

2014/2015 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **4 July 2014**

Supervisor Information (First named supervisor will be the contact):

Supervisor's Name(s): Dr Nigel Millar, Assoc Prof Geoff Shaw, and Dist Prof J Geoffrey Chase

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Research Category (Choose one category only – to be used for judging the students' presentations):

Clinical X

Laboratory

Community

Project Title (20 words MAXIMUM):

A real time system to warn to carers that a patient, at risk of falling, is leaving the bed

Project Description:

Introduction

It is a tragedy when a person enters hospital and ends up being harmed permanently or even loses their life as a consequence of an avoidable adverse event such as injury due to a fall. Falls in hospital are frequent, mainly affecting older people, resulting in distress, injury and occasionally death.

The incidence of falls in hospital and aged care facilities is three times the rate of falls in community dwelling elderly¹. Over 40 percent of patients with specific clinical problems are reported to experience one or more falls during their hospitalisation². Apart from the financial cost to the health care facility, falls in hospital settings may have a devastating impact on an elderly person's physical, psychological and social status, increasing the risk of institutionalisation considerably^{3, 4, 5}.

Inpatient falls are a significant problem for institutions providing care to the elderly. The majority (up to 50%) of these falls occur in the patient's bed area with the corridor, bathroom and toilet being other frequent locations for inpatient falls⁶. Hanger et al (1999) reported that 80% of falls occurred around the bedside in a rehabilitation hospital setting⁷.

It is very difficult to reliably predict if a patient might fall when attempting to get out of bed. Methods to reduce this risk frequently impede the independence of an older person through rehabilitation. Current options to reduce the risk of falls include (i) bed rails or other restraints, (ii) pressure pads on the floor, (iii) frequent observations, (iv) strategies to limit desire to move, and (v) sitters. These methods are frequently ineffective and direct supervision of at-risk patients is expensive and constrained by workforce availability. Finally, restraining patients or obstructing their egress from a bed are in fact counterproductive and increase the risk of serious injury

A practical solution is continuous monitoring of the patient's position in bed to predict egress from the bed and alert a carer in sufficient time to prevent a fall.

Aim

To develop a real time system to warn to carers that a patient (at risk of falling) is leaving the bed, which:

- Actively records and displays the position of a patient in bed by measuring the change in weight distribution over the hospital bed legs in real time.
- Predicts a patient leaving the bed.
- Triggers an alert direct to the carer e.g. nurse.

Method

The student will participate in **Stage 1**, which is part of a larger program of work as outlined below

Stage 1

- Develop and implement weight sensing technology into bed structure.
- Develop software to determine position of patient on the bed
- Develop software to monitor person position in real time.

Stage 2

- (a) Develop software to predict person position and activity in real time.
- (b) Develop alarm criteria and technology to alert carers

Stage 3

- (a) Trial implementation of full software and alert system
- (b) Randomised trial of bed, software and alert system – end point reduction in falls.

Expectations

The student will be exposed to methods and practice of basic research, the results of which will be used to pilot a study of this system in clinical use. He/she will be involved in the design, and decision-making, and will thus gain a wide experience of solving a significant clinical problem through innovative design. Their work will form the initial part of an anticipated larger research programme carried out by senior academic staff (Dist Prof JG Chase), Masters and PhD students from the University of Canterbury, and Assoc Prof GM Shaw from ICU. Results from this work will be published in appropriate medical and biomedical engineering journals.

Where appropriate, the supervisors (NM, GS, and JGC) will ensure that opportunities to secure intellectual property are taken.

Timeframe

Ideally the student will be involved in all hardware and software design, as well as performance analysis. The first 2 weeks will involve background research to produce a concept design. In weeks 2-8 they will be supervised receiving hands-on experience in the design and implementation of the proposed system (Stage1). This will be followed by performance testing, analysis and documentation of results in the last two weeks.

References

1. Anonymous. Guideline for the prevention of falls in older persons. American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls. *Journal of the American Geriatrics Society* 2001;49(5):664-672.
2. Care CDoHaA. National Falls Prevention for Older People Initiative 1999-2003, 'Step Out with Confidence': Background Paper. Canberra: Commonwealth of Australia; November 2000.
3. Hill K, Smith, R., Murray, K., Sims, J., Gough, J., Darzins, P., Vrantsidis, F., & Clark, R. An analysis of research on preventing falls and falls injury in older people: community, residential aged care and acute care settings. Canberra: National Ageing Research Institute; 2000.
4. Rhymes J, & Jaeger, R. Falls: Prevention and management in the institutional setting. *Clinics of Geriatric Medicine* 1988;4(6):613-622).
5. Gluck T, Wientjes, H., & Rai, G. An evaluation of risk factors for inpatient falls in acute and rehabilitation elderly care wards. *Gerontology* 1996;42:104-107
6. Evans D, Hodgkinson, B., Lambert, L., Wood, J., & Kowanko, I. Falls in Acute Hospitals: A systematic review. Adelaide: Joanna Briggs Institute of Evidence Based Nursing & Midwifery; 1999
7. Hanger H, Ball, M., & Wood, L. An analysis of falls in the hospital: Can we do without bedrails? *Journal of the American Geriatrics Society* 1999;47:529-31.

