# Towards Robot-Assisted Wound Care: An Ethnographic Study of Nursing Practices and Robotic Design Recommendations

Zulekha Karachiwalla[1] Annika Srinivasan[2] Ellen Lee[1] Andrew Dierkes[3] Zackory Erickson[1] Henny Admoni[1]

Carnegie Mellon University[1], University of Illinois Urbana Champaign[2] and University of Pittsburgh[3]

## Motivation

**Gap:** No foundational understanding of the needs of wound care through robotics

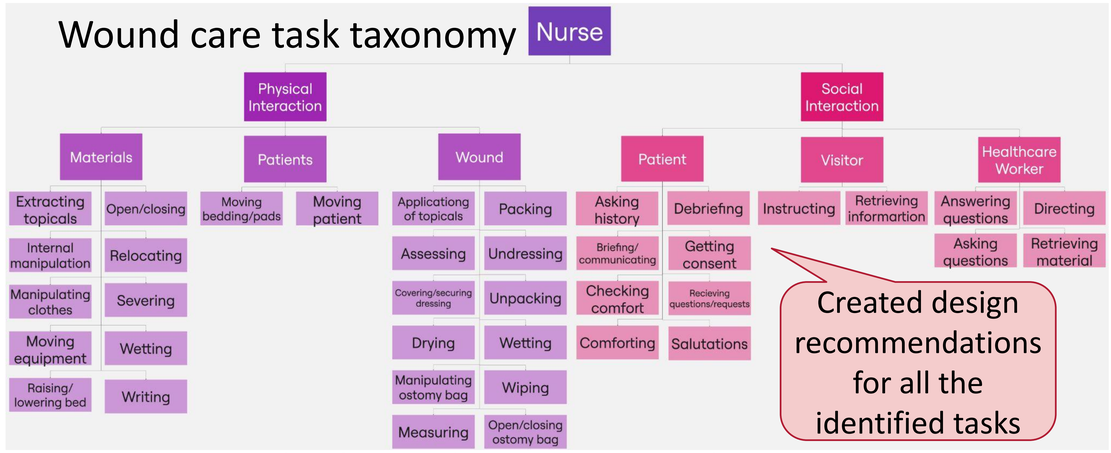
1) **Identify** areas to support nurses in wound care
2) **Develop** design recommendations for wound care robots
3) **Design** and **evaluate** wound dressing robot

## Methods

1. Observational study: Understand how nurses conduct wound care and identify supportive tasks for robots.
2. Analyze observational data and extract design recommendations for wound care robots
3. Utilize design recommendations in a case study of developing the first wound dressing robot

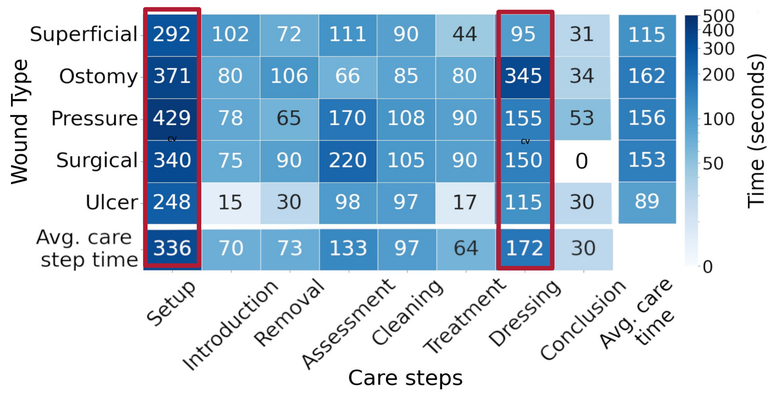
## Results

### Wound care task taxonomy




Created design recommendations for all the identified tasks

### Average time for wound care step per wound (Hospital setting)




Use recs to develop wound dressing robot

### Observational notes

*"Nurse layers pad on ankle"*

*"Nurse places gauze over leg"*

*"Smooths down edges"*

*"Nurse lightly presses pad on wound to ensure stick"*

*"Nurse wraps around the ankle over the pad"*

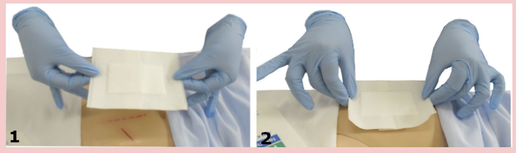
*"Patient says its too tight, N unwraps ace wrap"*

### Dressing Robot Design Recommendations

| Robotic Capability | Capability for Covering and Securing |
|---|---|
| **Grasp Type** | Precision grasp |
| **Number of Contact Regions** | 4 fingertips and thumb |
| **Need for Bimanual Manipulation** | Yes |
| **Wound Manipulation** | On/over wound |
| **Work Area for Manipulation** | Edge of material |
| **Mobile Manipulation** | No |
| **Common Motions** | In and out of plane, along plane |

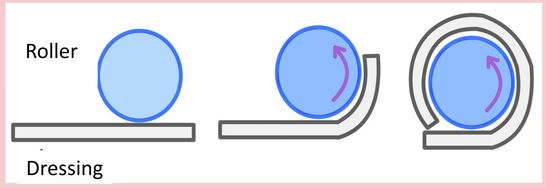
## Case study: Development of wound dressing robot

### Manipulating gauze

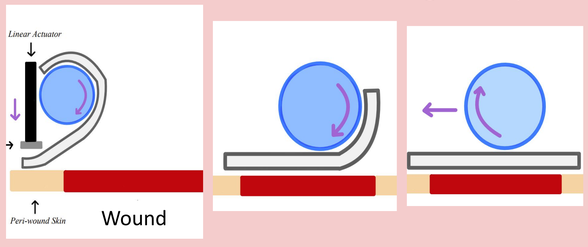



Pick (from material edge) and Place (on/over the wound)


Non-prehensile pressing (along the edge of gauze)

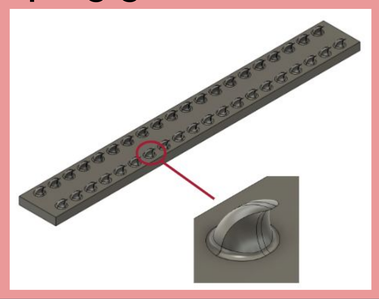



Actuated roller the lifts gauze up

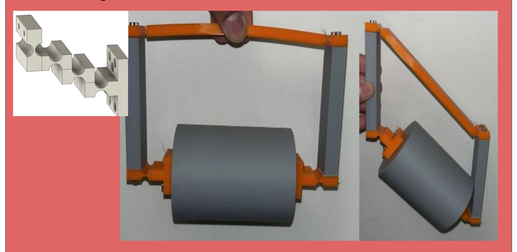



Actuated roller to place gauze over wound

### Grasping gauze

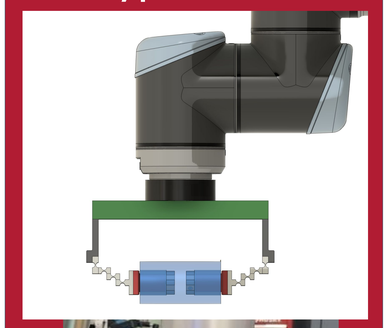


### Compliance



Added flexible hinges (in orange) to comply on human body

### Prototype



## Future Work

- Improve compliance of robot
- Workshop the design with nurses
- Improve design from nurse feedback

## Acknowledgement

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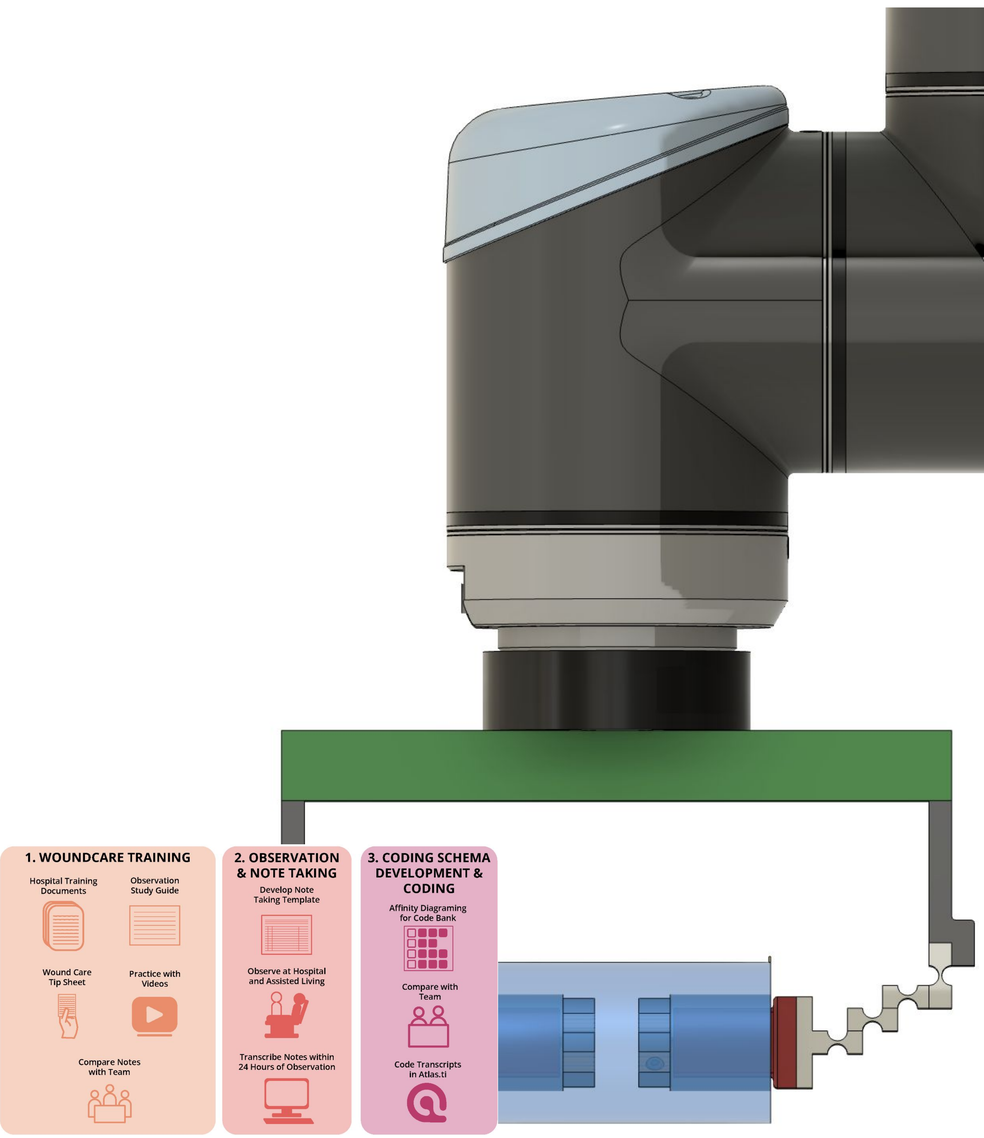
## Contact

zkarachi@andrew.cmu.edu

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