Complex lower extremity deformities often require surgical reconstruction to restore normal alignment. Accurate measurements are needed to assess body alignment. However, there is currently a lack of proper tools to do so intraoperatively. There is currently no standard instrument to assist with intraoperative lower extremity deformity correction. The current methods are inefficient with a potential for inaccuracy and time consuming, with the risk of excess radiation exposure to the patient. The goal of this project is to create a custom board with an alignment grid specific to patients with a multiplanar deformity or multi-bone deformity requiring a specific angle of correction. Surgical plans can include multiple correctional surgeries each with a target angle to obtain. This custom radiolucent alignment board will allow the surgical team to utilize any angle needed as a reference for alignment.

The objectives of this project include developing a radiolucent board with radiopaque grid lines. Our final product consists of a 3D printed PLA board with lines engraved into the board. These lines house radiopaque copper wire of various thicknesses, which can be modularized to fit in angles from 83-90 degrees. Before converging upon this final design, we circulated through various prototypes and materials for our board and grid lines. The team explored combinations of carbon fiber and plexiglass boards with ABS or barium sulfate grid lines, based on their material properties such as Z values. After developing a few prototypes testing grid line definition and time, the team decided to switch direction to PLA and copper due to its ease of use. This solution to a multifaceted problem will allow for less personnel working on the patient and allow simultaneous measurements to be taken at one time. The custom board will improve alignment accuracy and reduce operating times and radiation exposure for all involved.