

# Head-Worn Displays in the Prehospital Environment

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# Use Cases for Head Worn Displays in Emergency Medical Services?

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Participatory Design [Simonsen and Robertson, 2013]

## Related research

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### **Benefits and challenges of HWD use in healthcare environments**

- Applications in a variety of medical fields: anaesthesiology, surgery, intensive care, training
- Primary focus in prehospital care on mass casualty incidents and triage [Follmann et al., 2019]
- Continuous and hands-free access to data [Sanderson et al., 2008]
- Indications for improved situation awareness in some settings [Schlosser et al., 2019]
- Mixed feedback from patients and colleagues [Grundgeiger et al., Unpublished manuscript]
- Technical challenges: weight and comfort, battery, camera angle [Nakhla et al., 2017]

# Design - Understanding Work and Developing Support Systems

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## **Interviews and observations**

- 5 interviews with clinical coordinators
- 8 situated interviews and observations
- 2 observations of full day high fidelity training

## **Workshops**

- 7 workshops with a total of 10 staff
- Duration of 45-100 minutes
- Video and audio recorded

# Design – Development of 17 Initial Use Cases

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Vital sign monitoring



Documentation



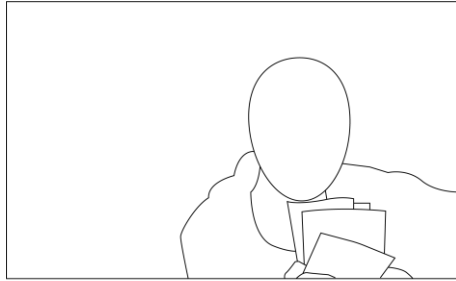
Training



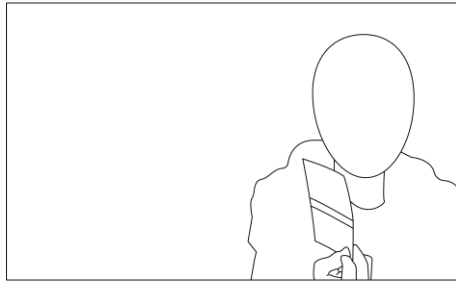
Ultrasound

# Design – Remote Support System

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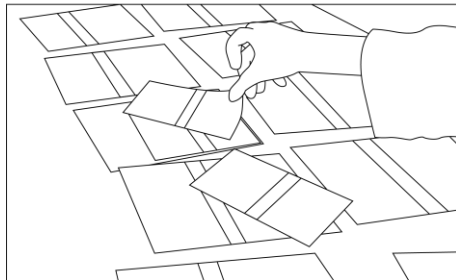


“I think the filming and documentation is also pretty good. Just having the feedback to be like: ‘Hey, you’ve landed here? Where can the other helicopter land? How is everyone going to get out?’



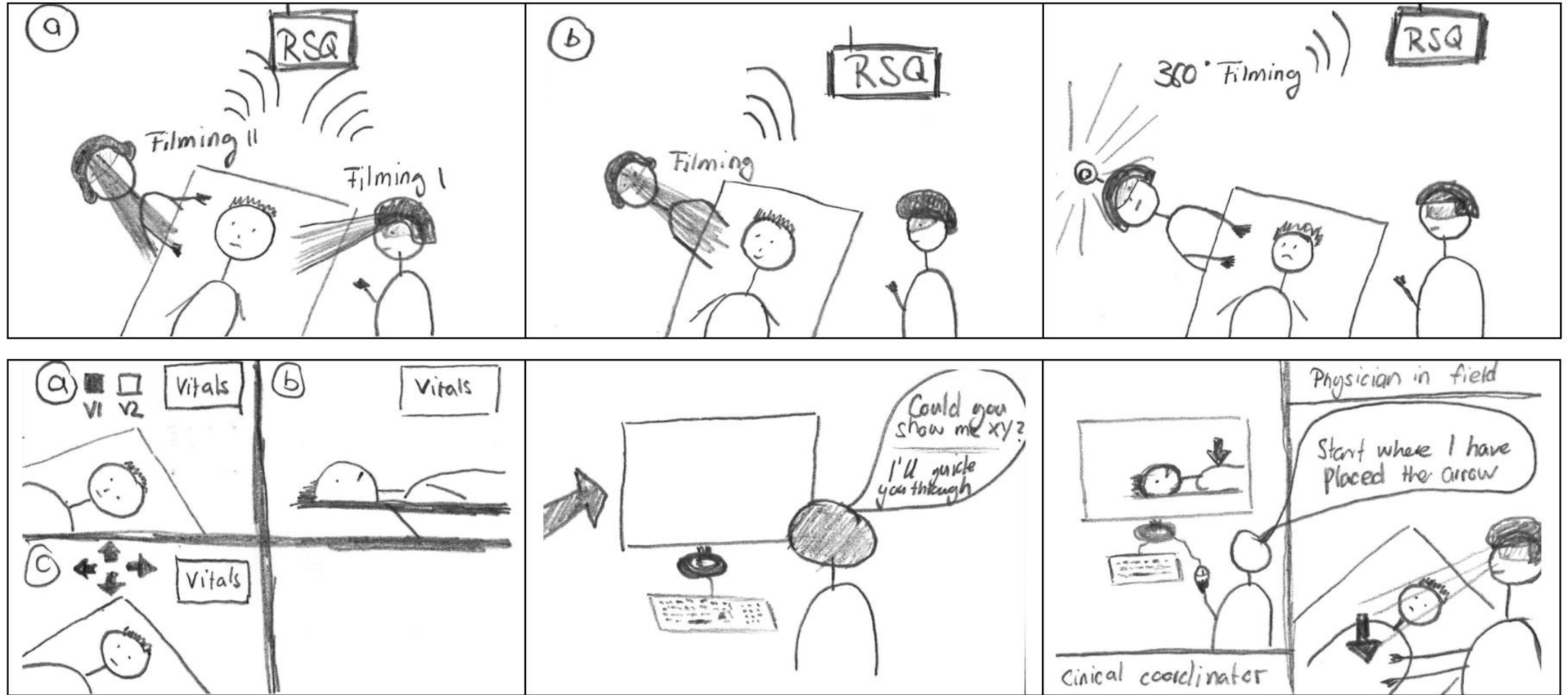
Because the problem is, once you land the helicopter on a road, it means no one else can go in and out. So, it's, it's all those kind of components for them [the clinical coordinators] that they think about and that can be problematic. I might be walking around, but I might not realize something is there, because that's not what I'm paying attention to.

So, it [a video feed from the HWD] might be useful for them.”



P2, Workshop 2

# Design – Remote Support System



# Preliminary Evaluation – Method

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## **Simulated placement of a MAC line (standardised instructions)**

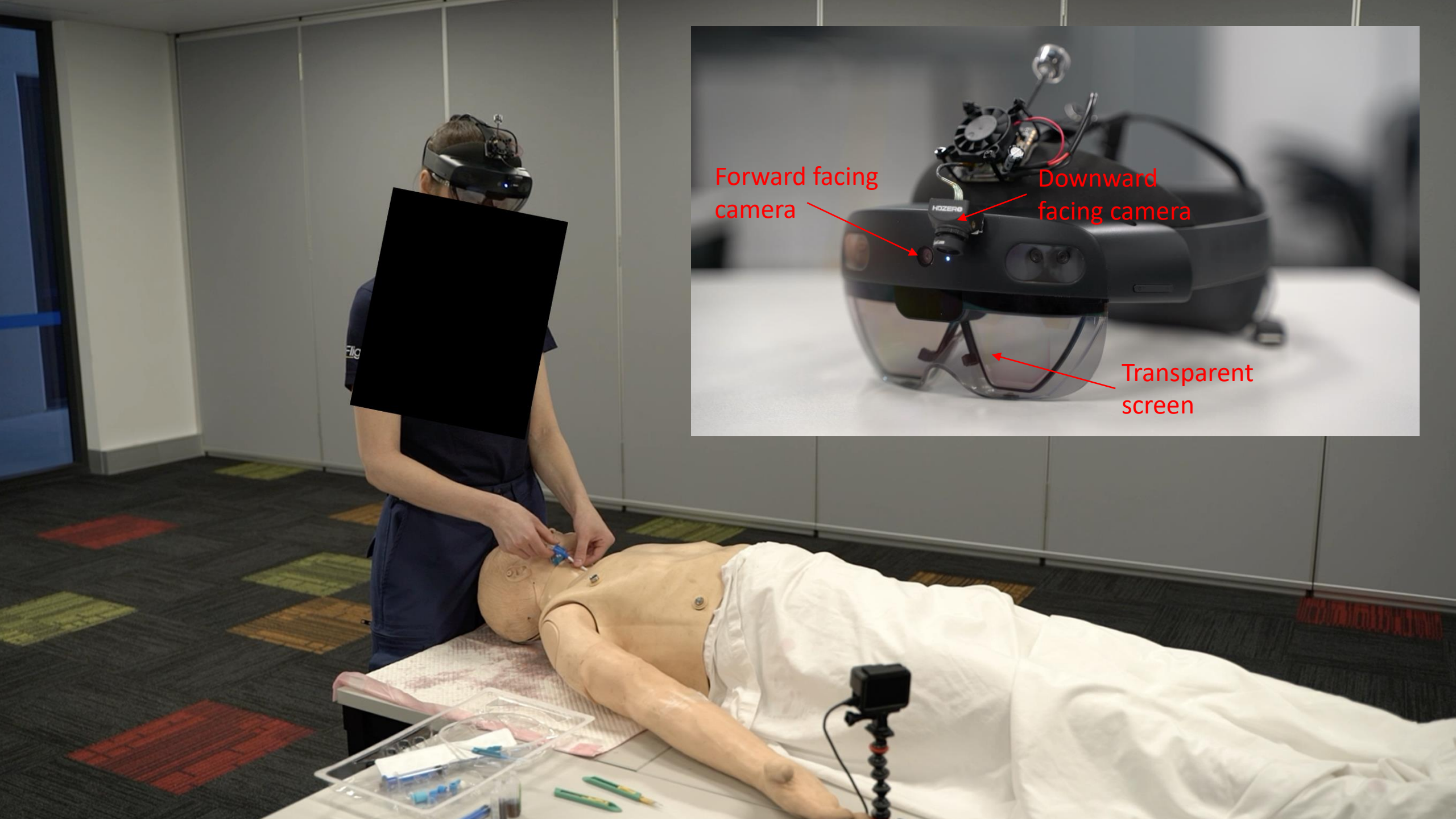
### **Experimental design**

- Between subjects design with randomised assignment: Support via HWD vs phone
- Participation of 23 physicians (emergency, anaesthesiology, intensive care)

### **Dependent variables**

- Clinical measures
  - Duration
  - Procedure adherence and quality
- Collaboration measures
  - Communication volume
  - Communication balance
  - Responsiveness
  - Spontaneous information sharing





Forward facing camera

Downward facing camera

Transparent screen



## Participants' comments

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"If you were a junior doctor in the middle of nowhere, and you have never done a procedure like this before, this is the next best thing of having the person next to you doing it [the instructing]" –P23

"When I looked up, I saw the photos of the instructions. They were quite useful to go step by step [through the procedure during the initial briefing]. During the actual procedure, I didn't look up so much at it but having the [auditory] instructions was quite nice [at that stage]" –P20

"I really appreciated that you could see what I could see. So that when I would say: 'Is it this one [piece of equipment]?' And you are obviously seeing [what I am referring to]. That was the most useful thing" –P3

"If I am on the side of the road doing a primary, I feel that I need all of my [peripheral] vision. And [with the HWD] taking that away from me, I felt like I was missing my senses" –P11

# Conclusion

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- 17 use cases developed in a series of workshops using participatory design
- Supporting remote collaboration with HWDs in the EMS context looks very promising
- More detailed analysis of data in future work

