

Capstone as a Vehicle for Translational Research

Timothy Allen, David Chen, and Shayn M. Peirce

Translational biomedical research—the translation of scientific discoveries into practical clinical applications—is a rapidly growing focus of innovation in the field of Biomedical Engineering. Translational research is an integral component of the NIH Roadmap for Medical Research, and private foundations (e.g. Wallace H. Coulter Foundation and Alfred Mann Foundation) have played critical leadership roles in promoting the translational research environment within BME programs. With this new emphasis on “benchtop-to-bedside” efforts in our field, along with the an infusion of targeted funding opportunities, two important questions arise at the departmental level regarding undergraduate curricula in BME: 1) How can we involve undergraduate BME students in translational research using the Capstone Design course as a vehicle for upstream innovation?; and 2) How can involving our undergraduates in translational research, in turn, bolster an environment of innovation at our university? Towards answering these questions, we will present a case study from the BME Capstone Design Course at the University of Virginia in which undergraduates contributed to the inception and continued progress of a funded Wallace H. Coulter Translational Research Project. The goal of the project was to develop a novel surgical instrument that improves the efficiency and safety of the ear tube insertion procedure. This procedure is used to treat cases of otitis media with effusion and is the most frequently performed surgical procedure in children. We will describe the involvement of the undergraduates at each level of the medical device development process: through the conceptual design stages, prototyping and testing, intellectual property protection, product market research and marketing, FDA device approval, pre-clinical testing, and a clinical trial. We will also discuss various challenges that arose from involving students in these processes, including intellectual property ownership, timing issues relating to the academic calendar and coursework, and the transition of responsibilities from one class of undergraduate students to the next, while continuing to fulfill the requirements of our BME Capstone Design Course. We will conclude by highlighting the tremendous value added, to both the educational thrusts of our Department and to the translational research environment at UVa, by involving undergraduate BME students in each step of the translational research innovation process.