

# IMPROVEMENTS IN PREOPERATIVE HAIR REMOVAL

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Client: Dr. Gregory Hartig

Advisor: Dr. Naomi Chesler



# Outline



- Introduction
  - Need for Surgical Hair Removal
  - Current Methods
  - Problem Statement & PDS Summary
- Designs
  - Design Options
  - Design Matrix
- Future Work
- Acknowledgements

# Need for Hair Removal



- Allows later removal of skin less painful
- Allows later removal of wound dressings less painful
- Makes surgical procedures easier because hair not in way

Siddique, M. S., V. Matai, and J. C. Sutcliffe. "The Preoperative Skin Shave in Neurosurgery: Is it Justified?" *British journal of neurosurgery* 12.2 (1998): 131,131-135. ProQuest Research Library. Web. 16 Oct. 2011.

# Current Methods

## □ Three types:

### 1. Electric Clipper



[www.3m.com/products](http://www.3m.com/products)

### 2. Razors



[www.moonbattery.com](http://www.moonbattery.com)

### 3. Depilatory creams



[www.nair.au.com](http://www.nair.au.com)

Kjonniksen, I., et al. "Preoperative Hair Removal--a Systematic Literature Review." *Association of Operating Room Nurses.AORN Journal* 75.5 (2002): 928,928-38, 940. ProQuest Research Library. Web. 16 Oct. 2011.

# Electric Clipper

- Skin Integrity
  - ▣ Skin condition preserved since hair cut above surface
  - ▣ Less likely to damage skin
- Hair residue
  - ▣ Length approximately 0.03 in
- Hair Removal Time
  - ▣ Less than 5 min for knee to groin
  - ▣ Up to 45 min for neck to ankle



At 117X magnification  
[www.3M.com/healthcare](http://www.3M.com/healthcare)

Alexander, J.W., et. al., "The Influence of Hair Removal Methods on Wound Infections," *Archives of Surgery*, Vol. 118, March 1983.

Jepsen, O.B.; Bruttomesso, K.A., "The Effectiveness of Skin Preparations," *AORN Journal*, September 1992, Vol. 58, No. 1.

# Razor

- Skin Integrity
  - ▣ Skin susceptible to damage through cuts, nicks, scrapes
- Hair Residue
  - ▣ Hair cut at or below surface
  - ▣ Sharp hair follicles may cause irritation when regrowing
- Hair removal time
  - ▣ Similar to clippers



At 117X magnification  
[www.3M.com/healthcare](http://www.3M.com/healthcare)

Alexander, J.W., et. al., "The Influence of Hair Removal Methods on Wound Infections," *Archives of Surgery*, Vol. 118, March 1983.

Jepsen, O.B.; Bruttomesso, K.A., "The Effectiveness of Skin Preparations," *AORN Journal*, September 1992, Vol. 58, No. 1.

# Depilatory

- Skin Integrity
  - ▣ may cause allergic reaction
- Hair Residue
  - ▣ Dissolved at or below skin surface
- Hair removal time
  - ▣ Approximately 20 min including application & cleanup
  - ▣ May become longer with incomplete hair removal



At 117X magnification  
[www.3M.com/healthcare](http://www.3M.com/healthcare)

Alexander, J.W., et. al., "The Influence of Hair Removal Methods on Wound Infections," *Archives of Surgery*, Vol. 118, March 1983.

Jepsen, O.B.; Bruttomesso, K.A., "The Effectiveness of Skin Preparations," *AORN Journal*, September 1992, Vol. 58, No. 1.

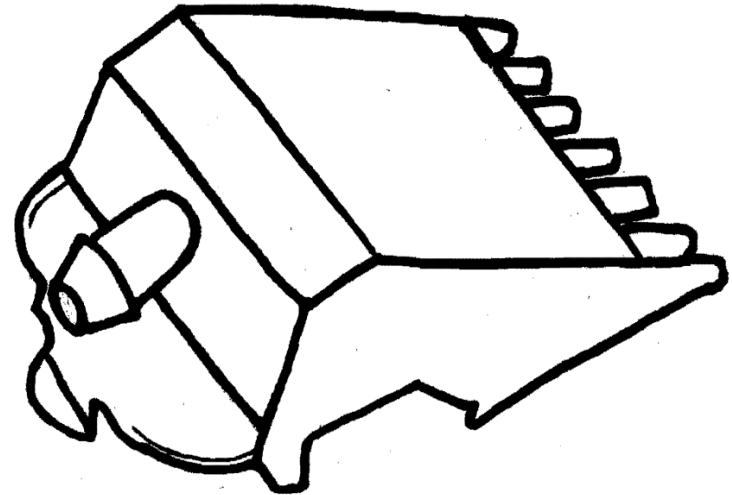
# Problem Statement & PDS Summary

- Client: Dr. Greg Hartig, ENT & Plastic Surgeon at UW Hospital
- Suction device should be:
  - Simple and time efficient
  - Hypoallergenic
  - Non-damaging to the skin
  - Compatible with preexisting suction in all ORs and/or suction devices (-200 mmHg)
  - Capable of preventing loose hair from contaminating surgical site
  - Universal for different hair types/surgeries



# Design 1: Trimmer Design

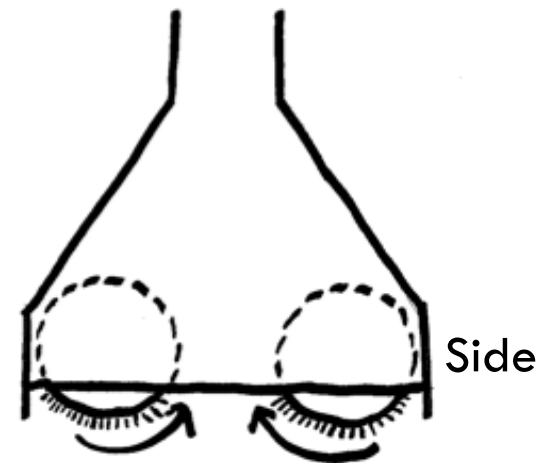
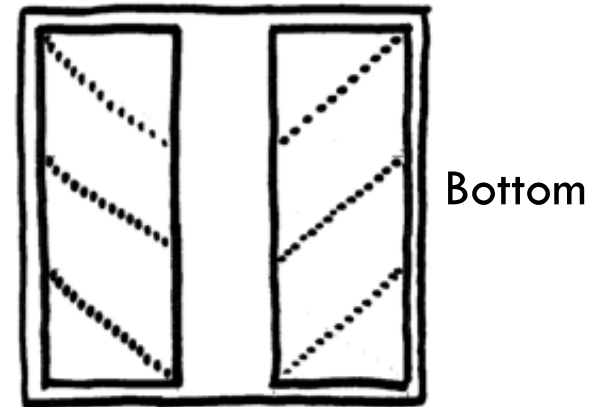
- ❑ Snaps directly on head of clipper, catch hair immediately after cut
- ❑ Hair trap: screen before suction tubing
- ❑ Small size: will not reduce suction, only hold limited of amount of hair
- ❑ Inexpensive



Created by Kimberly Maciolek

# Design 2: Brushes Design

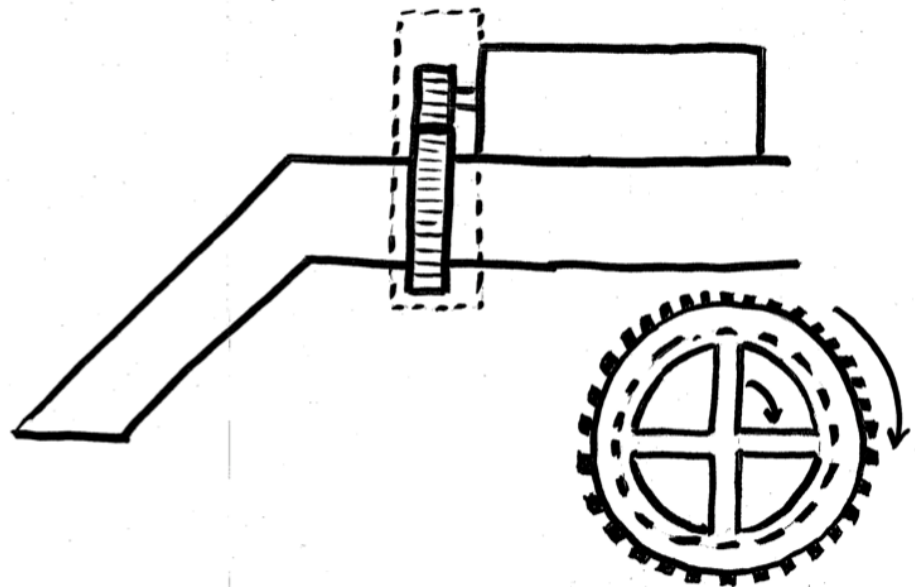
- Used primarily to pick up hair
- 2 rotating bristled cylinders move hair into center suction tube
- Adjustable brushes according to hair type/skin type
- Pivoting handle for easy maneuvering



Created by Cody Williams

# Design 3: Fan/Blade Design

- 4 Pieces to the design
- Reusable electric motor
- Gear system
- No need to trap the hair



Created by Cody Williams

# Design Matrix

<b>Categories</b>	<b>Weight</b>	<b>Trimmer Design</b>	<b>Brushes Design</b>	<b>Fan/Blade Design</b>
Cost	30%	4	3	2
Safety	25%	4	2	3
Efficiency	20%	4	4	5
Universality	15%	5	3	3
Ergonomics	10%	4	2	4
<b>Total:</b>	<b>100%</b>	<b>4.15</b>	<b>3.2</b>	<b>2.85</b>

# Future Work



- Focus on Trimmer design
- Construction of prototypes
- Small design variations to improve efficiency, ergonomics
  - ▣ Test different hair traps
  - ▣ Move suction attachment
- Testing on loose synthetic hair, stuffed animals or fur pelts
- 3D printing

# Acknowledgements



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- Dr. Naomi Chesler, advisor



Any Questions?