

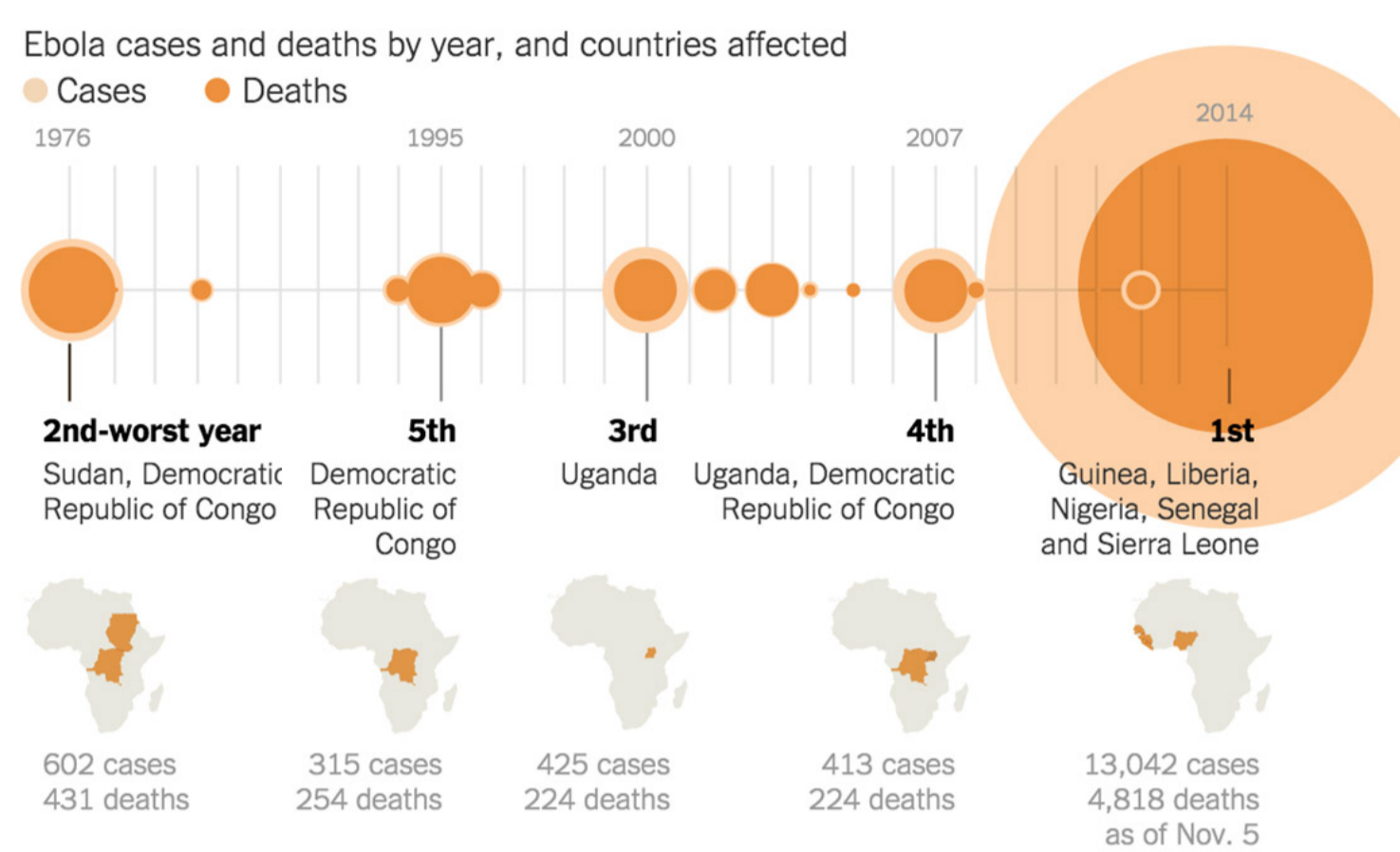
# Cyber Physical Systems for Advanced Response to Epidemics (CARE)



Taşkın Padır (PI), Sonia Chernova, Jeanine Skorinko, Michael Gennert

Deliver a safe, reliable, and intuitive emergency treatment unit to facilitate a higher degree of safety and situational awareness for medical staff, leading to an increased level of patient care during an epidemic outbreak in an unprepared, underdeveloped, or disaster stricken area.

## 2014 West Africa Ebola Outbreak



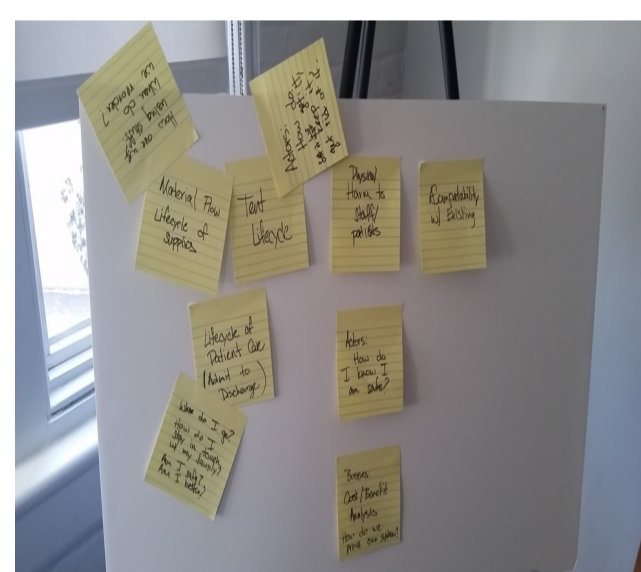
Source: World Health Organization



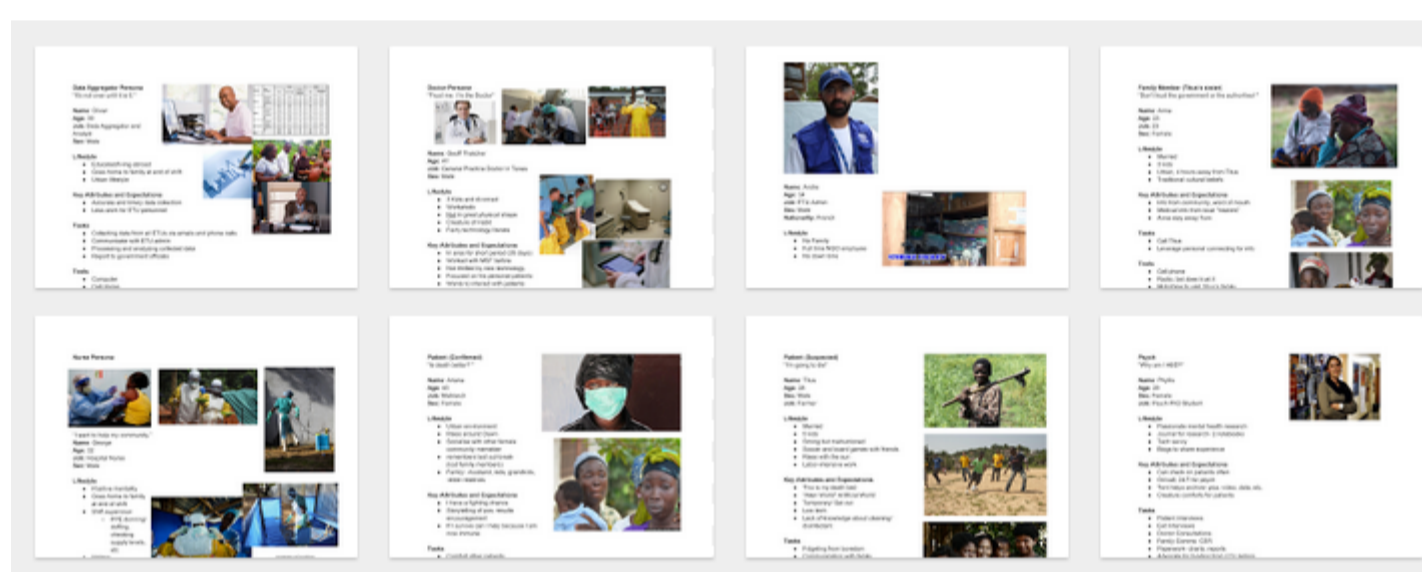
These images are courtesy of Mary Beth Heffernan.

## Human-Centered Design

### 1 - Define the design challenge



### 2 - Generate stakeholder personas



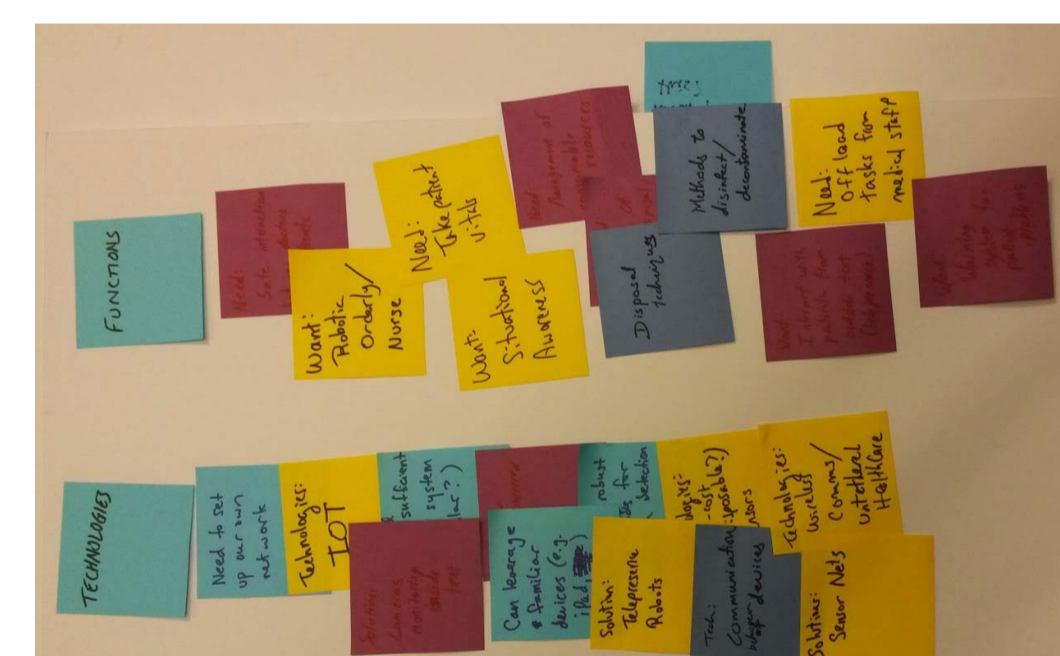
Data Aggregator  
Doctor  
ETU Admin  
Family member

Nurse  
Patient (confirmed)  
Patient (suspected)  
Psychologist

### 3 - Areas of Opportunity and Ideation

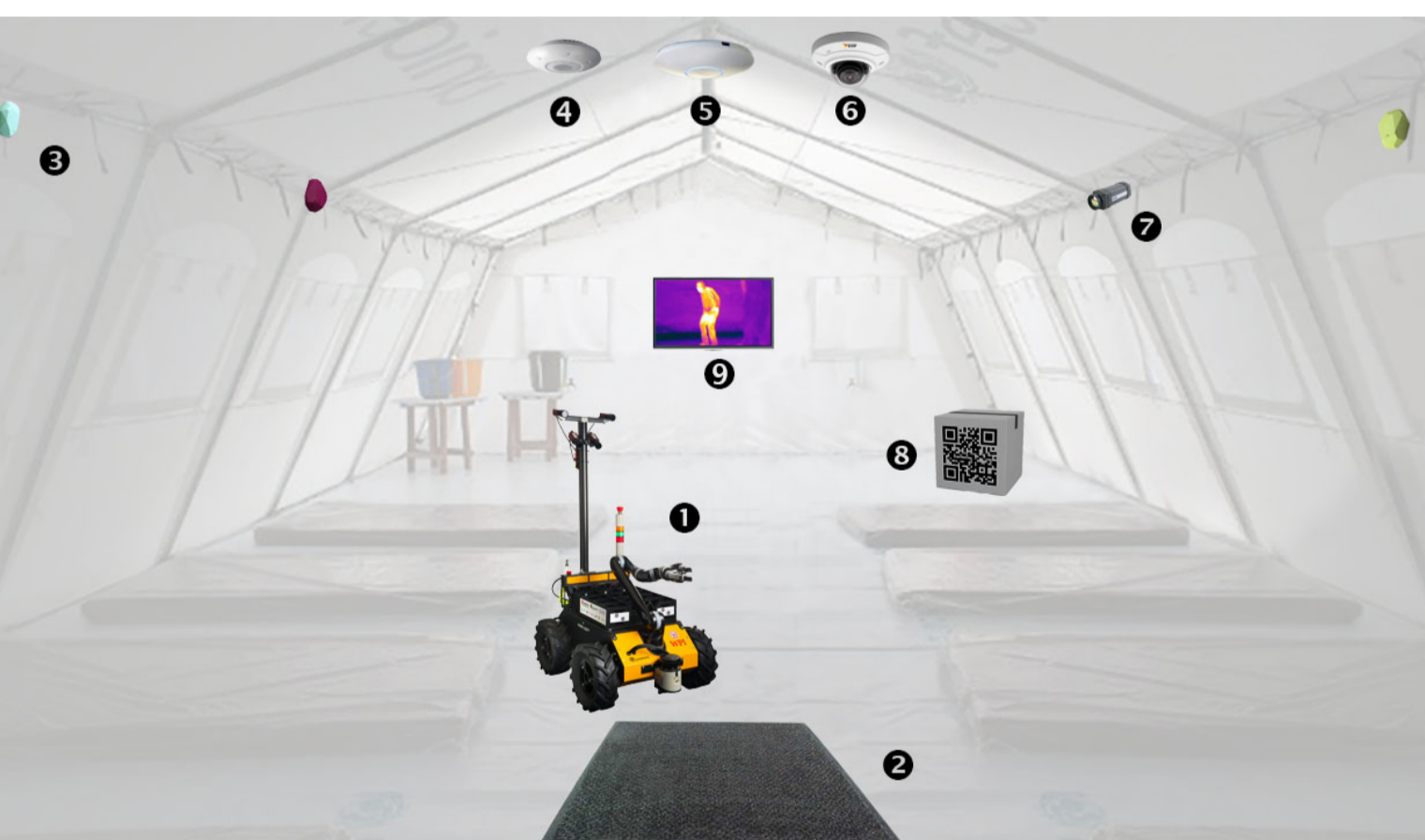
Communication  
Records Keeping  
Stress and Anxiety  
Safety  
Resources

Patient Care  
Staff  
Trust  
Isolation  
Logistics



## Concept

## Testbed Implementation

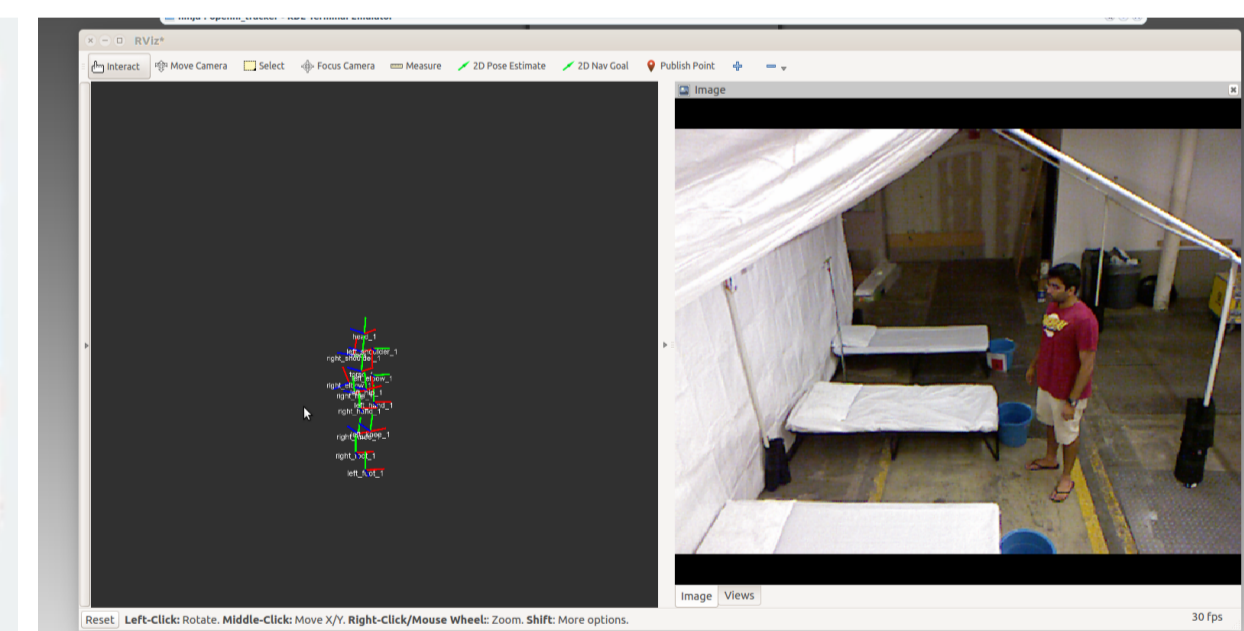


### Example Modules of Next Gen Ebola Treatment Units

1. Teleoperated robot for logistics and decontamination
2. Pressure sensitive mat for occupancy awareness
3. Bluetooth low-energy localization beacons
4. Microwave and infrared motion sensors
5. Wireless communication network
6. Pan/tilt/zoom camera for remote observation
7. Infrared camera for remote temperature monitoring
8. Barcoded and tracked equipment and consumables
9. Telemedicine interface for no-contact interactions with both staff and family



Camera views of patient areas enabling remote monitoring of patient movements, activities, and general wellbeing.



Skeleton tracking algorithms allow autonomous detection of anomalous patient activities.



Ebola treatment unit tent testbed allows students to quickly prototype, implement, and test ideas with stakeholders.



Teleoperated robots offload decontamination and material handling tasks from doctors and nurses.