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Port Injection Site Sanitization (PSS) Dispenser Design

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PSS Dispenser Design

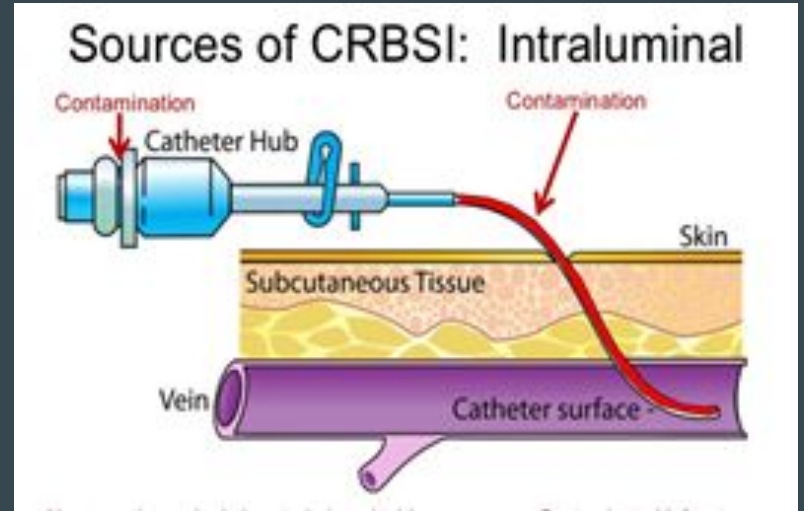
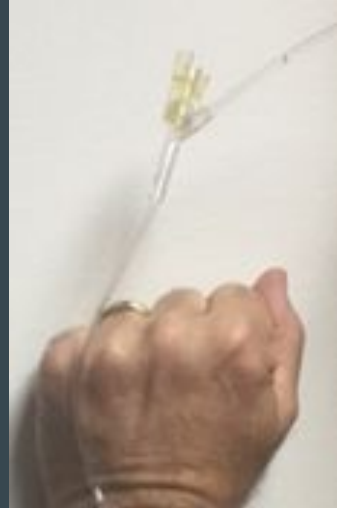


Ya Gao, Lindsey Greenwood, Rachel Mann, Katherine He

Problem Statement

A way to reduce catheter-related bloodstream infections (CRBI) in patients using peripheral venous catheters due to ineffective sterilization of these catheters in order to reduce the amount of time spent in hospitals due to preventable bacterial infection.

Background Research



More Injections = More Infections

Design - Custom Holder

Device must:

- Remain clipped over the catheter hub
- Only affect the catheter drip rate minimally
- Dispense sterilant onto catheter hub



Figure 1

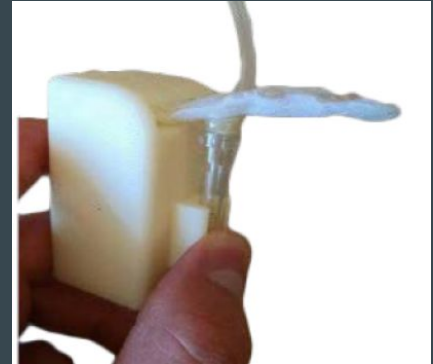
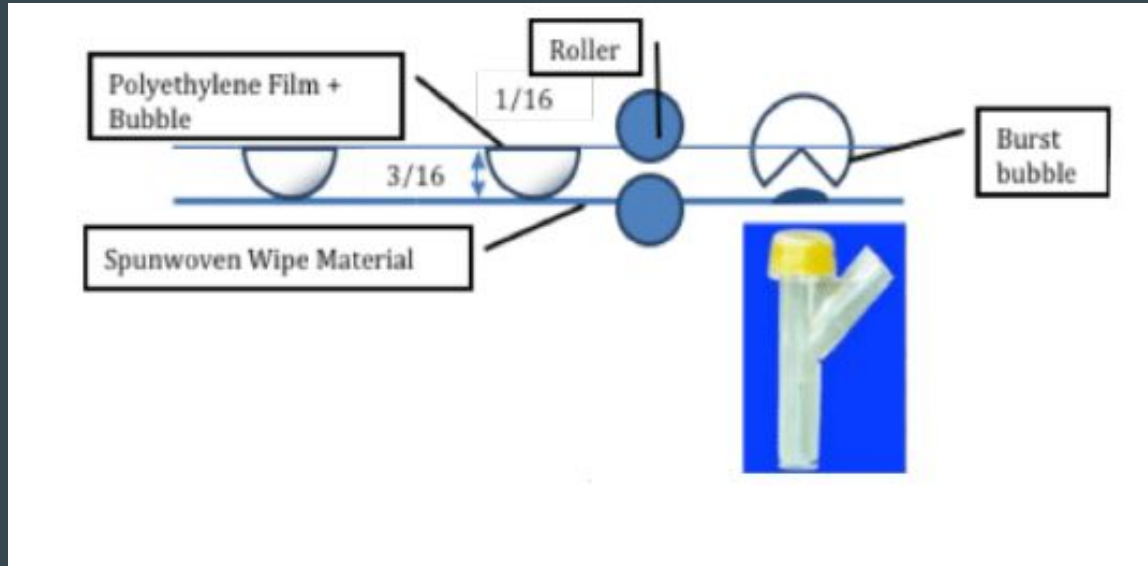


Figure 2

Design - Sterilant Tabs



Bubbles impregnated with sterilant will be pulled through a roller, which pops the bubbles and releases the sterilant over the catheter hub.

Weight Analysis

Knowing the approximate volume of 50 sterilant tabs: $V = 15 \text{ in}^3 = lxy$

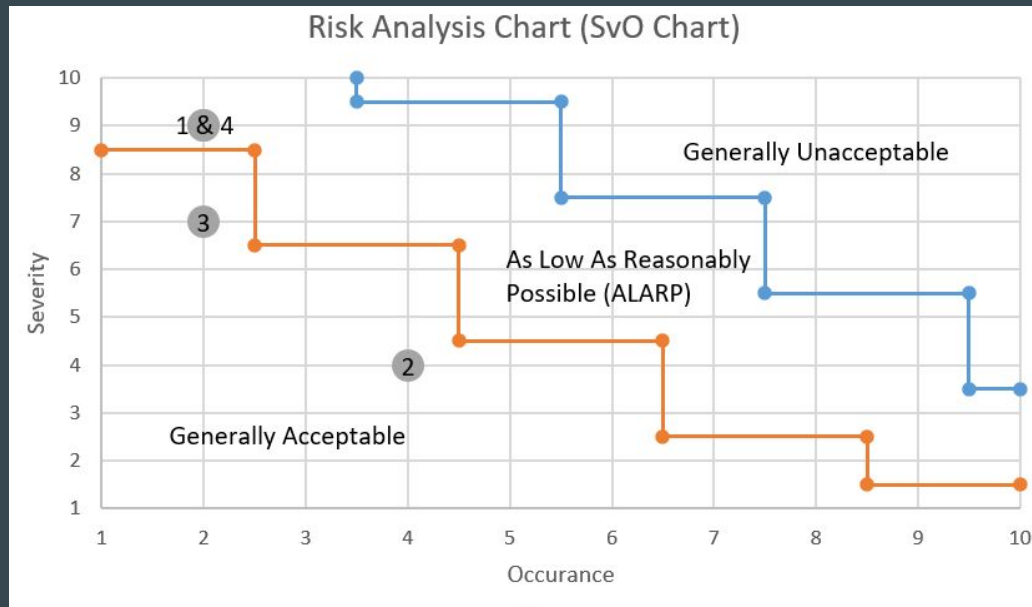
After performing an optimization analysis, the smallest dimensions of the dispenser are: $x = y = 3.9 \text{ in}$

And the force required to hold this weight on the catheter: $F_{\text{Grip}} = FN = .11 \text{ lb}$

Which results in a decreased flow rate of $.001 \text{ mL/min}$, which is negligible in the clinical setting

SvO

No.	(S)	(O)	RPN	Class
1 Toxic Disinfectant		9	2	72 ALARP
2 Failure to secure position		4	4	16 GA
3 Antimicrobial agent elute		7	2	14 GA
4 Low biocompatibility		9	2	72 ALARP



Prototype Cost

Item	Supplier	Description	Justification	Total Cost
3D Printing Services	ThinkBox	Used to build the sterilization tab housing	Necessary due to the complicated shape of housing	\$20 estimation About 130 grams of material
Isopropyl alcohol	Belle Chemical	32 oz 99% medical grade alcohol	Necessary to achieve sterilization function	\$13.99
Bubble wrap	Scotch	12" x 25', ½" bubbles	Necessary to make the tabs to be dispensed	\$13.79
Syringe	Shaoton	20 2.5ml syringes with 23Ga needle	Necessary to insert sterilant into tabs	\$12.90
Liquid skin bandage	Amerisource Bergen Corp	.3 oz bottle antiseptic liquid bandage	Necessary for sealing over the injection point of each tab	\$6.94

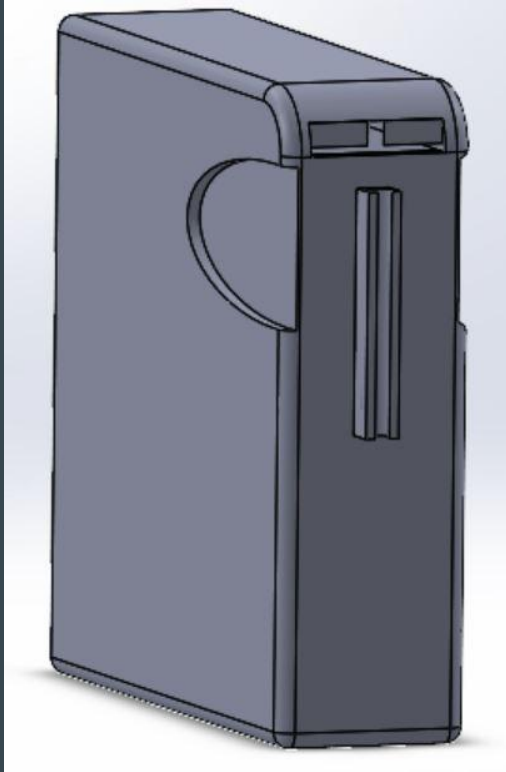
Table 1: List of Proposed Items

The total cost for our prototype: ~\$60

Reusable dispenser: \$10 estimation

Pack of 50 sterilant: \$0.04

Prototype



Resources

- Dr. James Reynolds
- Stephanie Weidenbecher
- Dr. Jim Rowbottom
- Ludwin Mora
- Ryan Crisp
- NCAI Application Grant Body (2015)
- Sarah Carney
- Colin Drummond
- Matthew Williams
- Research Review

References

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- NCAI Application PS System Grant Body October 2015

Thank you

We are excited to hear from you at the Q&A session