Overview
Postoperative infections in patients who have undergone open-heart surgery have been linked to the current heater/cooler device used at HMC. Our sponsor sought a complete redesign of the current class of heater/cooler devices, such that they would eliminate the associated infections. It is suspected the reservoir of the current class of devices is part responsible for bacterial proliferation.

Objectives
Our team’s objective was to design a heater/cooler device that would be conducive to effective cleaning methods, such that it would ultimately eliminate postoperative infections.

Approach
● Our group initially visited our sponsor on site to better understand the mechanics of the heater/cooler device
● Our group determined customer needs from Drs. Myers and Weiss (sponsors)
● Specific heating requirements were provided from perfusionists at HMC
● Concept generation and selection was accomplished via the analytical hierarchy process
● An extensive pattern search was performed in parallel to concept generation
● The group reported our progress to our sponsors via weekly status reports in addition to weekly Skype calls. Sponsor feedback was provided in these sessions
● Heating and cooling requirements were determined using a traditional set of thermodynamic equations in parallel to finite element modeling
● CAD models were constructed for finite element modeling and the final design assembly
● Model validation was accomplished by comparing the results of the traditional equations with the results of finite element modeling

Outcomes
● It is believed that the implementation of a heater/cooler unit based off this design will help to prevent infection in patients undergoing open heart surgery
● The heating and cooling studies proved the design to be feasible for the heating and cooling of blood