torres WM. The Role of Computational Modeling and Simulation in the Product Development Life Cycle for Medical Devices. Keynote Presentation, COMSOL Day: Biomedical Devices, 2021.

Torres WM, Thames AT, Shazly T, Spinale FS. Transesophageal echocardiography enables regional quantification of left ventricular strain in a porcine model of myocardial infarction. Podium Presentation, Summer Biomechanics, Bioengineering, and Biotransport Conference, 2017.

Torres W, Shaw T, Suarez K, Eberth J, Lessner S, Shazly T. Identifying geometric determinants of hemodynamics in the human carotid artery prior to endarterectomy. Poster Presentation, 11th International Symposium on Biomechanics in Vascular Biology and Cardiovascular Disease, 2016.