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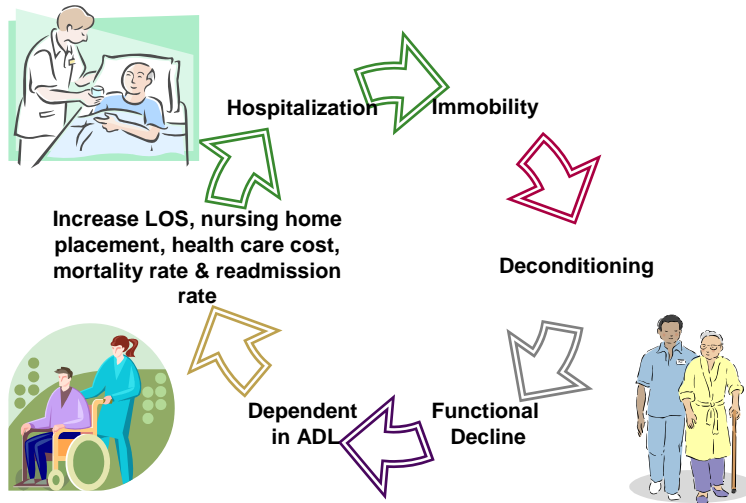
Do Clinicians know how much walking their patients do in the geriatric rehabilitation wards?

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The Problem



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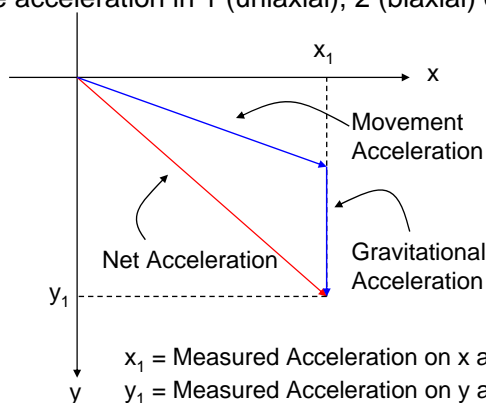
Motivation

- How to measure the amount of walking?
 - Direct observation, questionnaire, video camera etc
- Are these methods...
 - Efficient?
 - Accurate?
 - Reliable?
 - Practical?
- Can we measure the amount of walking everyday over a few weeks of time?



Potential Solution – Accelerometer Device

- Measure the applied net acceleration acting along a sensitive axis using a spring mass system
- Can measure acceleration in 1 (uniaxial), 2 (biaxial) or 3 (triaxial) directions



Objectives of this Study

- To validate the activity classification algorithm
- To describe the activity pattern and record the variations in activity level during their length of stay
- To examine clinicians' ability to estimate the average daily walking duration for each patient in the previous week



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Accelerometer Device for this Study

- Size: 90mm X 40mm X 16mm
- Weight: 55g with battery
- Sampling Rate: 75 Hz
- 3 dimensional
- Attach at the right hip with a belt
- Acceleration data needs to be analysed by an activity classification algorithm to classify postural movements into lying, walking, sitting, standing and transitions such as sit-to-stand and stand-to-sit



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Methodology

- Participants criteria: age \geq 60 yrs, able to walk independently or with assistance
- Exclude lower limb amputees or cognitively impaired patients
- 20 participants
- Recruited from 2 wards at the Geriatric and Rehabilitation Unit at Princess Alexandra Hospital, Brisbane
- 4 devices were available



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Methodology (cont.)

- Study Protocol:
 - Attached the device everyday when the patients got up and removed it before bed time
 - Kept a record of the attachment and removal times of the device
 - Conducted a 6 mins activity routine 2-3 times a week
 - Clinical staff estimated the average daily walking duration in the previous week



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Results

- Commenced in Feb 08 and completed in Jan 09
- 10 males & 10 females patients
- Mean age = 77.8 (± 6.6) yrs, age range = 67 – 91 yrs
- 9 patients at risk of de-conditioning, 6 stroke patients & 5 orthopaedic patients
- Statistical method:
 - Sensitivity & Specificity to assess accuracy of algorithm
 - Bland-Altman method to assess agreement between clinician's estimated walking time and accelerometer measured walking time



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Results – Algorithm Validation

- Validation result – Event-based Comparison
- Total of 140 activity routines from 20 patients (mean = 7 (± 3.68), range = 1-15)
- Includes 280 lying events, 437 walking events, 837 sitting events, 562 standing events, 279 sit-to-stand transitions, and 276 stand-to-sit transitions
- Each observed event is compared with the event classified by the algorithm

	Postures & Transitions					
	Lying	Walking	Sitting	Standing	Sit-to-Stand	Stand-to-Sit
Sensitivity	93.93%	95.95%	90.20%	90.04%	90.32%	92.75%
Specificity	99.87%	98.75%	95.32%	96.17%	99.87%	99.62%



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Results – Walking Time from Device

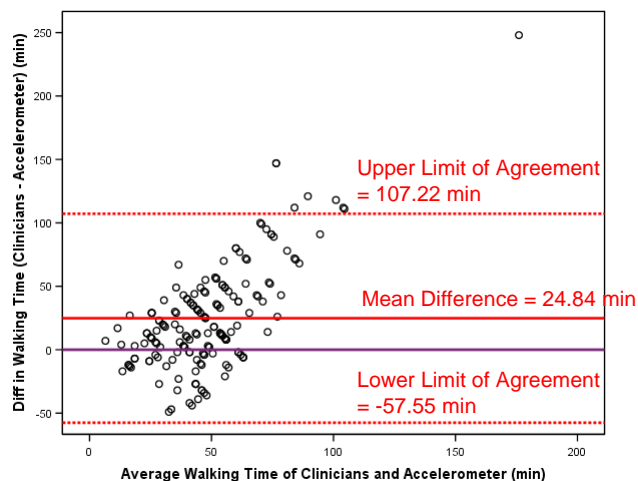
- Observation result – day-to-day activity trends
- Total number of days monitored with device = 388 days
- Average number of days monitored = 19.4 (± 9.7) days
- Average LOS in GARU = 43.9 days
- Average walking time per day:
 - all days = 37.4 ± 23.4 min, (1 – 192 min)
 - weekdays = 39.1 ± 21.4 min, (2 – 113 min)
 - weekends = 32.9 ± 27.6 min, (1 – 192 min)



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Results – Bland-Altman for all Members in the Clinical Team

- 176 estimates of daily walking time in the previous week
- 31 weeks
- 13 patients
- Clinicians:
Physiotherapist,
Occupational
Therapist, Nurse
Unit Manager,
Consultant
Geriatrician, Senior
Geriatric Registrar
and Resident



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Results – Bland-Altman for Individual Members in the Clinical Team

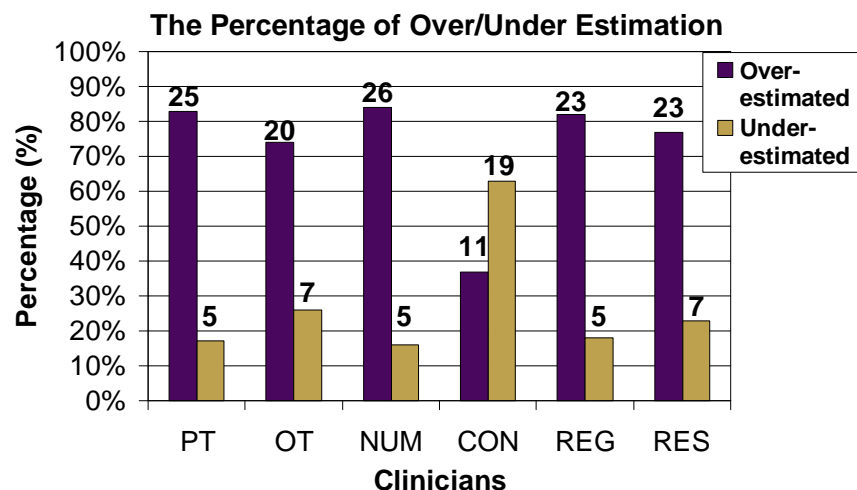
- Staff's estimations result – comparison of the daily walking durations between staff's estimations in the previous week and accelerometer's measurements

Clinician Roles	N	Min	Max	Mean [95% CI]	Std. Dev	Limit of Agreement
Physiotherapist	30	-34	91	30.31 [17.62 to 43.00]	34.00	-37.68 to 98.30
Occupational Therapist	27	-47	248	23.26 [2.16 to 44.36]	53.33	-83.39 to 129.91
Nurse Unit Manager	31	-49	118	40.65 [25.51 to 55.79]	41.29	-41.93 to 123.23
Consultant Geriatrician	30	-42	99	0.67 [-11.61 to 12.95]	32.89	-65.11 to 66.45
Senior Geriatric Registrar	28	-32	147	27.32 [12.61 to 42.04]	37.95	-48.58 to 103.23
Resident	30	-27	147	26.29 [12.14 to 40.43]	37.88	-49.48 to 102.06



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Results – % of Over/Under Estimation



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