

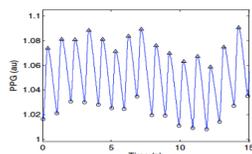
Background

- Thousands of older people present to Liverpool Hospital Emergency Department (ED) each year, with delirium a common condition in this group.
- Delirium is diagnosed by history and clinical examination, complimented by appropriate investigations.
- The potential aetiological factors for delirium are myriad, and differentiation in the acute presentation phase can be difficult.
- Furthermore, the duration and resolution of delirium can be unpredictable, although outcomes may be poorer in patients with underlying dementia /other comorbidity may suffer poorer outcomes.
- Continuous ECG measurement can provide beat-to-beat fluctuations in heart rate, known as heart rate variability (HRV), and similar fluctuations are also present in peripheral blood volume waveforms or photoplethysmography (PPGV).
- This advanced physiological monitoring- beyond or in addition to routine 'observations'- may aid in differentiation and prognostication of acute medical presentation such as cardiac ischaemia or sepsis, but their potential role in delirium has largely been unexplored.

Objectives

- In a prospective observational study of adult patients presenting to the ED, to elucidate the specific predictive value of our novel non-invasive HRV / PPGV analytic method in the identification of specific causes of delirium and outcomes following same.

Feature detection from ear photoplethysmogram (PPG) waveform segment



Study Overview

- This cross disciplinary prospective study will investigate the potential association between delirium- and its aetiology, subtype (hypo-/hyper-active, mixed), severity and outcomes- and HRV/PPGV output in the acute setting.
- Aetiology is not always immediately apparent, and it can be difficult to predict outcomes in the early phase.
- We will perform frequency spectrum analysis of HRV and finger/ear PPGV on a consecutive sample of older patients presenting to ED with delirium over a 3-month period.
- Multivariate analysis with logistic regression will be performed to investigate the association between cross-spectral analysis of HRV and PPGV, delirium (including subtypes, causes and severity), and more distal outcomes such as duration and resolution of delirium, length of stay, death, discharge destination and principal (discharge) diagnosis.

Research Questions

- Is there a relationship between HRV and PPGV and delirium aetiology?
- What is the relationship between HRV and PPGV and principal (discharge) diagnosis?
- Is there a relationship between HRV and PPGV and delirium severity?
- What is the relationship between HRV and PPGV and patient outcomes (duration and resolution of delirium, death, discharge destination)?
- What is the relationship between HRV and PPGV and principal diagnosis?
- How successful is the cross-spectral analysis of HRV and PPGV at predicting outcomes following delirium?
- Do any of the above variables differ with patient characteristics (age, sex, CALD background, underlying dementia and other morbidity)?

Monitoring equipment to collect HRV and PPGV



Supervisors

- **A/Prof. Paul Middleton**

Senior Staff Specialist in Emergency Medicine, Liverpool Hospital.

Director, South Western Emergency Research Institute, Ingham Institute.

Chief Medical Information Officer, SWSLHD.

Conjoint Associate Professor, UNSW Medicine.

Email: Paul.Middleton@health.nsw.gov.au



- **A/Prof. Danielle Ní Chróiní**

Staff Specialist in Geriatric Medicine

Liverpool Hospital.

Conjoint Associate Professor,

UNSW Sydney.

Email: Danielle.Nichroinin@health.nsw.gov.au



Presentation and Publication Plans

- In addition to your UNSW thesis/report, you will be supported to submit project for presentation at an international scientific conference, and resultant manuscript(s) for publication in a peer-reviewed scientific journal.