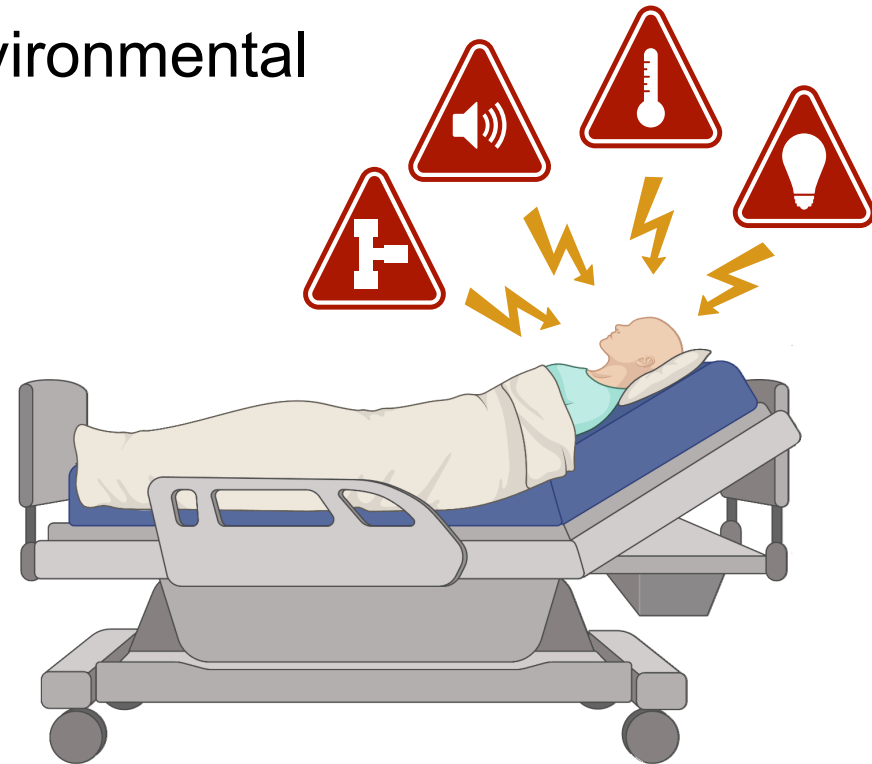




Need

- Traumatic brain injury is a leading cause of death and disability in the US, resulting in an estimated 288,000 hospitalizations, most of which require neurocritical care [1]
- **'Contextual factors'** include environmental conditions, patient interventions, and intracranial pressure draining stopcock usage
 - These factors may impact patient outcomes, but a lack of quantitative data exists to fully define their impact [2,3,4]



Design Inputs

Key Constraints

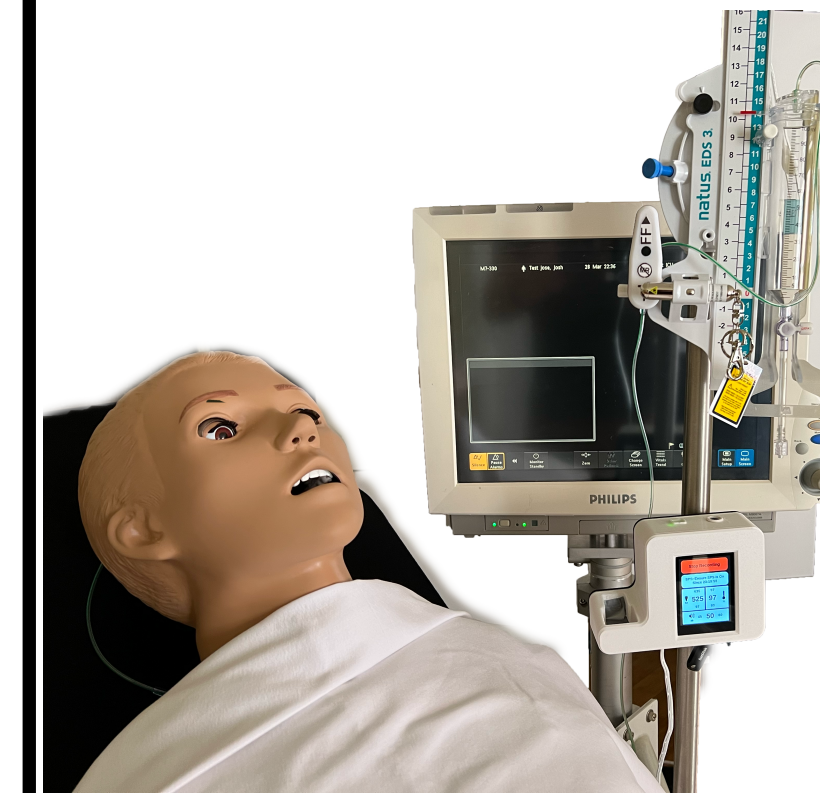
- Disinfection by EPA certified solutions
- No emissions above background level
- Labeled MR unsafe

Requirements

- **Light** 0-5000lux
- **Sound** 20Hz-20kHz
- **Temp** 60-90°F
- **SPS** 4 positions
- **Power** 18 days

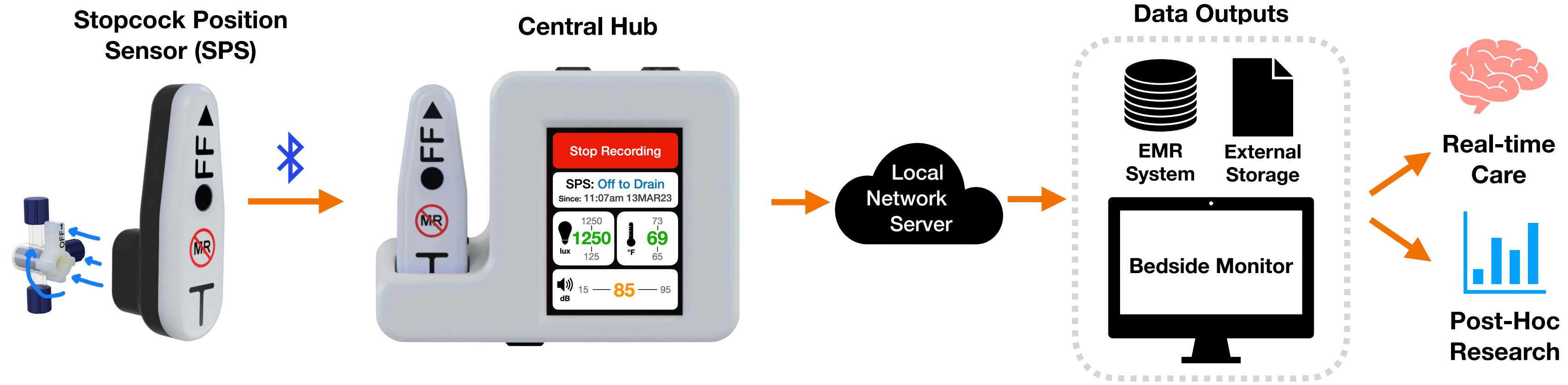
Verification Testing

- Each hub sensor underwent testing to ensure its requirement was met
- The SPS was further evaluated to ensure function



Test	Outcome
Light	✓
Sound	~
Temp	✓
SPS	✓
Power	✗

Solution



- Tracks EVD stopcock position over time
- Automated Light, Sound, Temperature Recording
- Intuitive Touchscreen User Interface
- SPS Charging Dock
- Annotated data enables machine learning research
- Clinical display enables real-time intervention by clinicians

Deployment

- Currently being tested at UT Southwestern Medical Center in an IRB approved study
 - Initial feedback from clinicians is positive
- Allows for better informed treatment decisions, potentially improving patient outcomes

Future Work

- Optimization of SPS battery-life
- Additional sensing modalities
 - Tracking of patient interventions
- Enhanced integration with hospital data systems

[1] Harder, Tyler J, et al. Journal of Neurotrauma, 2023, <https://doi.org/10.1089/neu.2022.0433>. [2] Liu, X., et al., (2020). Journal of Neuroscience Nursing <https://doi.org/10.1097/jnn.0000000000000048> [3] Olson, D. M., et al., (2013). American journal of critical care 10.4037/ajcc20 [4] Thielen et al., (2022). Journal of Neuropsychology. <https://doi.org/10.1111/jnp.12284>.

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