

Investigating Nurse, Patient, and Healthcare Partner Needs for Assistive Robots

BINGHAMTON
UNIVERSITY
STATE UNIVERSITY OF NEW YORK

Mallak Alqaisi, Amoolya Varghese, Lexine Mae Egypto



INTRODUCTION

- **Nursing burnout is at critical levels:** Hospitals, especially in the U.S., are struggling to retain enough nurses as stress, exhaustion, and high turnover continue to rise—made worse by the pandemic.
- **Hospitals turning to robots:** To ease the load on staff, many facilities have started using collaborative robots (cobots) for basic tasks like supply delivery and medication transport (Papadopoulos et al., 2020).
- **Effectiveness still unproven:** Despite growing use, popular robots like Moxi and TUG haven't been backed by strong evidence. Many frontline staff report they're more trouble than help (Pfeiffer et al., 2022)
- **Robots miss the mark:** Most current systems don't match how nurses actually work. Without practical input from users, these tools often fall flat in real-world settings.

SIGNIFICANCE AND RATIONALE

- **Our solution co-designed robotic functionality:** This project uses human-centered design principles to build robotic software that solves real, validated nursing problems. Early design interviews with nurses identified two priority areas:
 1. **Support for isolation room workflows** (e.g., reducing unnecessary room entry).
 2. **Assisting nurses through smart delivery** of gear equipment using natural language, minimizing interruptions and manual trips.
- **Technical implementation:** The solution will be deployed first on the Stretch 3 robot with modular code that allows future integration with other robot types, ensuring scalability and long-term applicability.

IMPLICATIONS OF POTENTIAL RESULTS

- **If successful, nurse workload will be meaningfully reduced**, as robotic modules take over routine tasks like supply delivery and support in isolation rooms—freeing nurses to focus more on direct patient care.
- **We expect improved nurse satisfaction and retention**, as reducing unnecessary physical and mental strain can help lower burnout and increase long-term commitment to the profession.
- **Success may also open the door to wider use and continued development**, encouraging healthcare providers and industry partners to expand robot capabilities into other high-need areas based on demonstrated impact and practical value.

REFERENCES

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3. Pfeiffer, J. (2022). Barriers to patients' acceptance of social care interventions in clinic settings - american journal of preventive medicine. [https://www.ajpmonline.org/article/S0749-3797\(22\)00250-1/fulltext](https://www.ajpmonline.org/article/S0749-3797(22)00250-1/fulltext)

RESEARCH QUESTION

How can human-centered design, informed by stakeholder input, guide code and functionality adaptations of Stretch 3 to meet the practical needs of nurses, patients, and healthcare partners in clinical care settings?



Figure 1: Visual depiction of the Stretch 3 robot

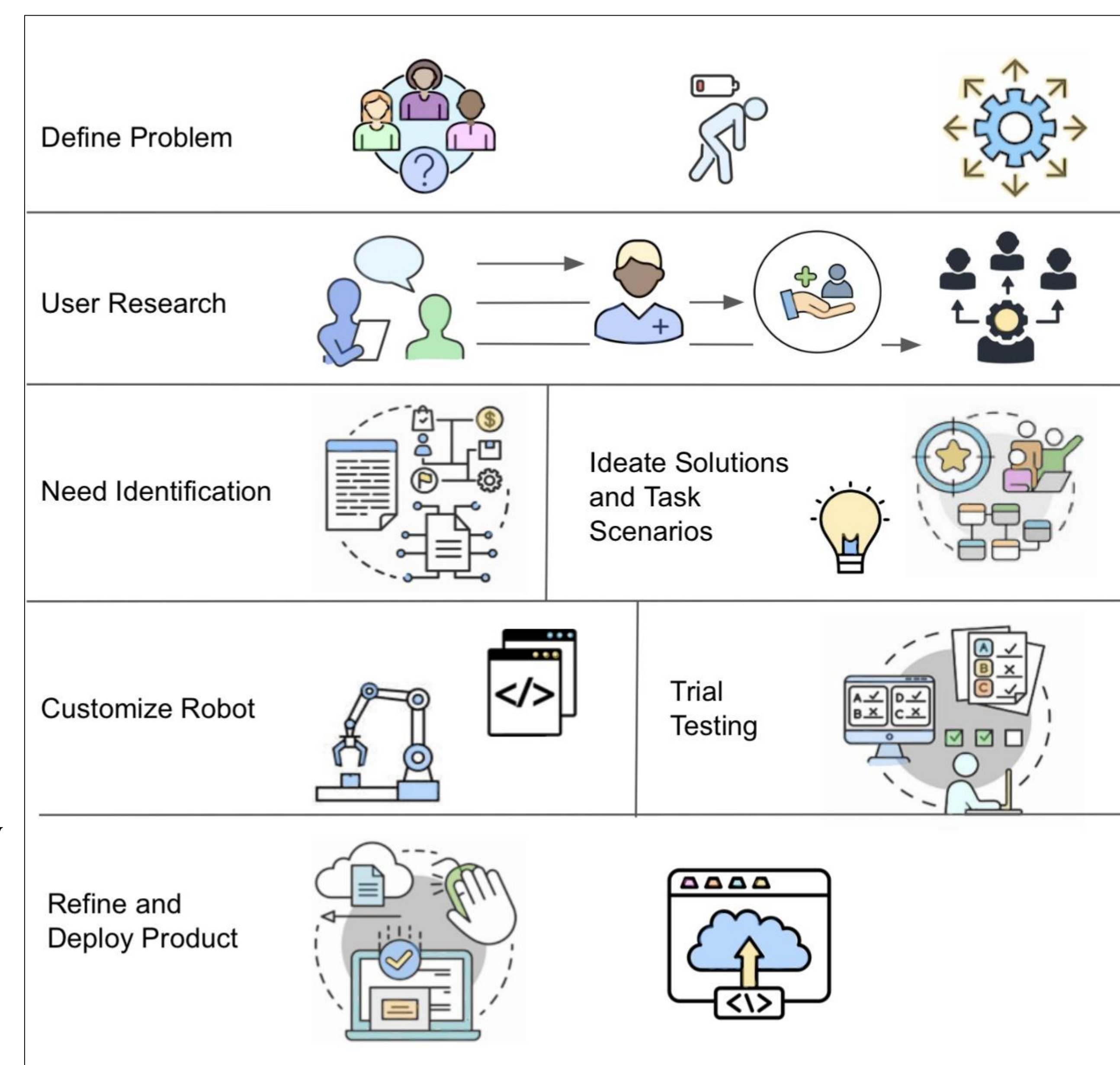


Figure 2: Human-Centered Design Process for Customizing an Assistive Healthcare Robot

OBJECTIVE & METHODOLOGY

- **Aim of the project:** To design, develop, and evaluate nurse-assistive robotic modules using human-centered design principles, targeting specific high-need workflows in hospitals—such as isolation room support and supply delivery—in order to reduce nurse workload, improve workflow efficiency, and enhance staff satisfaction
- **Methodology: Human-Centered Robotic Development Using Stretch 3 Platform:**
 1. Interviews were conducted to acquire information from healthcare workers and other design partners (i.e., nurses, nurse practitioners, administration, patients, etc.). Study is ongoing. Currently, 7 interviews have been conducted and data collection is ongoing.
 2. Healthcare use cases are being developed using the Stretch 3 robot, using Python and ROS (Robot Operating System) on the Stretch 3 robot.

PRELIMINARY RESULTS

- **Nurses desire help** with repetitive and disruptive work, which can undermine their ability to be present with patients and complete their work safely.
 - **Quote:** *“[To overcome time-consuming repetitive work] I took shortcuts, honestly... this is where you see people skipping washing their hands and things like that” (Nurse participant)*
- **Technology can be a double-edged sword**, sometimes making nursing work easier, but adding interruption or unintended consequences
 - **Quote:** *“We had a communication device called a ‘Vocera’... It was also harmful because it was easier. It was nice when you wanted to find someone because you can just call them, say their name and it would go to them. It was also annoying when you were being interrupted.” (Nurse participant)*
 - **Quote:** *“I watched the progression of the virtual sitter it was not a good experience... So the person is virtually watching and can alert the nursing staff and someone can rush in there and hopefully prevent a fall... by the time a human gets in there to actually physically help or calm or soothe or whatever, the problem has already happened.” (Nurse Practitioner participant)*
- **Our robots could assist with telepresence in “contact precaution” rooms**, in which patients are kept isolated to prevent infection, either because they are contagious or are immunocompromised.
- **Our robots may also be valuable to nurses** if they can reduce interruptions to workflow, automate simple tasks that do not require the nurses' expertise, or function as a “personal assistant” to the nurse; however, designers must be careful not to dehumanize healthcare for patients—a top concern for nurses.

FUTURE DIRECTIONS

- **Design of experiments for simulated healthcare environments**
- **Testing the robot within real hospital environments** to assess effectiveness, nurse satisfaction, and workflow impact.
- **Enhance system intelligence:** Future iterations may incorporate smarter task scheduling, basic decision-making, and context awareness to improve how robots respond to dynamic clinical environments.
- **Commercial Partnerships:** Collaborate with robotics companies (e.g., Hello Robot, maker of Stretch 3) to bring tested modules to market, focusing on affordability, reliability, and ease of integration.

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