

How does hSITE Impact Older Adults?

McGill University
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OUTLINE

- Background
- Clinical Applications of Sensors
 - Bed Sensor: Nocturia
 - Bed Sensor: Mobility
 - Bed Sensor: Breathing
- Next steps

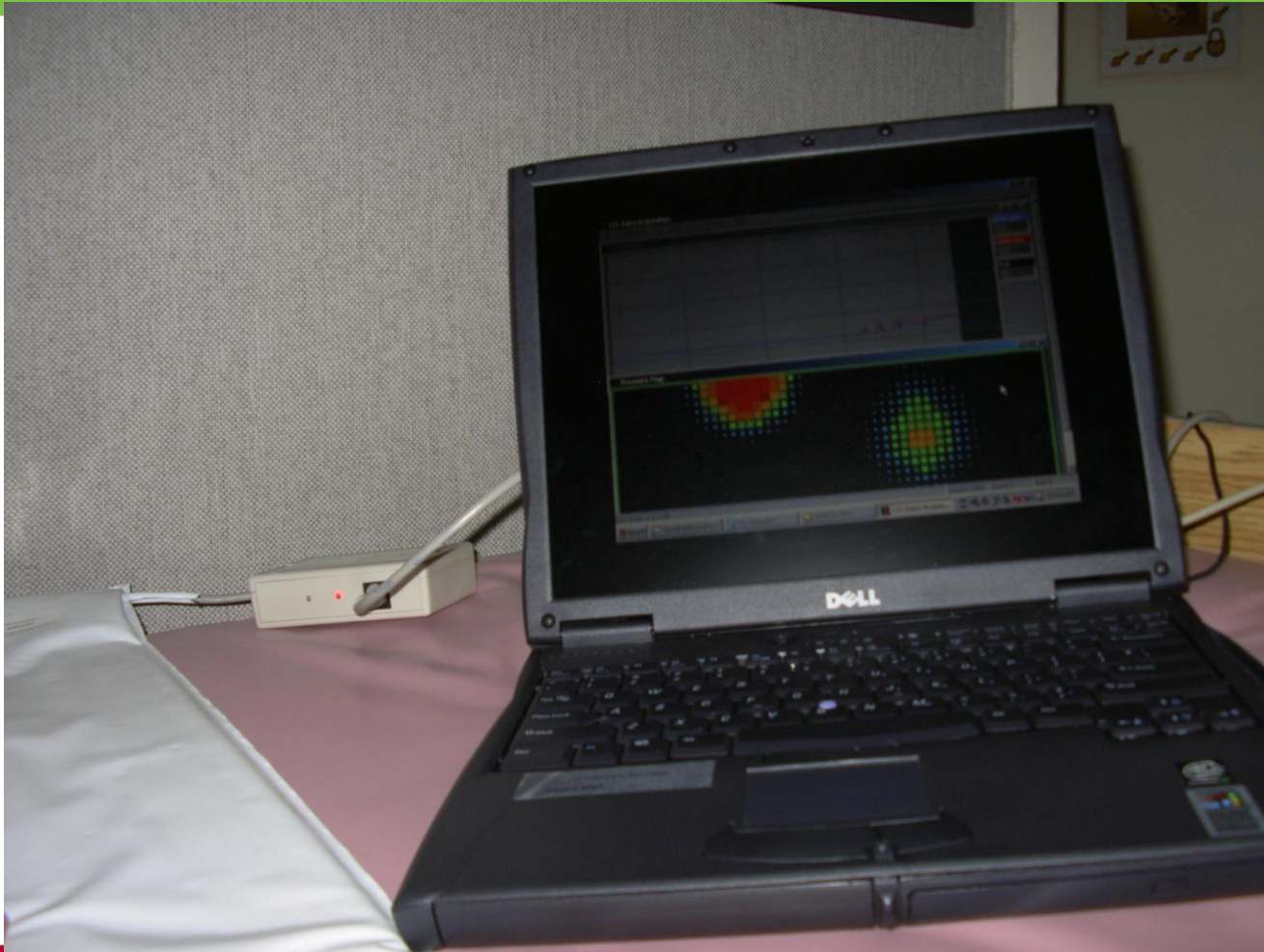
BACKGROUND

- Overall Goal
 - Establish close link between clinicians and their needs, and engineers and their solutions
- Context 2:
 - Homecare for Seniors and People with Disabilities
- Theme 2:
 - Context Aware Sensor Systems, Software and Applications

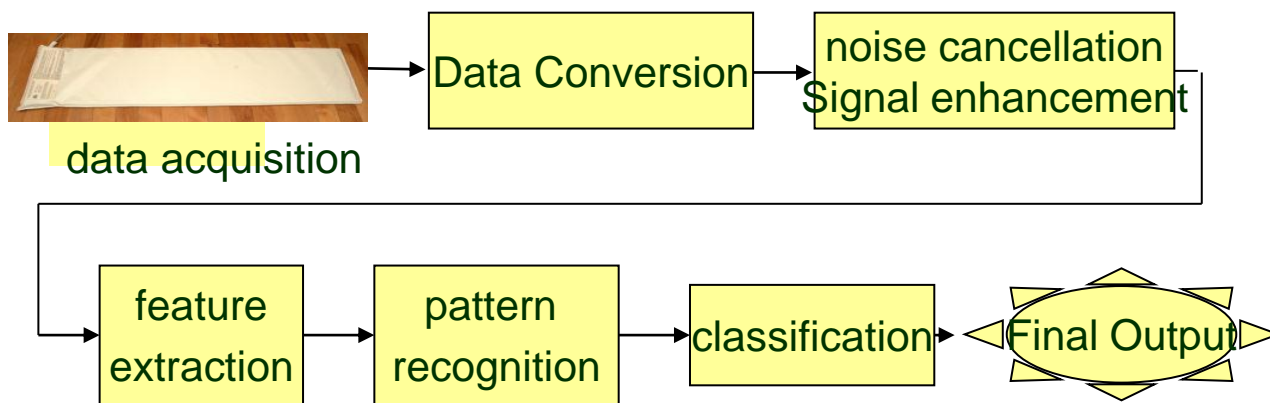
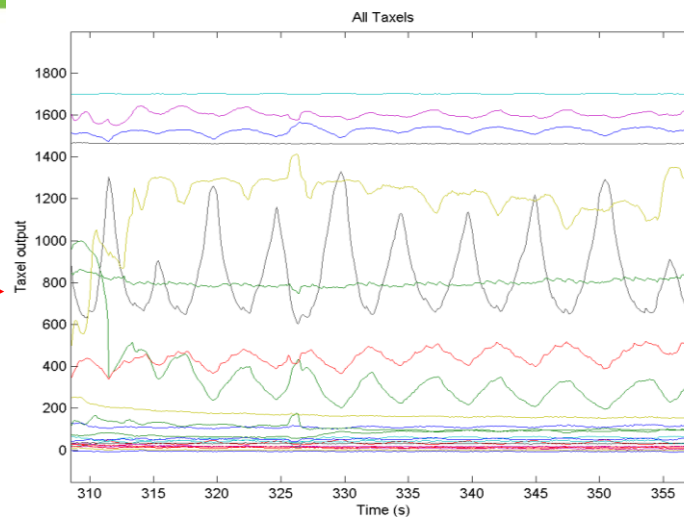
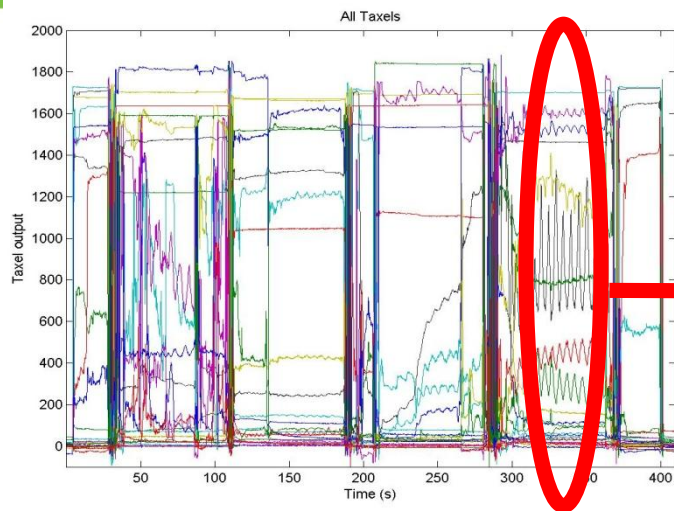
THE TEAM

- Dr. Rafik Goubran, Theme Lead
- Dr. Amaya Arcelus, now PhD graduate
- Megan Holtzman, PhD Candidate
- Anita McKee, PhD Candidate
- Robert Levesque, undergrad student
- Mélanie Pouliot, undergrad student
- Matt Taylor, Masters student
- Daphne Townsend, now PhD graduate

BACKGROUND: HARDWARE



BACKGROUND: SOFTWARE



WHAT IS IMPACT FOR HER?



NOCTURIA

- Question: Can a mat sensor under a mattress help monitor nocturia treatment in the community?
- Methods: 10 frail older day hospital patients with nocturia monitored over 8 weeks in their homes

NOCTURIA: CHALLENGES

- Definitions:
 - When is night – when is sleep?
 - How long in bed = “gone to bed”
 - How long out of bed = “bathroom”

NOCTURIA RESULT I

Patient 7

29-May-2012

Home

Patient Information

Vitals

Bed Entry & Exits

Test Results

Type of Graph

- Number of Exits per Night
- Weekly Average
- Exit Times
- Continuous Sleep

Options

Definition of "night" :

Starts at: 9 pm

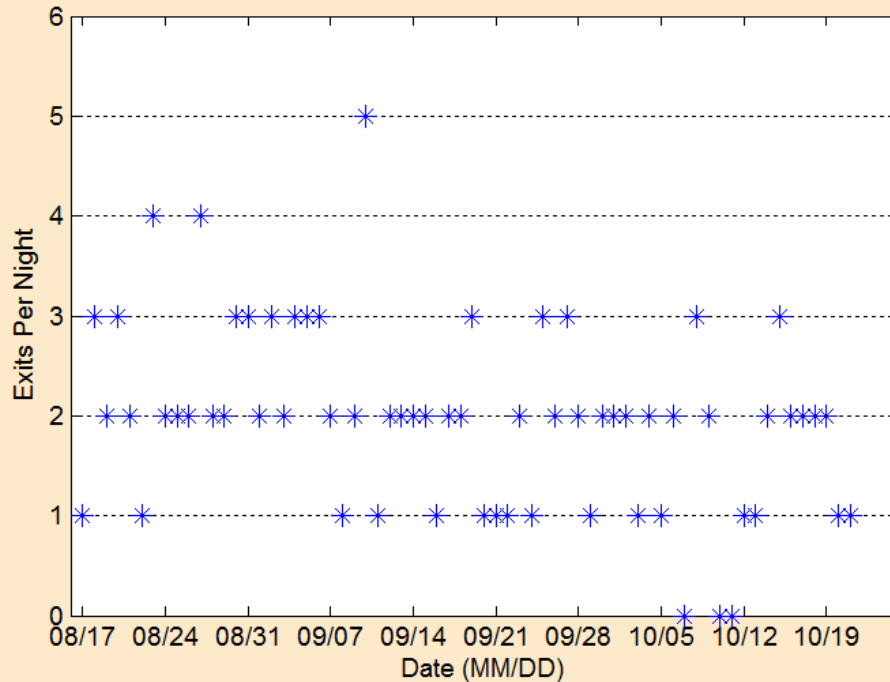
Stops at: 9 am

Exit Time Graph

Choose a week **: 3

Number of Exits per Night

Patient Exits -9:00PM -9:00AM



NOCTURIA: RESULT II

Patient 2

29-May-2012

Home

Patient Information

Vitals

Bed Entry & Exits

Test Results

Type of Graph

- Number of Exits per Night
- Weekly Average
- Exit Times
- Continuous Sleep

Options

Definition of "night" :

Starts at: 9 pm

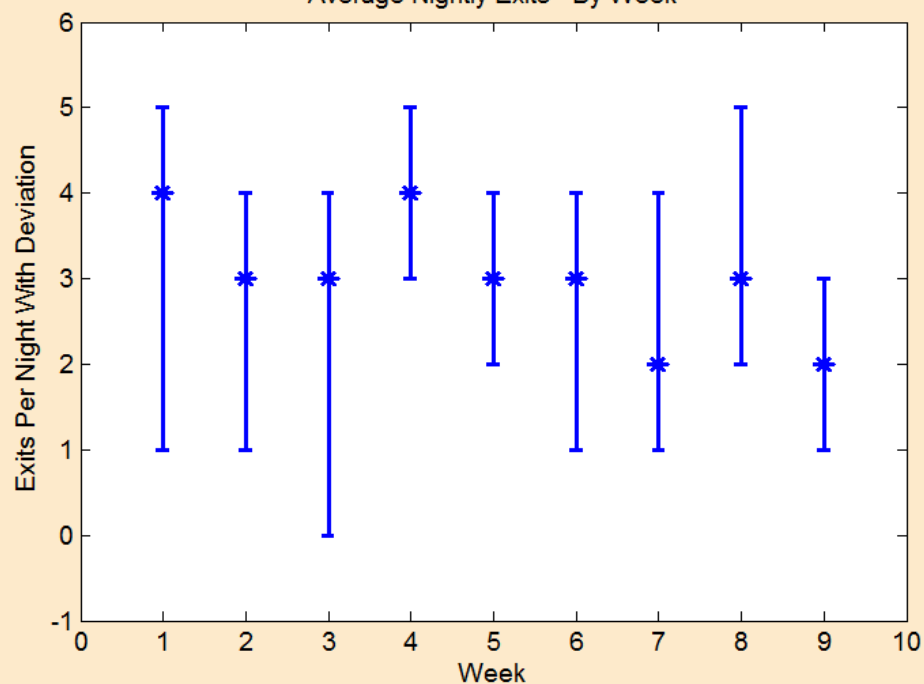
Stops at: 9 am

Exit Time Graph

Choose a week **: 2

Weekly Average of Exits per Night

Average Nightly Exits - By Week



NOCTURIA RESULTS III

Patient 7

29-May-2012

- Home
- Patient Information
- Vitals
- Bed Entry & Exits
- Test Results

Type of Graph

- Number of Exits per Night
- Weekly Average
- Exit Times
- Continuous Sleep

Options

Definition of "night" :

Starts at: 9 pm

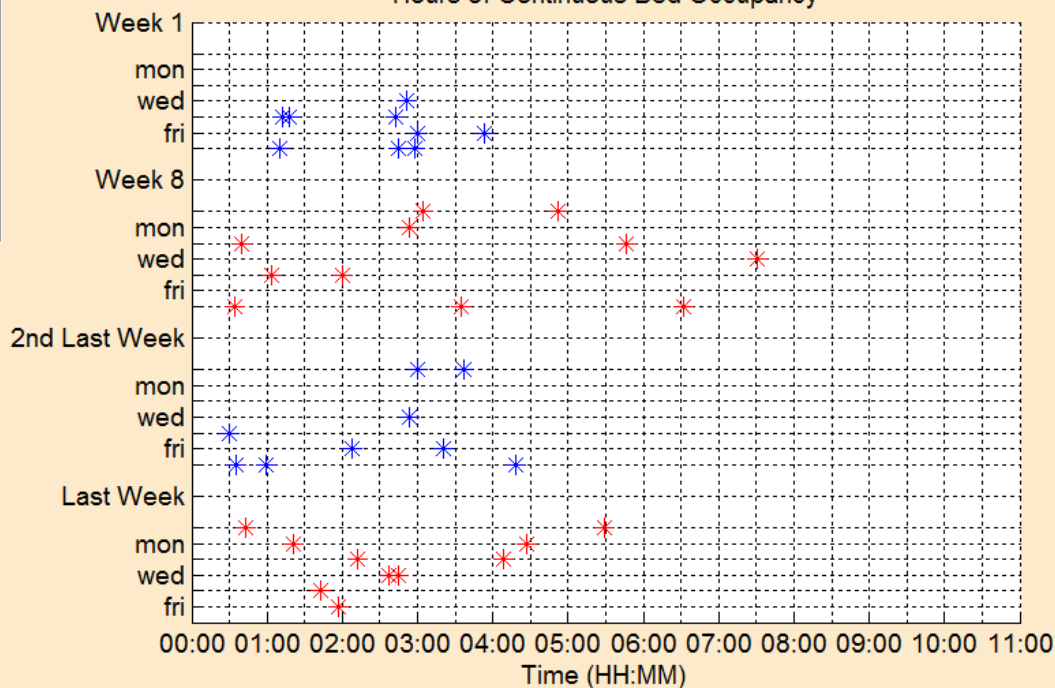
Stops at: 9 am

Exit Time Graph

Choose a week **: 8

Continuous Analysis

Hours of Continuous Bed Occupancy



NOCTURIA: ISSUES

- What percentage of “get out of bed” represent bathroom break?
- What percentage of bathroom breaks are bladder related?

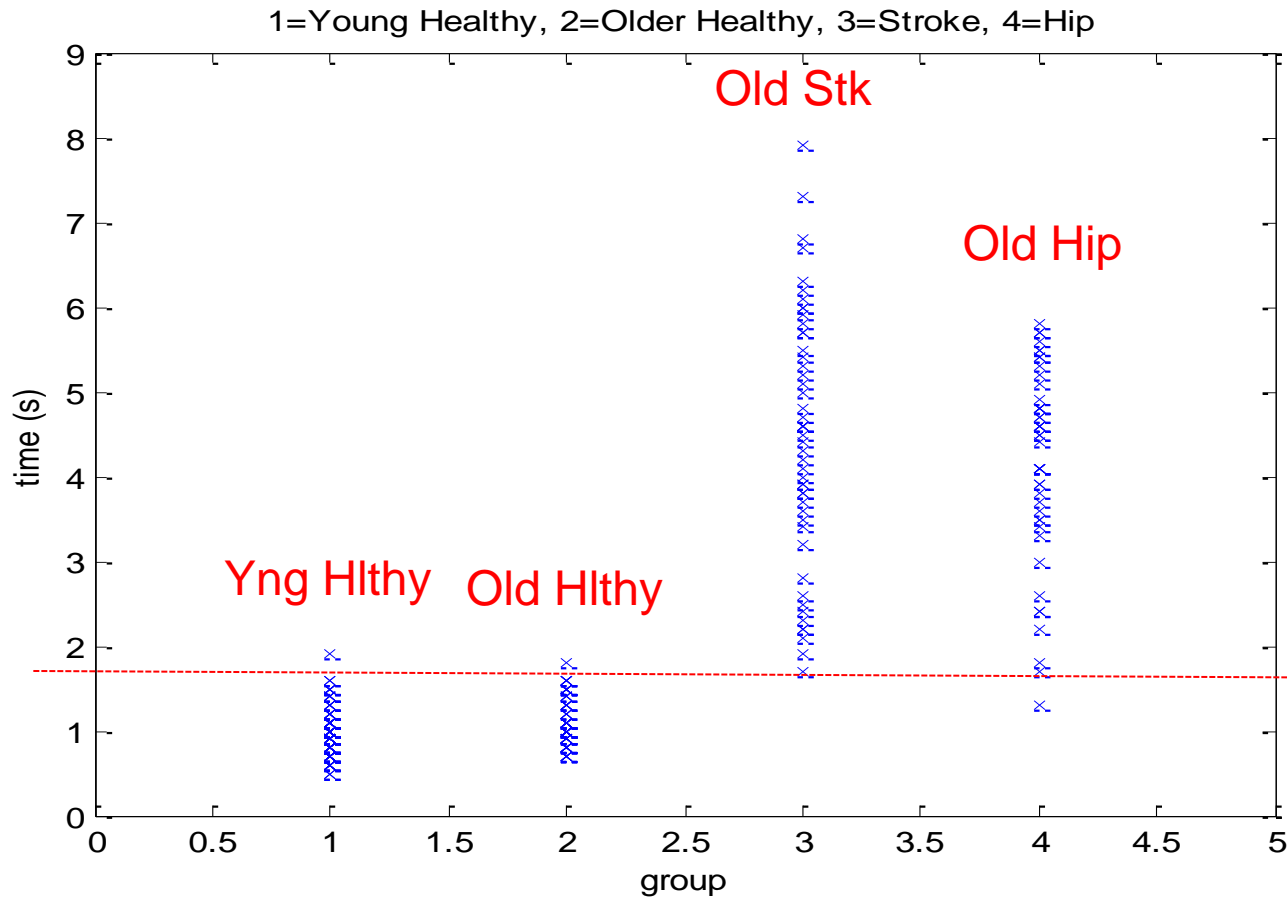
MOBILITY

- Question: Can mat data be used to identify changes in mobility – and if addressed, could this prevent falls?
- Step 1: compare transfers of clinical groups
- Step 2: compare transfers of single client over time

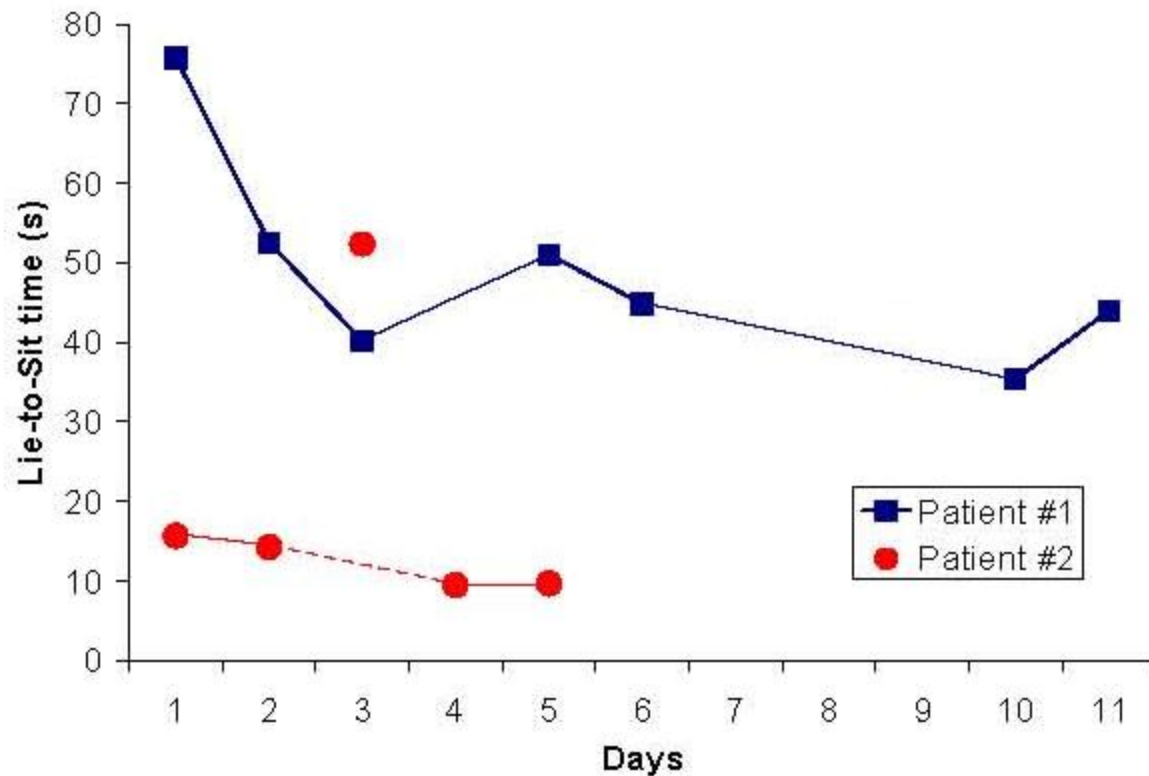
MOBILITY: CHALLENGES

- When does transfer start?
- Mat misses “stabilisation” phase

MOBILITY: RESULTS I



MOBILITY: RESULTS II



MOBILITY: ISSUES

- Transfer times in hospital: what is the role of nurse or therapist?
- Transfer times at home: what factors impact transfers from bed day to day, and when are the variations significant?

Patient data

- 64 yo
- Senior' s appt
- 23 days of data

Mat Video

- 3:38 lying position change
- 4:00 move to sit
- 4:45 up to standing

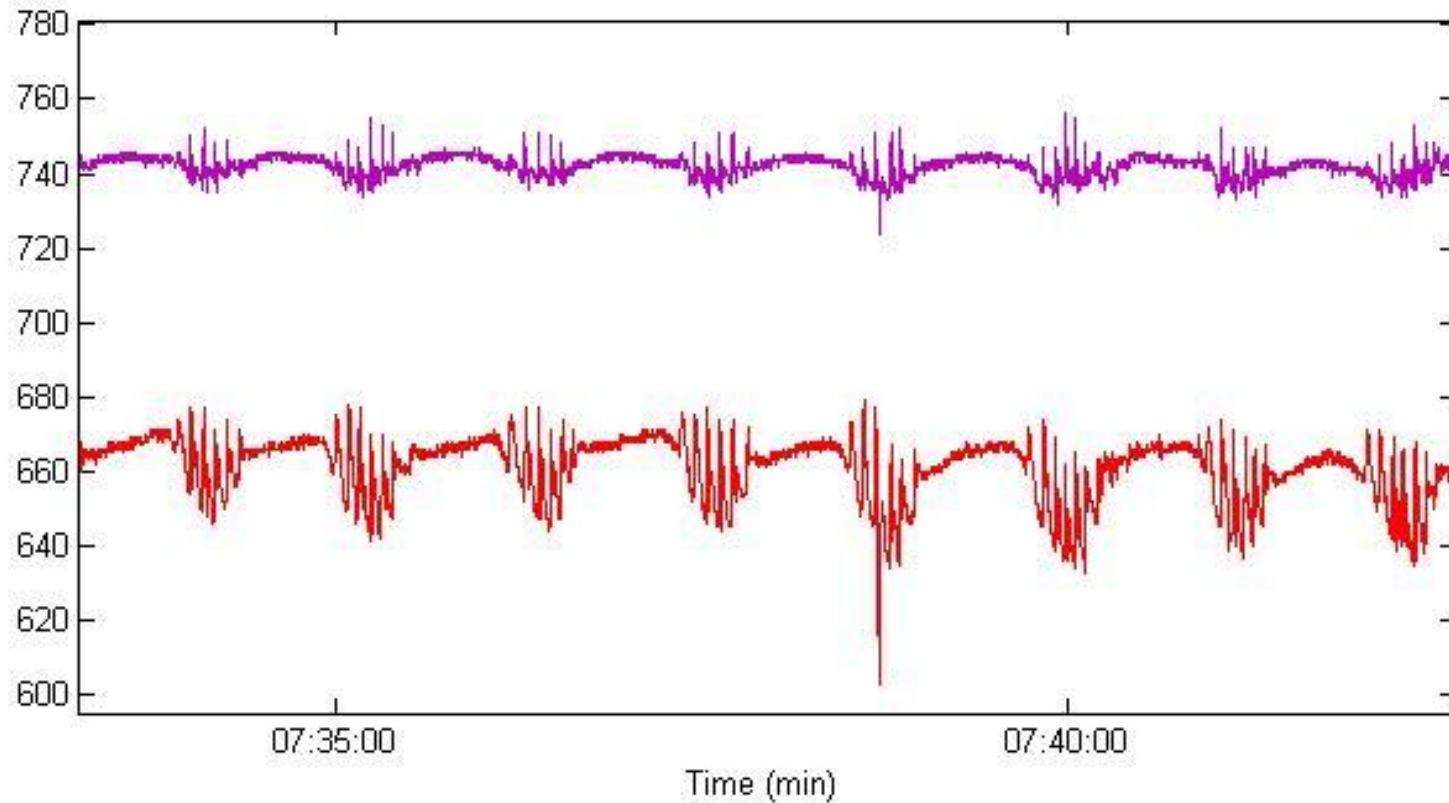
Patient results

- Get up time
 - Average 9:17 (5:47 to 10:56)
- Transfer time
 - Av. 71.8 s (+/- 68.7)
 - Lie to sit: 16.4 (+/- 7.3)
 - Sit: 49.8 (+/- 65.9)
 - Sit to stand: 5.6 (+/- 2.6)

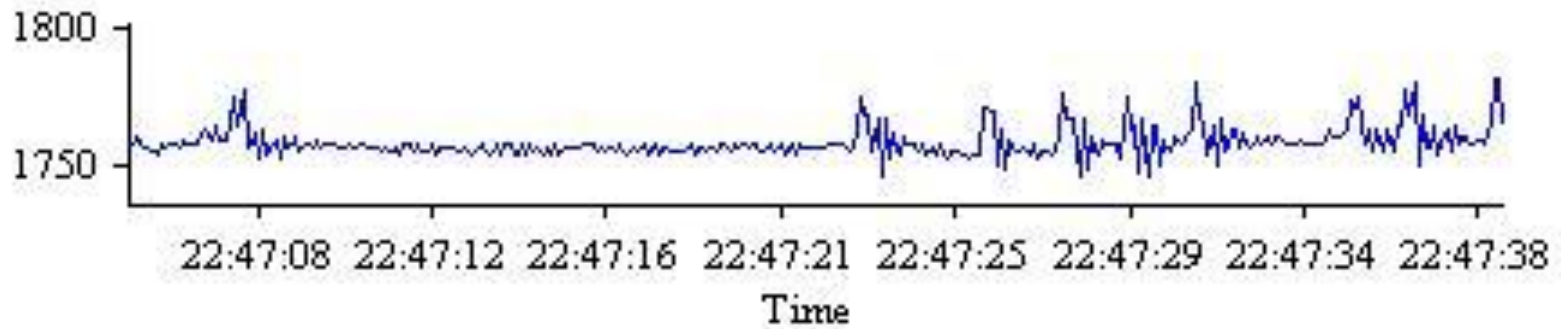
BREATHING PATTERNS

- Question: Can the mat algorithms create clinically identifiable breathing patterns - are there breathing or movement patterns that can predict the end of life?
- Methods: Monitor 15 patients on an in-patient palliative care unit for the duration of their stay

BREATHING: RESULTS I



BREATHING: RESULTS II



Respiratory Data Monitoring

Participant type	Number of "nights"	Total hours data
Healthy adults	10	79
Gastro-Intestinal Cancer	9	207
Lung Cancer	12	282

RAID

- Index of respiratory amplitude and interval disturbance (RAID)
- $RAID = 50(SD \text{ of normalized resp amp} + SD \text{ of resp interval})$

RAID Variation

Participant	Amplitude	Rate	RAID
H1	0.121 ± 0.124	0.142 ± 0.129	13.2 ± 11.7
H2	0.172 ± 0.155	0.160 ± 0.145	16.6 ± 13.6
H3	0.160 ± 0.108	0.200 ± 0.144	18.0 ± 11.3
H4	0.131 ± 0.104	0.131 ± 0.121	13.1 ± 10.3
GI CA	0.175 ± 0.132	0.136 ± 0.141	15.6 ± 11.9
Lung CA	0.459 ± 0.244	0.444 ± 0.224	45.1 ± 20.4

BREATHING: ISSUES

- Apnea vs. change in position
- Impact of coughing vs. breathing
- End of life: sleeping vs. resting

NEXT STEPS

- Nocturia: additional sensors: Bathroom? Fridge? TV?
- Mobility: additional sensors to determine if getting help?
- Breathing: additional sensors to determine cough? Presence of care provider?

Questions?

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