



## Needleless connector UV-C disinfecting device

### Overview

Contamination is a problem often encountered with IV connector sets. Moreover, the lack of a consistent disinfecting procedure when using these tubes exacerbates this serious issue. B. Braun Medical wishes to develop a device to better disinfect the IV sets using UV-C radiation, thereby establishing a consistent method to avoid the problem of opportunistic infections and contamination. This method will also avoid the mistakes and variability that arise from human factors.



### Objectives

Our objective was to design and build a device that used UV-C light to disinfect needleless connectors effectively and quickly, achieving a 4-log reduction in bacterial growth in less than 30 seconds.

### Approach

- Customer needs were identified by speaking to our sponsor and nurses at Mount Nittany Medical Center.
- We reviewed existing patents to ensure our device avoided patent infringement.
- Based on these needs, we developed 6 possible device designs.
- We used concept scoring matrices to select our final design to be pursued.
- We video conferenced with our sponsor weekly to ensure we remained on track with the project.
- We developed alpha, and beta prototypes prior to our final design. Rapid prototyping was used to manufacture all 3 device iterations.
- Heat simulation in COMSOL was used to ensure the UV-C LEDs did not pose a danger to the user, casing, or electronics.
- 3 rounds of bacterial testing were performed to examine the effectiveness of the LEDs in disinfecting the needleless connectors.
- In one instance, we achieved a 2-log (99%) reduction in bacterial growth on the connectors.

### Outcomes

- Our device validates the concept of using UV-C disinfection to decontaminate needleless connectors.
- The UV-C LEDs used must be modified by the manufacturer to ensure they remain on at a consistent power while connected.

