Pressurized Wound Irrigation for Effective Wound Cleaning in Emergency Rooms

PureStream MedTech
Clean Wounds, Better Healing
Abrazo Medical Group

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Our mission is to create an accessible, effective pressurized wound irrigation system that enhances healing, reduces infections, and improves care for all.

Clinical Needs

Background: Wound care is an important procedure in the E.R. as infections can lead to further complications. Around 40 million emergency department visits per year in the US are related to traumatic injuries, including open wounds from falls, car accidents, violence, and surgical procedures.

Current solutions:
- Plastic Bottles
- Syringes

Fig 1. Traditional methods of wound irrigation

Market Analysis

- Global Market Size: $285.67 million USD in 2022
- Projected growth: $347-411 million USD by 2030
- CAGR: 2.6-3.9% increase between 2023-2030

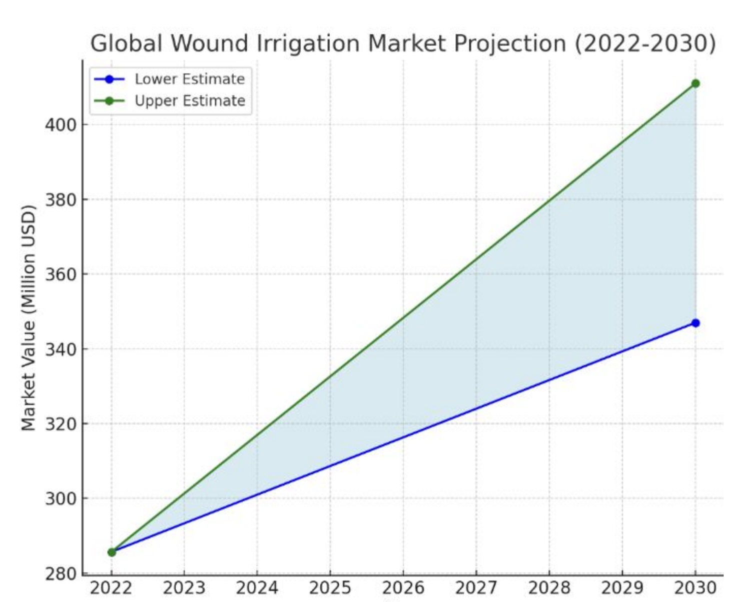

Figure 2. US irrigation market size graph

Final Product Specifications

Customer Needs	Specifications
Infection Prevention	Infection Rate less than 5%
Consistent Pressure	15 PSI (pounds per square inch)
Sterility	Follow Health standards
Easy to use	Less than 1 minute to set up
Affordable	Less than 40 USD
Consistent Flow Rate	600 mL/min or 10 mL/s

Table 1. Top customer needs with corresponding functional specifications.

Prototype

Device Concept and Design: Compact, portable, handheld size device that provides constant pressure and volume, enhancing patient comfort and reducing the risk of infection. With splash guard, it promotes safety for both patients and healthcare providers.

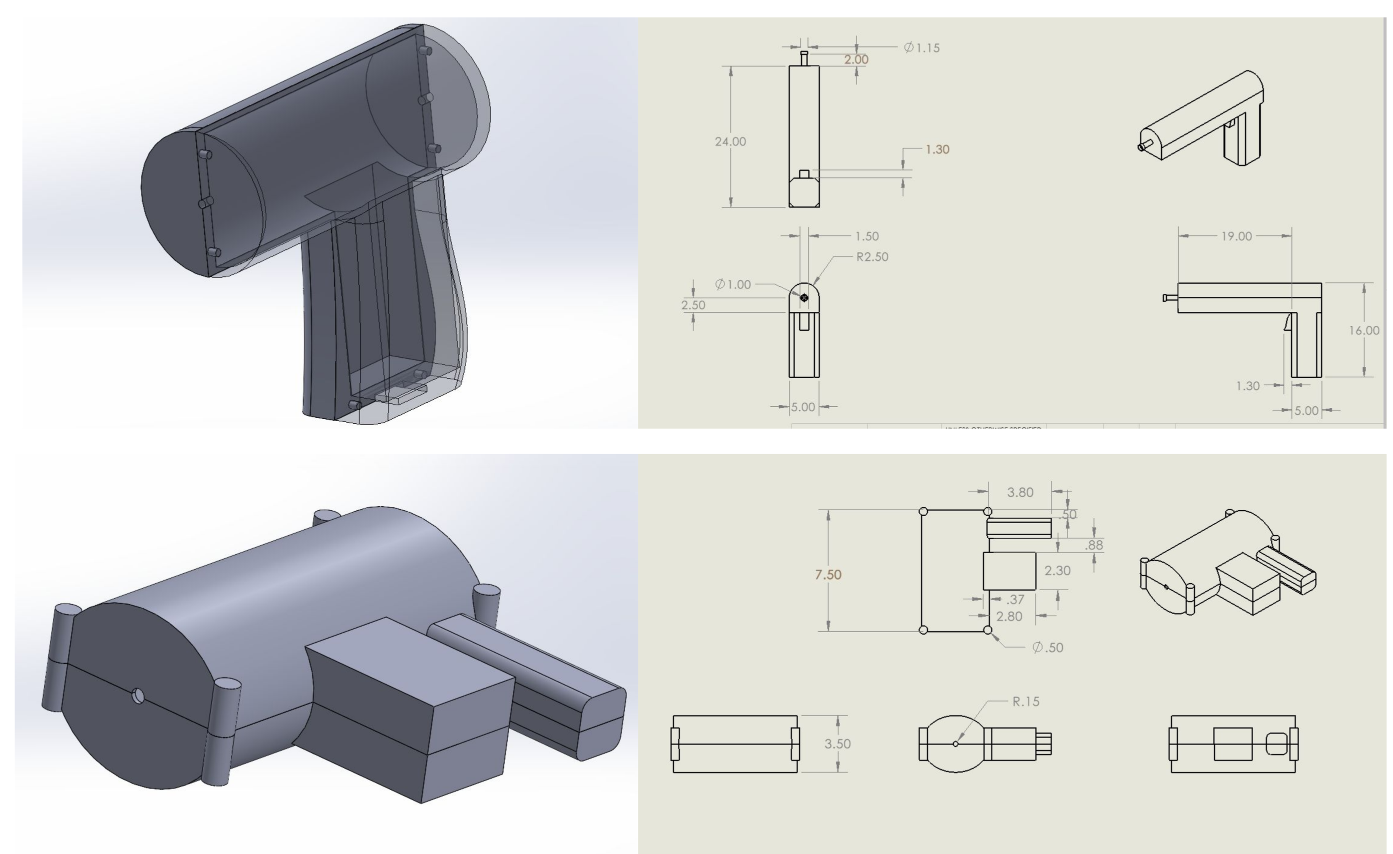

Figure 3. Prototype 1 (top left) and prototype 2 (bottom left) with specific dimensions (right)

Verification Results

Figure 4. Flow rate validation testing set-up

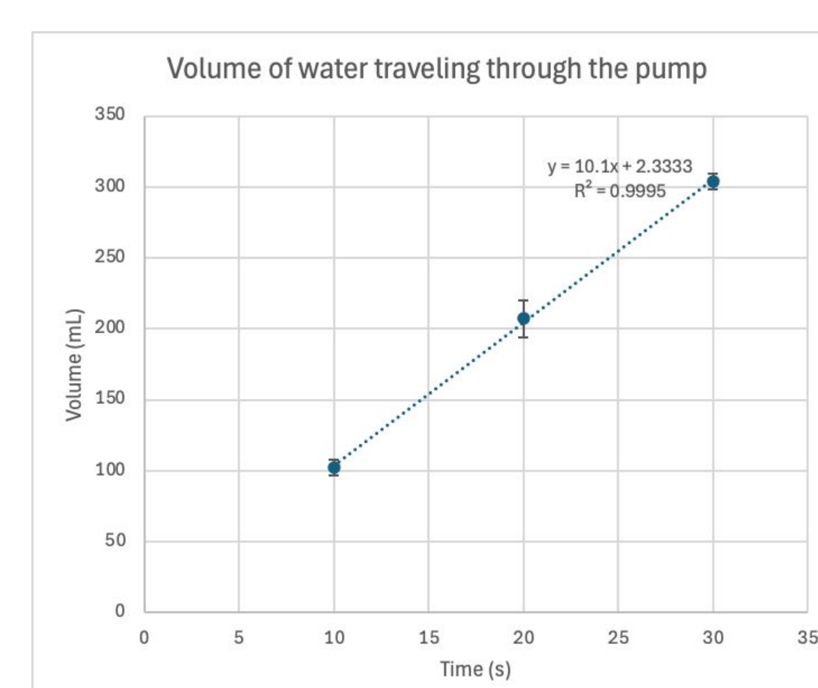

Table 2. The volume traveled through the pump (internal volumetric flow rate) in 10, 20, and 30 seconds as pressure is set at 15 psi

Final Technical/Mathematical Model

Input Variables:
- P_1 and P_2: Pressures at two points (in Pa)
- v_1 and v_2: Fluid velocities (in m/s)
- ρ: Fluid density (in kg/m^3)
- g: Gravitational acceleration (in m/s^2)
- h_1 and h_2: Heights at two points in the tubing (in m)

Output Variable:
- Pressure and Velocity calculations help meet target specifications at the nozzle.

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

Fig 3. Bernoulli's Equation allows us to regulate the pressure and velocity at different points in the tubing to confirm safe operation at the nozzle.

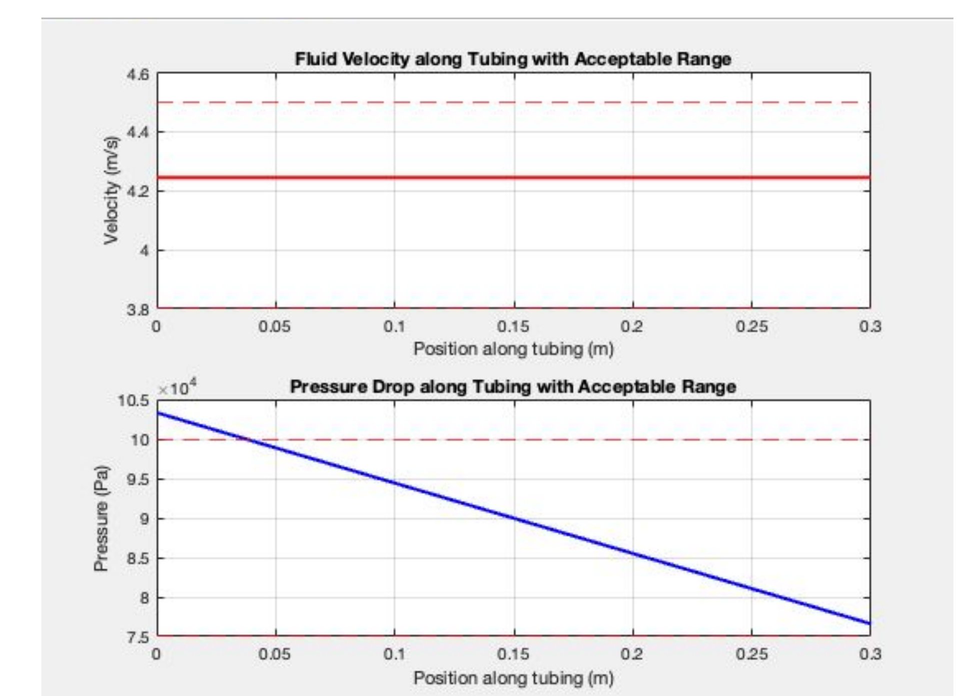

Figure 4. The top graph is the velocity of the fluid as it goes through the system. The bottom graph is the pressure drop through the system. Both of these must be consistent and at acceptable levels.

Future Directions

Future directions include prototyping and submitting FDA. Our device is classified as **FDA class II**: Moderate risk, thus, it will follow 510(k) premarket notification to demonstrate substantial equivalence to a predicate device.

Acknowledgments

We would like to thank the Ira A. Fulton Schools of Engineering and the Capstone Teaching team for the experiential learning that progressed throughout the 2024-2025 Academic Year. We are especially grateful to the mentorship and guidance of Dr. Beeman and Dr. Gerstman.