


## Providing Access With A Motion Sensing Switch: The noddle® min-mo

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### Speaker Disclosures

**Richard Hurtig, Ph.D.** is the Chief Scientific Officer of Voxello. He is also Professor Emeritus in the Department of Communication Sciences & Disorders at The University of Iowa. He also directs the UI Assistive Devices Laboratory.

Richard Hurtig has no Non-Financial Relationships to disclose

Richard Hurtig is a Founder of Voxello and has a financial stake in the company.



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## Presentation Agenda

1. Learning outcomes
2. Role of access & communication in patient-provider communication
3. Impact of barriers to communication
4. Identifying gestures and populations who would benefit from a motion sensing switch
5. Smart Switch design
6. Description of the min-mo and how it recognizes gestures
7. Clinical impact of providing access & communication tool
8. Next Steps
9. Q & A



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## Learning Objectives



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- Identify three types of voluntary gestures that can be detected using a motion detecting switch.
- Describe how a gesture counting algorithm can allow access to two or more devices.
- Identify at least three populations who could benefit from using a motion sensing switch



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## Access & Communication - 1

- Everyone has the “right” to be able to summon help and effectively communicate with caregivers
- In the hospital or other care facilities this means
  - Access to the nurse call system
  - Ability to express needs and participate in care



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## Access & Communication - 2

- Communication barriers put patients at risk of experiencing preventable adverse medical events. The barriers result from:
  - Inability to access the nurse call
  - Inability to use spoken or written language
  - Inability to understand caregivers
    - Limited English Proficiency
    - Language impairment
    - Dementia



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## How Big Is The Problem?

- Of the 35 million individuals hospitalized in the US, the percent who can't use existing nurse call systems and/or can't speak:
  - 46% of ICU Patients
  - 11% of non-ICU Patients
- 9% of US Residents have limited English proficiency
- Hospitalized patients who have dementia:
  - 5.1 million Americans are living with Alzheimer's
  - 2X as many hospital stays for Medicare patients with dementia



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## The Cost Of Adverse Events

- Number and current cost associated with treating patients who experience preventable adverse events
  - 2,872,240
  - \$29 Billion
- Savings possible by reducing the 3x risk associated with communication barriers
  - 671,440 fewer AEs
  - \$6.8 Billion reduction in costs
- Patient stress & satisfaction
- Staff stress and burnout



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## Access: Utilizing Small Intentional Gestures

- **Direct Access**
  - Touch-force
  - Mouse control
- **Indirect Access**
  - Remote Switch
  - Switch Scanning



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## Access: Limitations Of Conventional AT Solutions For Patients

- Limited movement
- Limited force
- Switch placement

## What Kind Of Intentional Gestures Can Patients Produce?

- Finger movement
- Wrist or hand movement
- Head movement
- Shoulder movement
- Foot or leg movement
- Tongue movements and clicks
- Eye blinks/winks
- Eye gaze

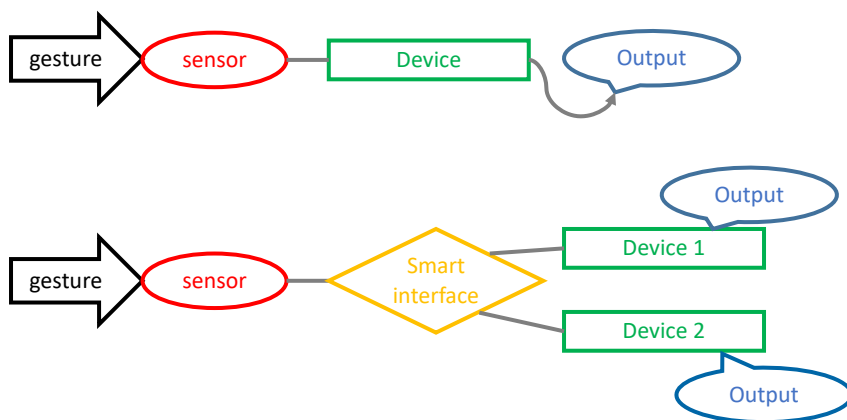
## Populations Who Can Benefit From Noddle System With The min-mo Sensor

- Neuro-trauma
- Spinal Cord Injury
- Amyotrophic Lateral Sclerosis
- Duchene's Muscular Dystrophy
- Guillain Barre Syndrome
- Burn/Trauma
- Transplant
- Conditions resulting in weakness or limited mobility
  - Cancer patients
  - Geriatric patients
  - Bariatric patients

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## Can Patients Who Can Only Produce A Single Gesture Control Multiple Devices?



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## What Should A Smart Interface Do?

- Accept input from different types of sensors/switches.
- Automatically recognize the type of sensor being used.
- Detect an intentional gesture in the signal from the sensor.
- Count the number of intentional gestures produced in sequence.
- Provide multiple outputs to devices based on number of gestures detected.
  - To nurse call system
  - To SGD



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## Voxello's noddle® Switch

- Auto-detects sensor type
  - Microphone
  - Proximity
  - Motion
- Gesture detection algorithm
- Gesture counting algorithm
- Bluetooth® and multiple relay outputs



## noddle® Gesture Detection: Distinguish Intentional Gesture From Noise

- Microphone Sensor
  - Acoustic spectrum of tongue click
  - Temporal characteristics of tongue click
  - Filtering out all other sounds
- Proximity Sensor
  - Approximation of body part to sensor
  - Temporal characteristics of the movement to the sensor
  - Filtering out tremor
- Motion Sensor ( min-mo)
  - Motion associated with a voluntary movement of a body part
  - Detect set magnitude of gesture
  - Detect temporal characteristics of gesture



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## noddle® sensors

- Noddle Mic
  - Vent-mic
  - J-mic
- Noddle Touch
  - J-touch
  - Bed-touch
- Min-mo
  - Default mode
  - Learning mode



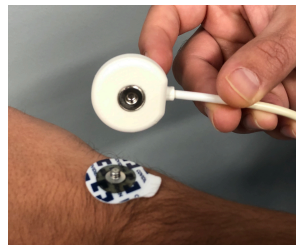
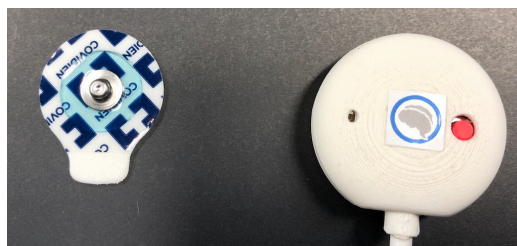
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## Min-mo Alternate Mounting Options

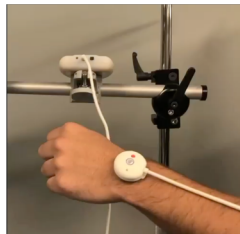
Small gestures of the head, shoulder, arm, wrist, hand, leg or foot can be detected by attaching the min-mo to that body part.



## Noddle min-mo Sensor Mounting



## Min-mo Demo Clips Response To 1, 2 & 3 Gestures

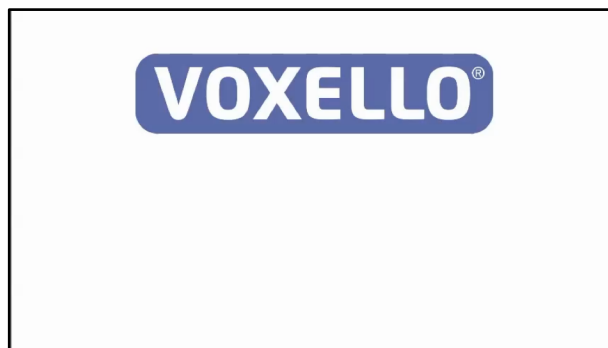


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## Min-mo With Noddle-chat Demo

- Noddle-chat in Row-Column 2-Switch Scanning Mode
  - Single gesture moves
  - Two gestures selects



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## Voxello Noddle System

- Provides access to nurse call and noddle-chat SGD
- Enhances patient provider-communication
- Increases patient , nurse and family satisfaction

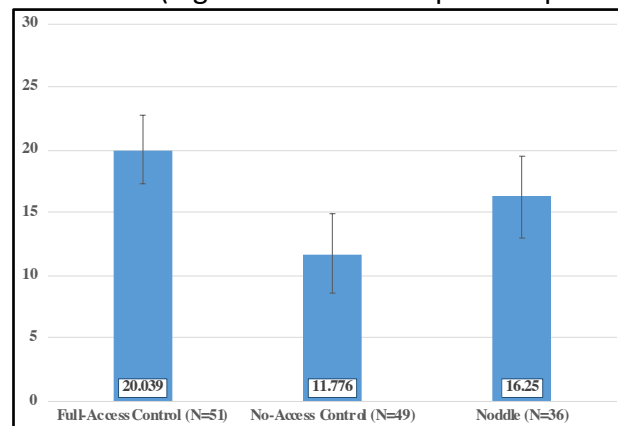


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## Impact Of noddle® System Clinical Trial Results

Composite scores of patient perceptions of access and communication (higher score = more positive perception)



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## Voxello: Next steps

- Release of noddle2.0
  - Enhanced algorithms
  - Speed function
  - Expanded set of sensors (including min-mo)
- Release of Bilingual noddle-chat
- Development of noddle-chat for patients with dementia



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## Questions & Comments



Come see the min-mo in the Exhibition Hall - APS3



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## References

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