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School of Public Health and Health Systems

interRAI™ CANADA

Identifying High-Risk Patients for Personalized Care Plans

John P. Hirdes, PhD FCAHS[1]
George Heckman, MD[1,2]
Paul Hebert, MD[3]
Allan Garland, MD[4]

1-School of Public Health and Health Systems, University of Waterloo
2-Schlegel-UW Research Institute for Aging
3-CHUM
4-University of Manitoba

Agenda

- Targeting high risk populations in long term care
  - Frailty
  - Health instability
- Personalized care plans based on interRAI assessments
- CFN Strategic Impact Grant:
  - Predicting transitions in health and service use – effect of advance directives
- CFN Transformative Grant:
  - Intervention study on advance care planning in LTC

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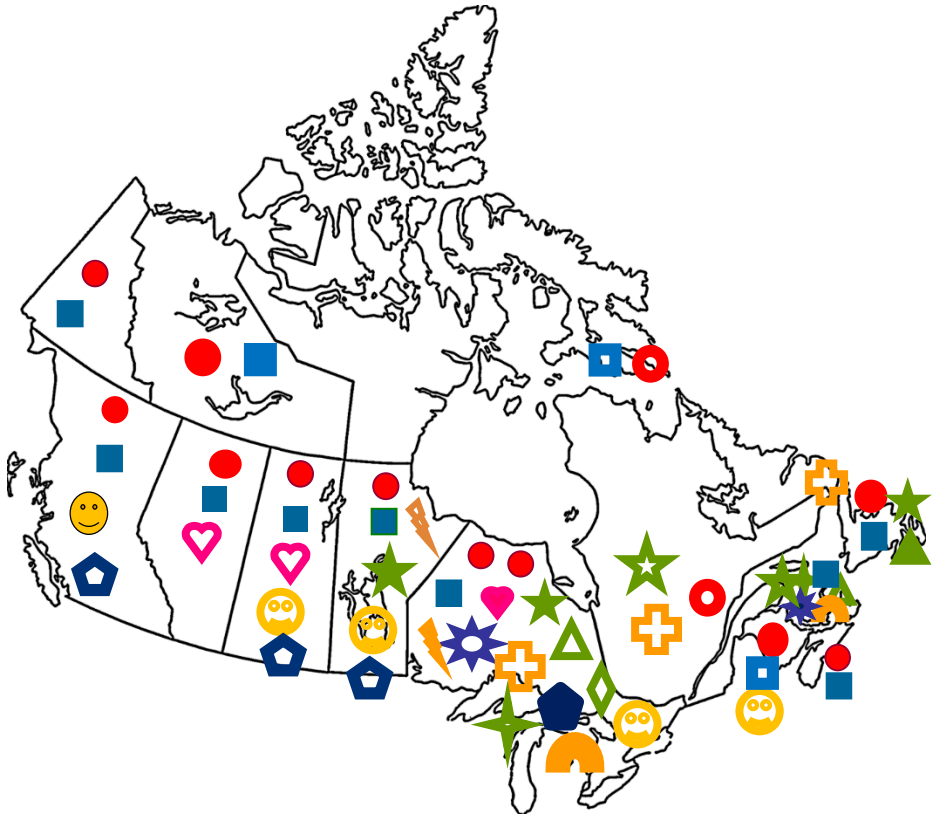
Use of interRAI Instruments in Canada



Solid symbols refer to implentations that have been mandated by government
Hollow symbols refer to research, pilot studies, or implementation planning underway

- RAI 2.0/ interRAI Long Term Care Facilities
- RAI-Home Care
- RAI-Mental Health
- interRAI Community Mental Health
- interRAI Emergency Screener for Psychiatry
- interRAI Brief Mental Health Screener
- interRAI Child/Youth Mental Health
- interRAI Intellectual Disability
- interRAI Palliative Care
- interRAI Acute Care/Emergency Department
- interRAI Contact Assessment
- interRAI Community Health Assessment
- interRAI Subjective Quality of Life

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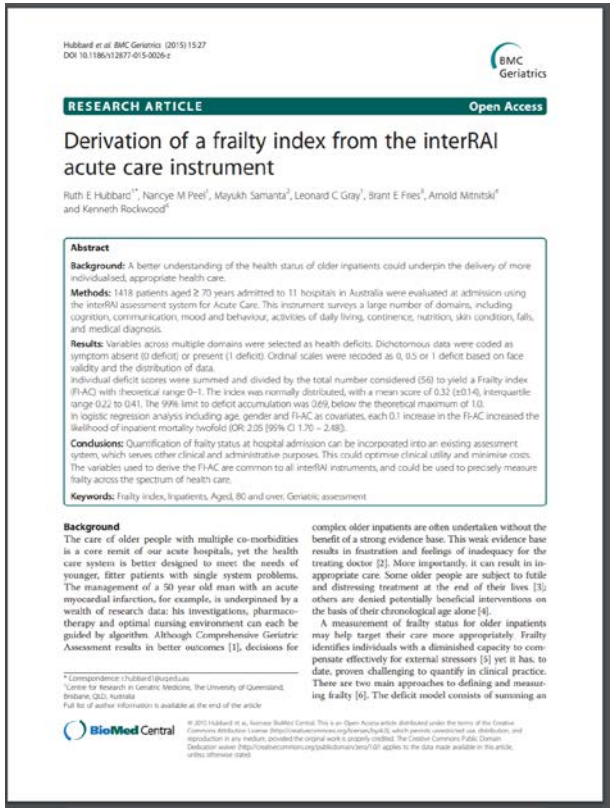
Deriving Frailty Index from interRAI Systems



Hubbard et al. BMC Geriatrics (2015) 15:27
DOI 10.1186/s12877-015-0026-z

BMC Geriatrics

RESEARCH ARTICLE Open Access

Derivation of a frailty index from the interRAI acute care instrument

Ruth E Hubbard[1*], Nancye M Peel[2], Mayukh Samanta[3], Leonard C Gray[3], Brant E Fries[3], Arnold Mitnitski[4] and Kenneth Rockwood[4]

Abstract

Background: A better understanding of the health status of older inpatients could underpin the delivery of more individualised, appropriate health care.

Methods: 1418 patients aged ≥ 70 years admitted to 11 hospitals in Australia were evaluated at admission using the interRAI assessment system for Acute Care. This instrument surveys a large number of domains, including cognition, communication, mood and behaviour, activities of daily living, continence, nutrition, skin condition, falls, and medical diagnosis.

Results: Variables across multiple domains were selected as health deficits. Dichotomous data were coded as symptom absent (0 deficit) or present (1 deficit). Ordinal scales were recoded as 0, 0.5 or 1 deficit based on face validity and the distribution of data.
Individual deficit scores were summed and divided by the total number considered (56) to yield a Frailty index (FI-AC) with theoretical range 0–1. The index was normally distributed, with a mean score of 0.32 (±0.14), interquartile range 0.22 to 0.41. The 99% limit to deficit accumulation was 0.69, below the theoretical maximum of 1.0.
In logistic regression analysis including age, gender and FI-AC as covariates, each 0.1 increase in the FI-AC increased the likelihood of inpatient mortality twofold (OR: 2.05 [95% CI: 1.70 – 2.48]).

Conclusions: Quantification of frailty status at hospital admission can be incorporated into an existing assessment system, which serves other clinical and administrative purposes. This could optimise clinical utility and minimise costs. The variables used to derive the FI-AC are common to all interRAI instruments, and could be used to precisely measure frailty across the spectrum of health care.

Keywords: Frailty index, Inpatients, Aged, 80 and over, Geriatric assessment

Background

The care of older people with multiple co-morbidities is a core remit of our acute hospitals, yet the health care system is better designed to meet the needs of younger, fitter patients with single system problems. The management of a 50 year old man with an acute myocardial infarction, for example, is underpinned by a wealth of research data: his investigations, pharmacotherapy and optimal nursing environment can each be guided by algorithm. Although Comprehensive Geriatric Assessment results in better outcomes [1], decisions for complex older inpatients are often undertaken without the benefit of a strong evidence base. This weak evidence base results in frustration and feelings of inadequacy for the treating doctor [2]. More importantly, it can result in inappropriate care. Some older people are subject to futile and distressing treatment at the end of their lives [3]; others are denied potentially beneficial interventions on the basis of their chronological age alone [4].

A measurement of frailty status for older inpatients may help target their care more appropriately. Frailty identifies individuals with a diminished capacity to compensate effectively for external stressors [5] yet it has, to date, proven challenging to quantify in clinical practice. There are two main approaches to defining and measuring frailty [6]. The deficit model consists of summing an

* Correspondence: r.hubbard1@uq.edu.au
[1]Centre for Research in Geriatric Medicine, The University of Queensland, Brisbane, QLD, Australia
Full list of author information is available at the end of the article

Research letters

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doi: 10.1093/ageing/afq098
Published electronically 16 September 2010

Examining three frailty conceptualizations in their ability to predict negative outcomes for home-care clients

SIR—Although being recognized as an important issue for public health researchers [1] and for clinicians [2], the concept of frailty remains controversial [3]. Albeit some definitions of frailty have received considerable attention and support [4], there is still no broad consensus on the definition of frailty and how it should be measured [5–7]. One way to compare the utility of alternative operationalisations of frailty is to test their relative ability to predict negative outcomes. Prior studies have compared the predictive ability of various measures of frailty in community samples of older persons [8, 9]; fewer studies have compared frailty measures in older persons within a health-care setting.

Home health services are an increasingly important component of the health-care system [10]. We chose to compare three common conceptualizations of frailty in a large sample of older home-care clients in Ontario, Canada. Given that home-care services play a critical role in managing the transition between community and institutional living for older individuals [10], the ability to identify the most at-risk frail individuals in this population is important. A frailty measure that was strongly predictive of poor outcomes among home-care clients could be used to target individuals for preventive or supportive interventions.

Methods

For these analyses, we made use of a large database ($n = 23{,}952$) with comprehensive health information on home care clients (aged 65+) of eight Community Care Access Centres (CCACs) in Ontario, Canada. CCACs coordinate access to home-care services and long-term care placement in the province.

Data were collected using the RAI-HC (sometimes referred to as MDS-HC [11, 12]), an assessment that has been mandated in Ontario since 2002 for all home-care clients expected to use services for longer than 60 days. The RAI-HC is one of a family of assessment tools developed by the international inter-RAI consortium [13]. The data entry software that collected the assessment information has checks at input, which constrains item responses as non-missing, within appropriate ranges, and with logical checks.

Frailty measures

For our comparison, we were interested in three conceptually different approaches to the measurement of frailty that could be operationalised using RAI-HC data. The first measure of frailty included is the Changes in Health, End-Stage Disease and Signs and Symptoms (CHESS) scale. This measure utilises client assessment information in its calculation and is designed to identify individuals at risk of serious decline [13]. The CHESS scale was developed using statistical methods, based on items available in the interRAI instruments. Although not explicitly a frailty measure, it is described as a measure of health 'instability'—an analogous concept—and to be predictive of mortality. The scores ranging from 0 (meaning no instability) to 5 (for the highest level of instability) have been demonstrated to be a strong predictor of mortality ($P < 0.0001$) in continuing care patients [13]. The second measure examined is the Edmonton Frail Scale (EFS), a brief multidimensional clinical measure designed for geriatricians in both inpatient and outpatient settings [14]. With the maximum score of 17 representing the highest level of frailty, the EFS is constructed of items from the following domains: cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence and functional performance. In post-operative older adults, high scores on the EFS has been shown to be associated with increased complications and a lower chance of being discharged home after surgery [15]. To

McKenzie et al. BMC Geriatrics (2015) 15:170
DOI 10.1186/s12877-015-0170-5

BMC Geriatrics

RESEARCH ARTICLE Open Access

Using an accumulation of deficits approach to measure frailty in a population of home care users with intellectual and developmental disabilities: an analytical descriptive study

Katherine McKenzie[3], Hélène Ouellette-Kuntz[2*] and Lynn Martin[2]

Abstract

Background: The aging population of adults with intellectual and developmental disabilities (IDD) is growing. In the general aging population, frailty is commonly used to predict adverse health outcomes, including hospital use, death, and admission to long-term care. However, existing frailty measures are less appropriate for aging persons with IDD, given their pre-existing conditions and limitations. An accumulation of deficits approach, which is now widely used to describe frailty in the general population, may be more suitable for persons with IDD. Frailty measures specific to persons with IDD have not been widely studied.

Methods: Using pre-determined criteria, a frailty index (FI) specific to persons with IDD was developed based on items in the Resident Assessment Instrument – Home Care (RAI-HC), and using the assessments of 7,863 individuals with IDD in Ontario (aged 18–99 years) admitted to home care between April 1st, 2006 and March 31st, 2014. FI scores were derived by dividing deficits present by deficits measured, and categorized into meaningful strata using stratum-specific likelihood ratios. A multinomial logistic regression model identified associations between frailty and individual characteristics.

Results: The resulting FI is comprised of 42 deficits across five domains (physiological, psychological, cognitive, social and service use). The mean FI score was 0.22 (SD = 0.13), equivalent to 9 deficits. Over half of the cohort was non-frail (FI score < 0.21), while the remaining were either pre-frail (21.1%, FI score between 0.21 and 0.30) or frail (27.1%, FI score > 0.30). Controlling for individual characteristics, women were more likely to be frail compared to men (OR = 1.39, 95% CI: 1.23–1.56). Individuals who were frail were significantly more likely to have a caregiver who was unable to continuing caring (OR = 1.86, 95% CI: 1.55–2.22) or feeling distressed (OR = 1.54, 95% CI: 1.30–1.83). Living with a family members was significantly protective of frailty (OR = 0.35, 95% CI: 0.29–0.41), compared to living alone.

Conclusions: Using the FI to identify frailty in adults with IDD is feasible and can be incorporated into existing home care assessments. This could offer case managers assistance in identifying at-risk individuals. Future analyses should evaluate this measure's ability to predict future adverse outcomes.

Keywords: Frailty, Intellectual disability, Developmental disability, Accumulation of deficits, Home care, RAI-HC, Aging

* Correspondence: helene.kuntz@queensu.ca
[2]Department of Public Health Sciences, Queen's University & Kingston, 191 Portsmouth Avenue, Kingston, Ontario, Canada K7M 8A6
Full list of author information is available at the end of the article

Hogan et al. BMC Geriatrics 2012, 12:56
http://www.biomedcentral.com/1471-2318/12/56

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RESEARCH ARTICLE Open Access

Comparing frailty measures in their ability to predict adverse outcome among older residents of assisted living

David B Hogan[1,2], Elizabeth A Freiheit[2], Laurel A Strain[3], Scott B Patten[2], Heidi N Schmaltz[1], Darryl Rolfson[4] and Colleen J Maxwell[2,5,6*]

Abstract

Background: Few studies have directly compared the competing approaches to identifying frailty in more vulnerable older populations. We examined the ability of two versions of a frailty index (43 vs. 83 items), the Cardiovascular Health Study (CHS) frailty criteria, and the CHESS scale to accurately predict the occurrence of three outcomes among Assisted Living (AL) residents followed over one year.

Methods: The three frailty measures and the CHESS scale were derived from assessment items completed among 1,366 AL residents (aged 65+) participating in the Alberta Continuing Care Epidemiological Studies (ACCES). Adjusted risks of one-year mortality, hospitalization and long-term care placement were estimated for those categorized as frail or pre-frail compared with non-frail (or at high/intermediate vs. low risk on CHESS). The area under the ROC curve (AUC) was calculated for select models to assess the predictive accuracy of the different frailty measures and CHESS scale in relation to the three outcomes examined.

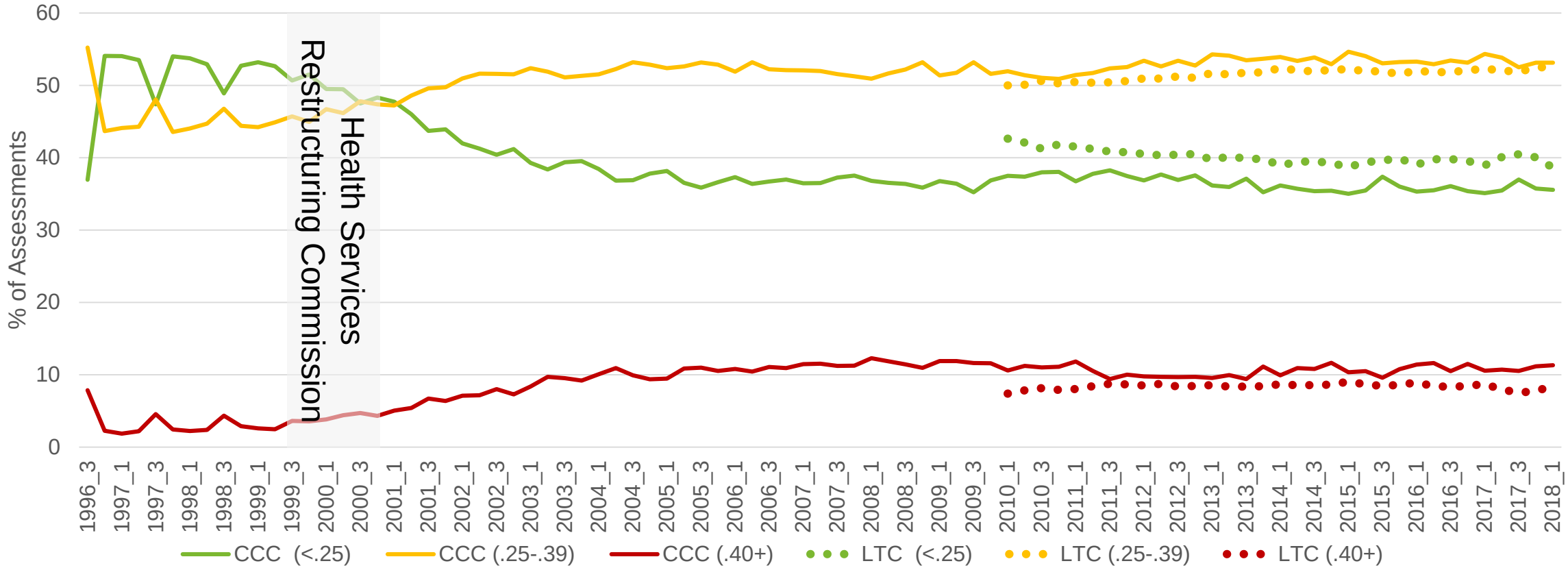
Results: Frail subjects defined by the three approaches and those at high risk for decline on CHESS showed a statistically significant increased risk for death and long-term care placement compared with those categorized as either not frail or at low risk for decline. The risk estimates for hospitalization associated with the frailty measures and CHESS were generally weaker with one of the frailty indices (43 items) showing no significant association. For death and long-term care placement, the addition of frailty (however derived) or CHESS significantly improved on the AUC obtained with a model including only age, sex and co-morbidity, though the magnitude of improvement was sometimes small. The different frailty/risk models did not differ significantly from each other in predicting mortality or hospitalization; however, one of the frailty indices (83 items) showed significantly better performance over the other measures in predicting long-term care placement.

Conclusions: Using different approaches, varying degrees of frailty were detected within the AL population. The various approaches to defining frailty were generally more similar than dissimilar with regard to predictive accuracy with some exceptions. The clinical implications and opportunities of detecting frailty in more vulnerable older adults require further investigation.

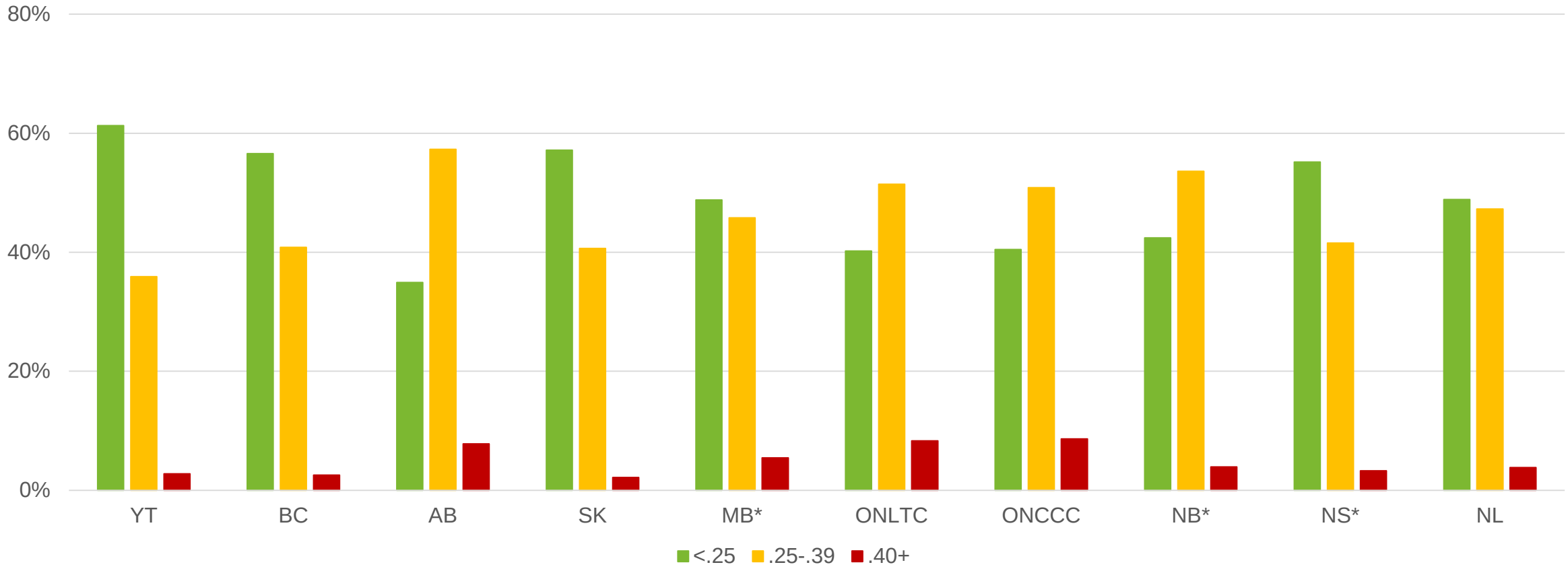
Keywords: Frailty, Predictive accuracy, Assessment, Assisted living

* Correspondence: colleen.maxwell@ualberta.ca
[2]Department of Community Health Sciences, University of Calgary, 3rd Floor TRW, 3280 Hospital Drive NW, Calgary, AB, Canada
[5]Schools of Pharmacy and Public Health & Health Systems, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada
Full list of author information is available at the end of the article

FI Scores in Ontario Complex Continuing Care Hospitals (n=662,946) & Long Term Care Homes (n=3,223,459) over Time



Distribution of FI Scores in LTC & CCC by Province/Territory, 1996-2018 (n=5,044,480 assessments)



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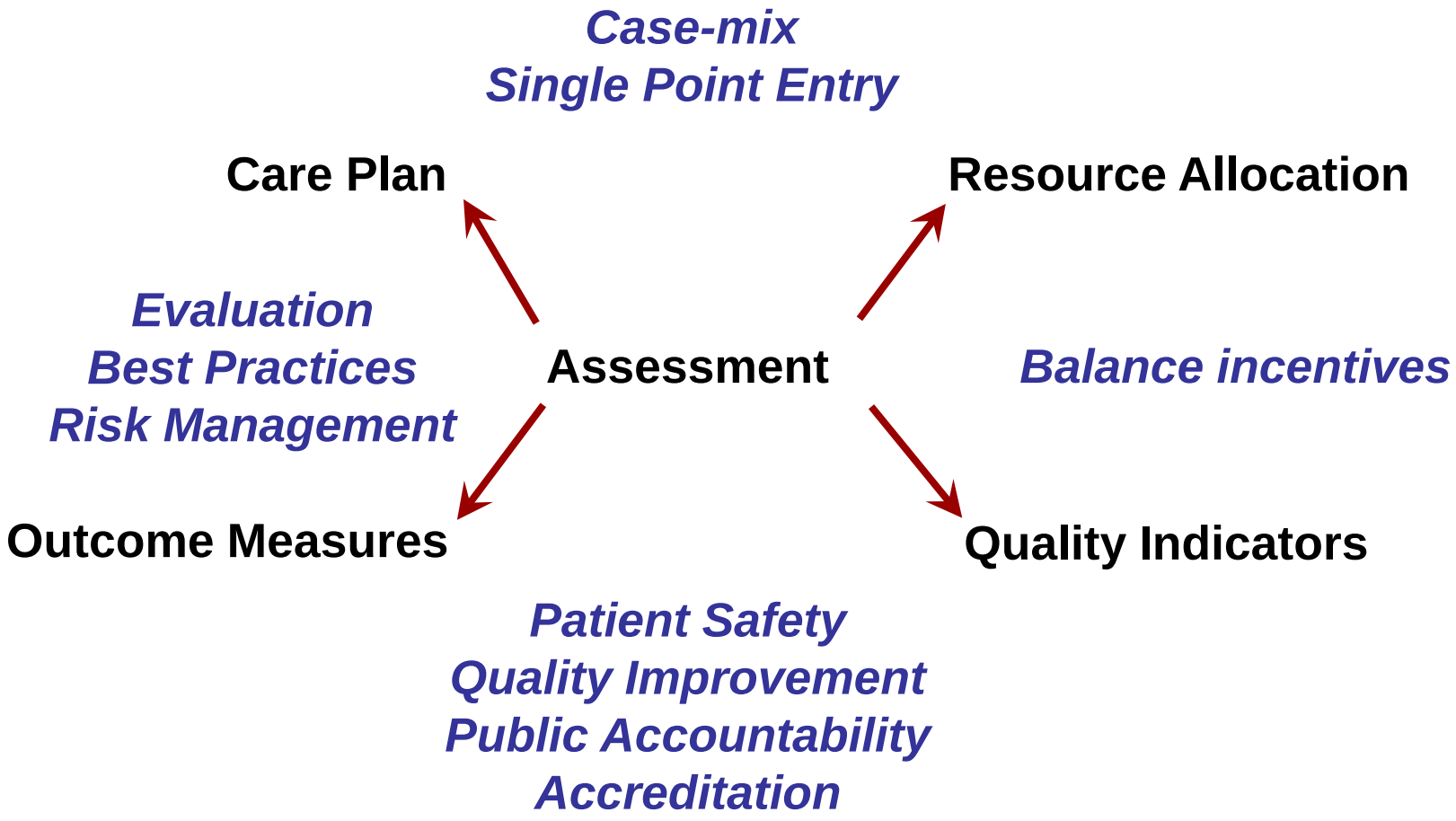
Applications of interRAI's Assessment Instruments:

One assessment … multiple applications



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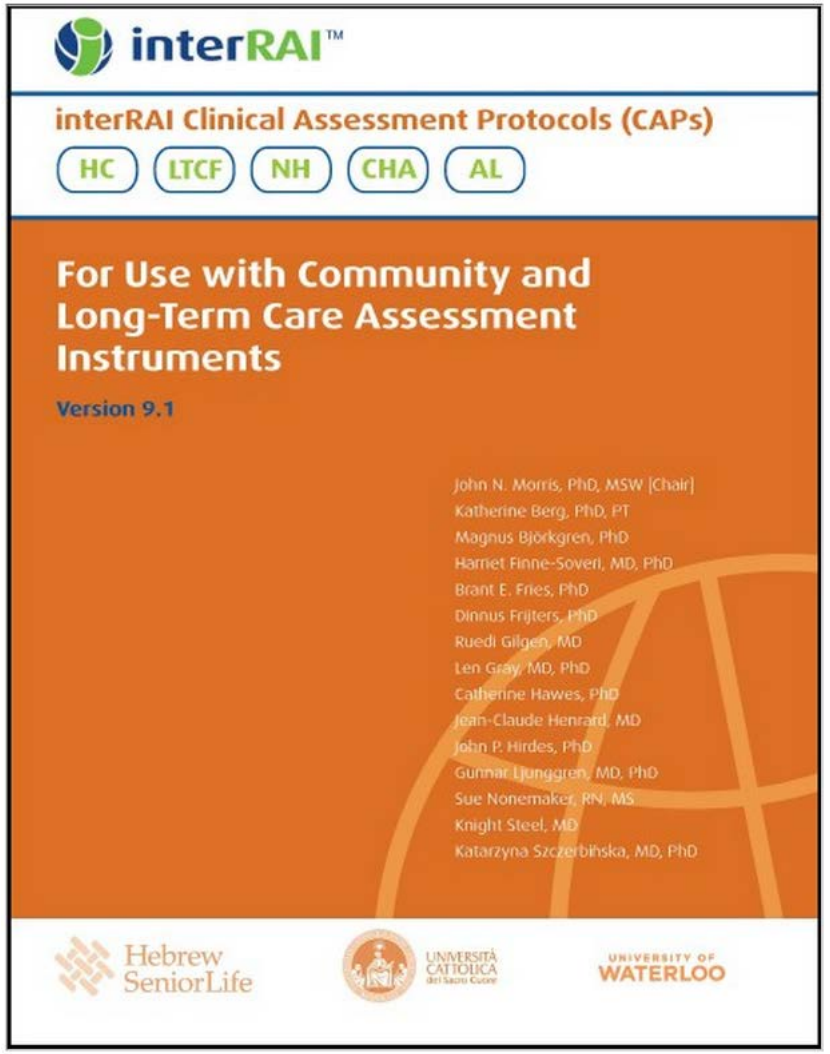
interRAI Clinical Assessment Protocols (CAPs)

Clinical tools to identify

- Need
- Risk of adverse change/event
- Potential for improvement



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interRAI CAPs for Nursing Homes, Home & Community Care

- **Functional Performance**
  - Physical activities promotion
  - Instrumental activities of daily living
  - Home environment
  - Institutional risk
  - Physical restraints
- **Cognition/Mental Health**
  - Cognitive loss
  - Delirium
  - Communication
  - Mood
  - Behaviour
  - Abusive relationships
- **Clinical Issues**
  - Falls
  - Pain
  - Pressure Ulcer
  - Cardiorespiratory conditions
  - Undernutrition
  - Dehydration
  - Feeding tube
  - Prevention
  - Appropriate medications
  - Tobacco & alcohol use
  - Urinary incontinence
  - Bowel conditions
- **Social Life**
  - Activities
  - Informal support
  - Social relationships

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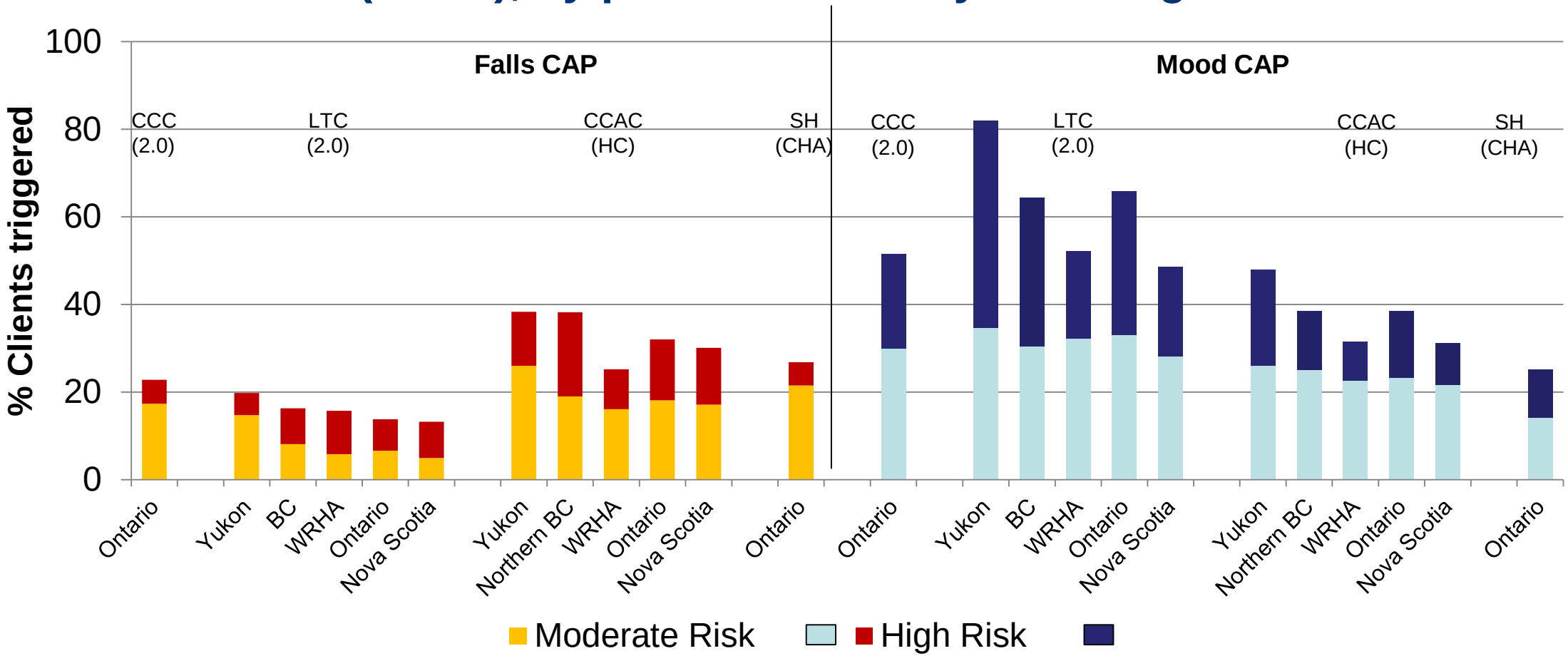
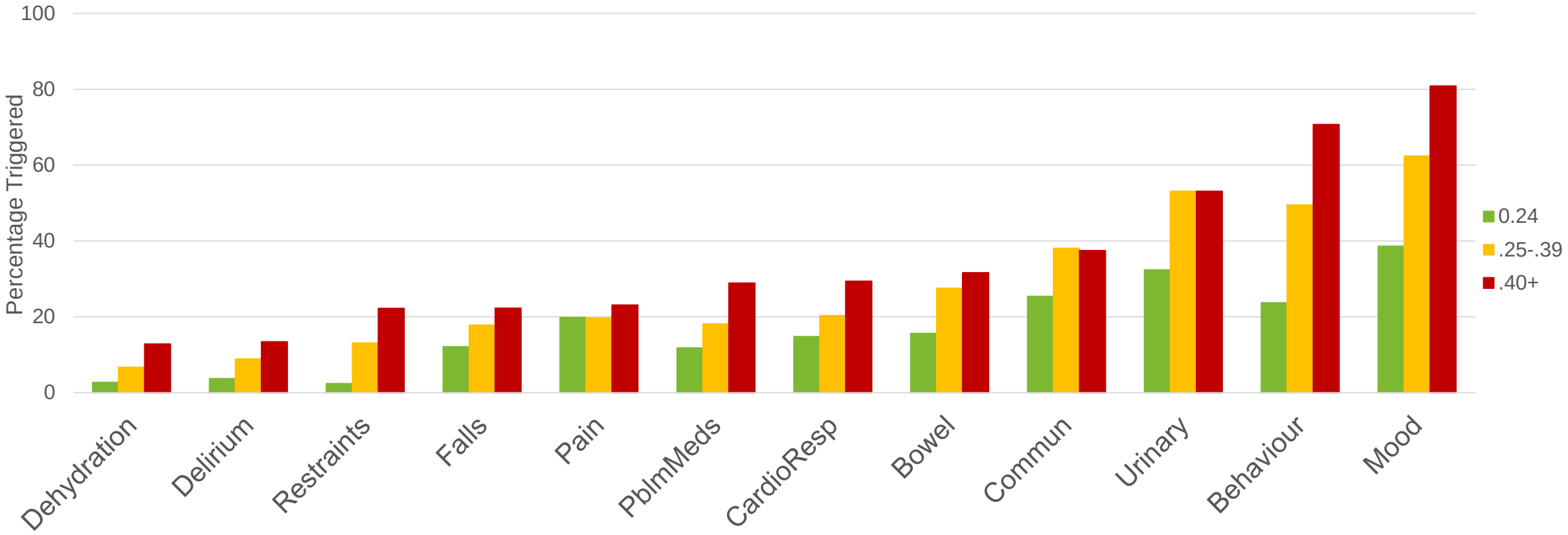
Triggering rates for two multi-level interRAI Clinical Assessment Protocols (CAPs), by province/territory & setting



interRAI Clinical Assessment Protocol (CAP) Triggering Rates by FI Score among LTC Residents, 9 Provinces/Territories (n=2,266,402 admission/annual assessments)



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PLOS ONE

Use of the interRAI CHESS Scale to Predict Mortality among Persons with Neurological Conditions in Three Care Settings

John P. Hirdes[1]*, Jeffrey W. Poss[1], Lori Mitchell[2], Lawrence Korngut[3], George Heckman[1]

1 School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada, 2 Winnipeg Regional Health Authority, Winnipeg, MB, Canada, 3 Department of Clinical Neurosciences, University of Calgary, Calgary, AB, Canada

Abstract

Background: Persons with certain neurological conditions have higher mortality rates than the population without neurological conditions, but the risk factors for increased mortality *within* diagnostic groups are less well understood. The interRAI CHESS scale has been shown to be a strong predictor of mortality in the overall population of persons receiving health care in community and institutional settings. This study examines the performance of CHESS as a predictor of mortality among persons with 11 different neurological conditions.

Methods: Survival analyses were done with interRAI assessments linked to mortality data among persons in home care (n = 359,940), complex continuing care hospitals/units (n = 88,721), and nursing homes (n = 185,309) in seven Canadian provinces/territories.

Results: CHESS was a significant predictor of mortality in all 3 care settings for the 11 neurological diagnostic groups considered after adjusting for age and sex. The distribution of CHESS scores varied between diagnostic groups and within diagnostic groups in different care settings.

Conclusions: CHESS is a valid predictor of mortality in neurological populations in community and institutional care. It may prove useful for several clinical, administrative, policy-development, evaluation and research purposes. Because it is routinely gathered as part of normal clinical practice in jurisdictions (like Canada) that have implemented interRAI assessment instruments, CHESS can be derived without additional need for data collection.

Citation: Hirdes JP, Poss JW, Mitchell L, Korngut L, Heckman G (2014) Use of the interRAI CHESS Scale to Predict Mortality among Persons with Neurological Conditions in Three Care Settings. PLoS ONE 9(6): e99066. doi:10.1371/journal.pone.0099066

Editor: Ulrich Thiem, Marienhospital Herne - University of Bochum, Germany

Received September 30, 2013; **Accepted** May 9, 2014; **Published** June 10, 2014

Funding: Funding for the study was provided by the Public Health Agency of Canada, Project #6271-15-2010/3970773. Funding was also provided for the Ontario Home Care Research and Knowledge Exchange Chair (to JPH) through the Ontario Ministry of Health and Long Term Care. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

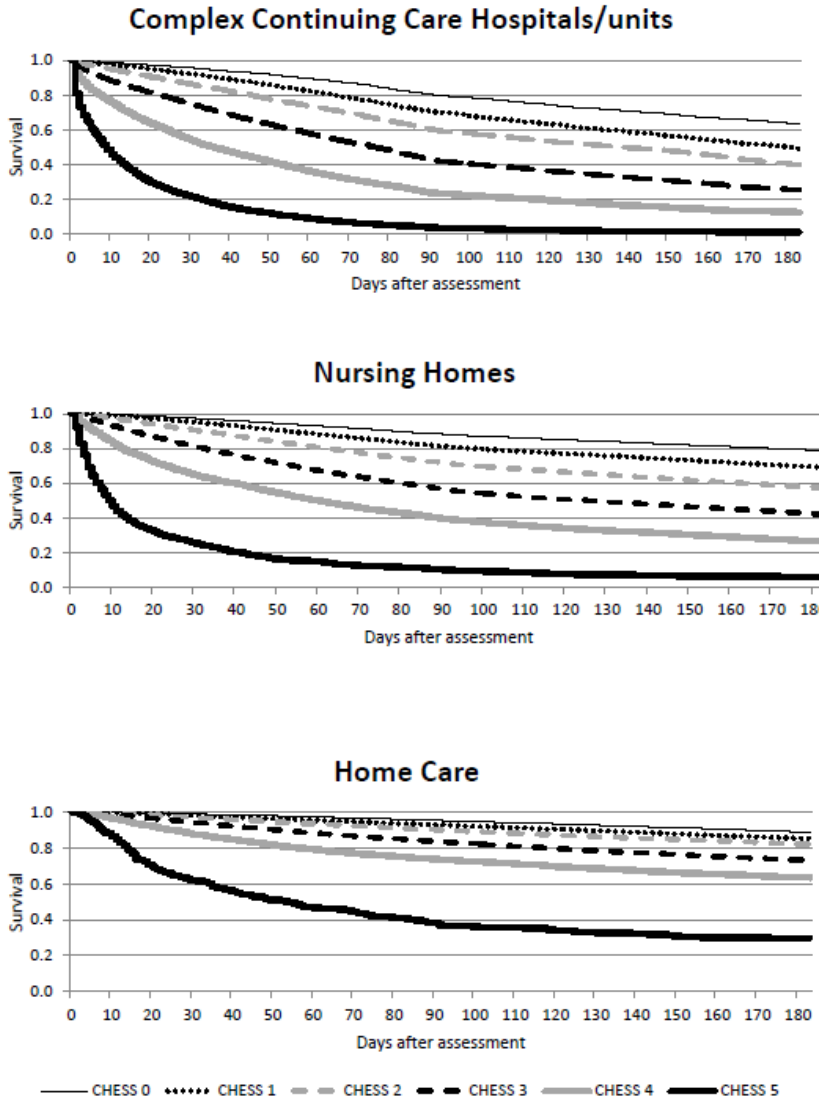
Competing Interests: The authors have declared that no competing interests exist.

* E-mail: hirdes@uwaterloo.ca

Introduction

The World Health Organization estimates that neurological conditions account for about 12% of global deaths and about 14% of years of healthy life lost to death [1]. For many developed nations, neurological deaths have gained prominence in relation to total mortality in the last three decades [2]. Certain neurological conditions (e.g., multiple sclerosis, stroke, TIA, parkinsonism) are associated with higher risks of mortality rates compared with persons without those conditions [3,4]; however, the risk factors for increased mortality *within* diagnostic groups are less well understood. Algorithms to predict mortality have been developed specifically for persons with ALS [5,6], Parkinsons disease [7] and Traumatic Brain Injury [8] using a variety of functional, clinical, and laboratory based indicators. Although some disease-specific methods appear to perform well at predicting survival times, these algorithms are often not applicable across neurological conditions or to non-neurological populations. In addition, the indicators employed in these algorithms are often not readily available in existing medical records.

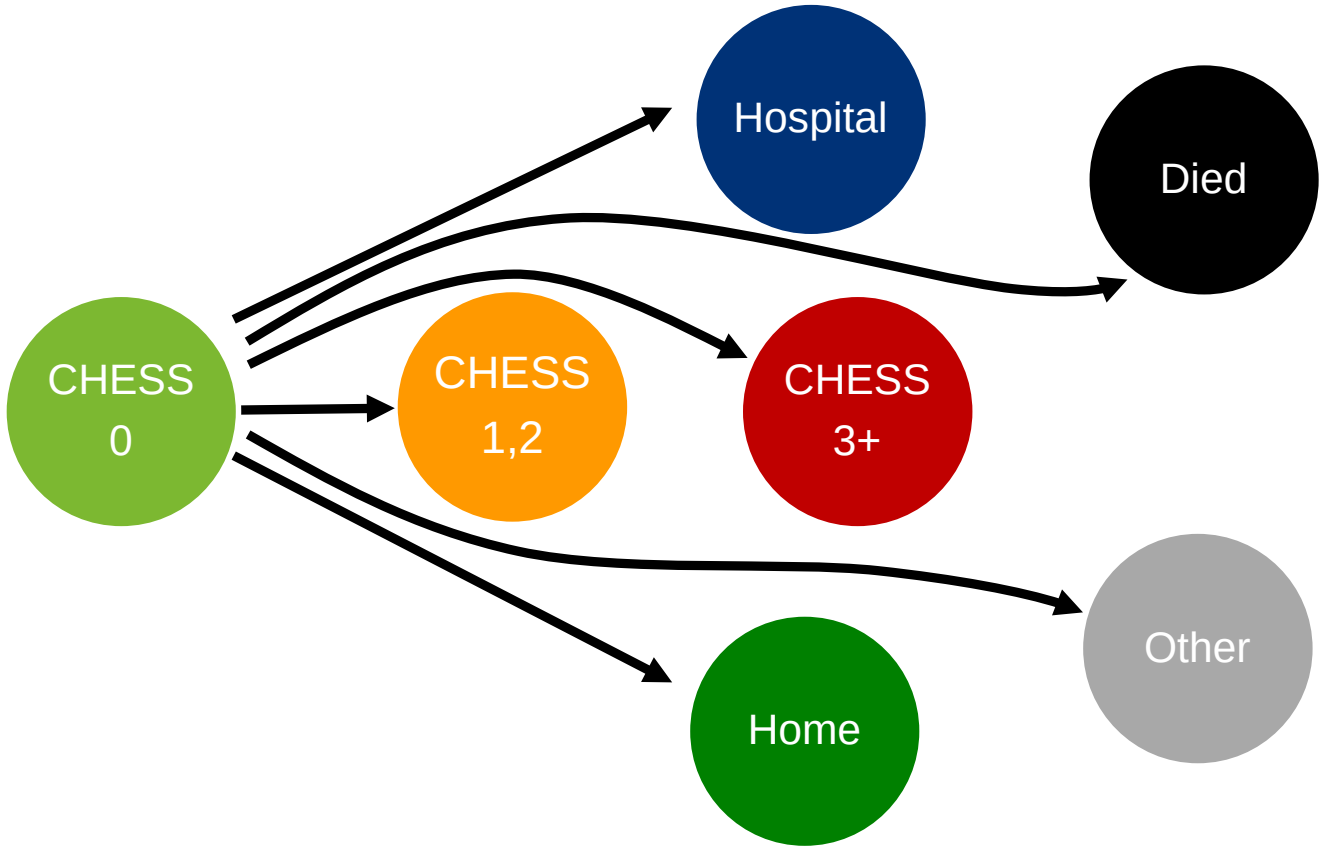
The Changes in Health, End-stage disease, and Signs and Symptoms (CHESS) scale has been shown to predict mortality, health service use, and caregiver distress in the overall populations of persons receiving care in home care, post-acute, nursing home and palliative care settings [9–14]. CHESS is a summary measure based on a count of decline in Activities of Daily Living (ADL); decline in cognition; symptoms such as weight loss, shortness of breath, and edema; and clinician ratings of a prognosis of less than six months. Although counts of deficits [15–17] can be useful indicators of frailty in older populations, CHESS has been shown to be a stronger predictor of time to adverse outcomes in home care clients than the Frailty Index [13]. CHESS scores are standardized algorithms obtained from items embedded in the interRAI assessment instruments, which have been adopted across the continuum of care in several countries including Canada [18–19]. As a result, persons of different ages receiving care in different



Multistate Transition Model for Nursing Home Residents

Effect of: X
Controlling for:

- Age
- Sex
- Marital status
- Day of stay at ax
- Facility size
- Province
- ADL Hierarchy
- Cognitive Performance
- Physician visits
- COPD
- Pneumonia
- Diabetes
- Arthritis
- Renal failure
- Urinary tract infection
- Alz & Related Dementia
- Heart Failure
- Cancer
- Depression
- Advanced directives DNR
- Advanced directives DNH



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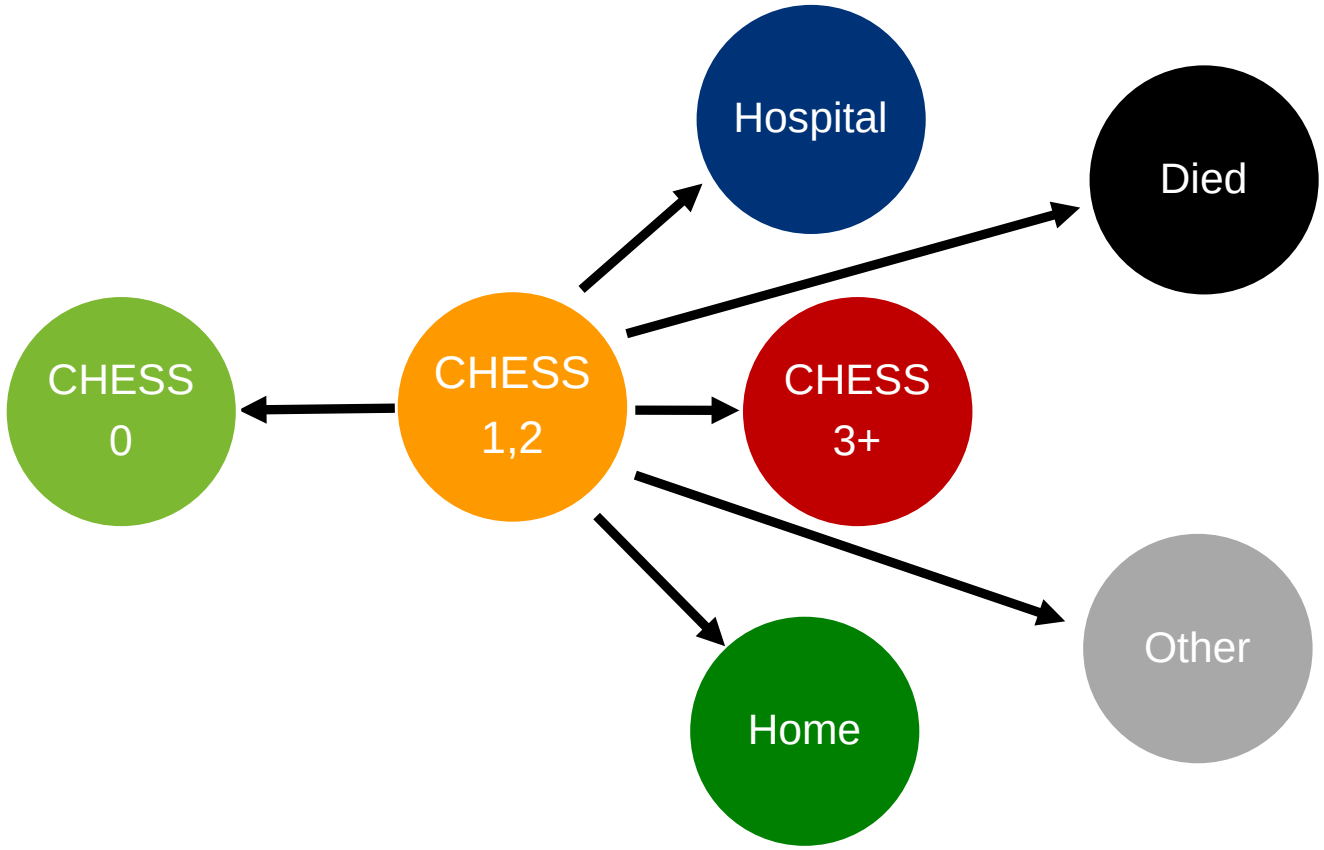

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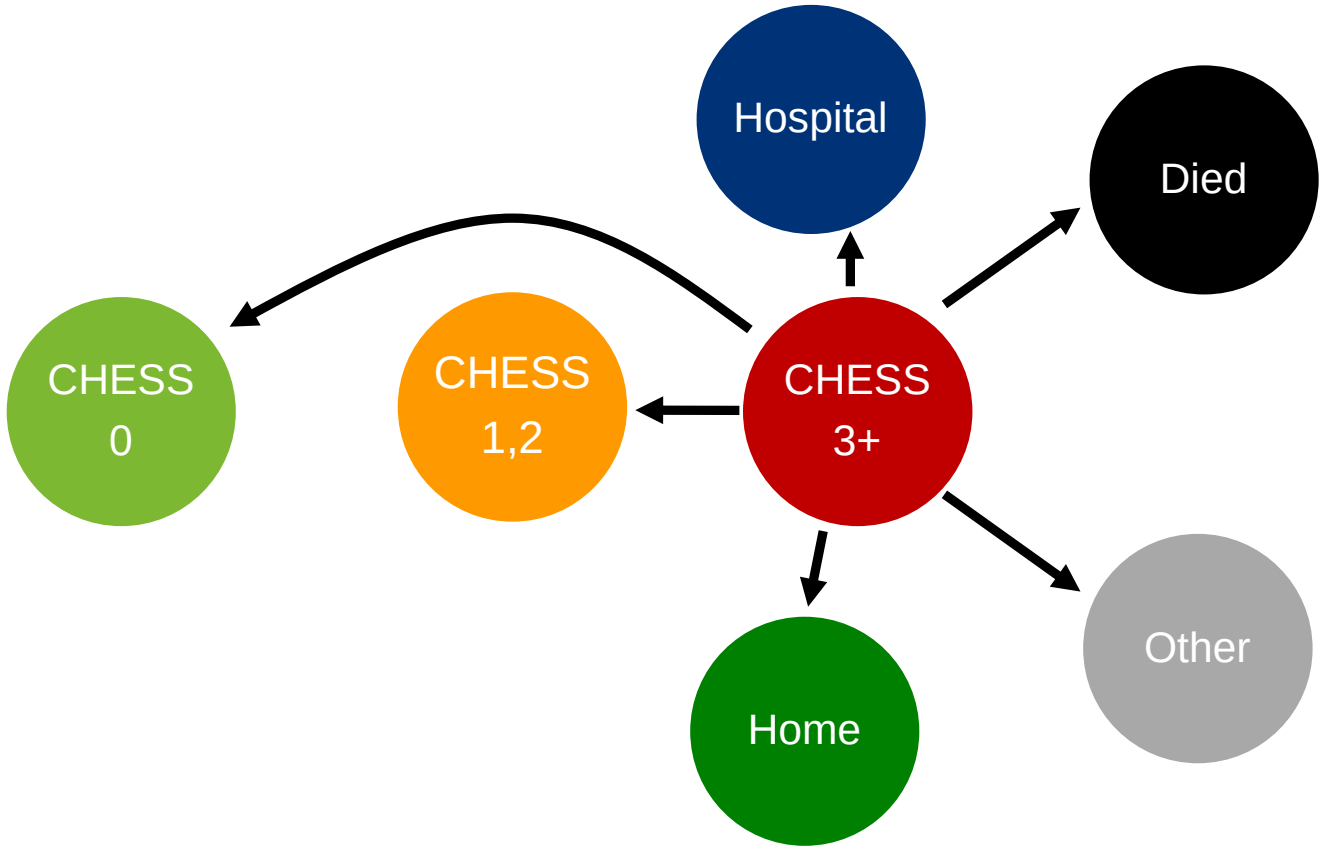

Multistate transition model for nursing home residents:

Adjusted odds ratios for advanced directives (ref=not present), Nursing homes in Ontario, BC & Alberta

		Transitions at follow-up (T_2)						
		Remained in Nursing Home CHESS Score			Admitted to Hospital	Died	Discharged Other Setting	Discharged Home
		0	1-2	3+				
Do Not Hospitalize (ref=Not Present)								
CHESS Score at baseline (T_1)	0	--	1.04 (1.02-1.07)	1.10 (1.03-1.19)	0.67 (0.65-0.69)	1.48 (1.38-1.58)	ns	ns
	1-2	0.92 (0.90-0.95)	--	1.07 (1.03-1.12)	0.63 (0.61-0.65)	1.46 (1.40-1.52)	ns	ns
	3+	0.76 (0.68-0.85)	0.81 (0.76-0.87)	--	0.47 (0.43-0.52)	1.48 (1.37-1.60)	ns	ns
Do Not Resuscitate (ref=Not Present)								
CHESS Score at baseline (T_1)	0	--	1.08 (1.05-1.11)	1.32 (1.21-1.45)	0.90 (0.87-0.92)	1.36 (1.25-1.49)	0.82 (0.72-0.94)	0.58 (0.51-0.65)
	1-2	0.91 (0.88-0.94)	--	1.19 (1.12-1.26)	0.82 (0.80-0.85)	1.38 (1.30-1.47)	0.85 (0.74-0.98)	0.55 (0.48-0.63)
	3+	0.75 (0.64-0.86)	0.85 (0.77-0.95)	--	0.63 (0.57-0.71)	ns	ns	0.53 (0.32-0.87)

Multistate transition model for nursing home residents:

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Advanced Directives in LTC

- Advanced directives are associated with
  - transitions from nursing home to hospital, death, transfer to other settings, discharge home
  - transitions in health among those who stayed in LTC
- Bottom line, advanced directives have a meaningful role in outcomes for persons in LTC
- Current CFN funded project: intervention study to take a systematic approach to advanced care planning in LTC to improve end of life care
  - Lead researchers: Garland and Heckman

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Better t**A**rgeting, **B**etter outcomes for frail **EL**derly patients

ADVANCE CARE PLANNING

Background

- Canadians in general have poor knowledge and engagement in Advanced Care Planning (ACP)
- Care decisions at end of life often driven by unprepared families and often discordant with resident wishes
- Systematic approaches to ACP have shown benefits

Objective

- Starting with proven approaches to ACP, and with stakeholder engagement, we aimed to develop and evaluate an intervention to support ACP discussions and demonstrate that it can be implemented in a scalable, sustainable way across provinces.

- Cluster RCT in 24 homes: Ontario, Alberta, Manitoba

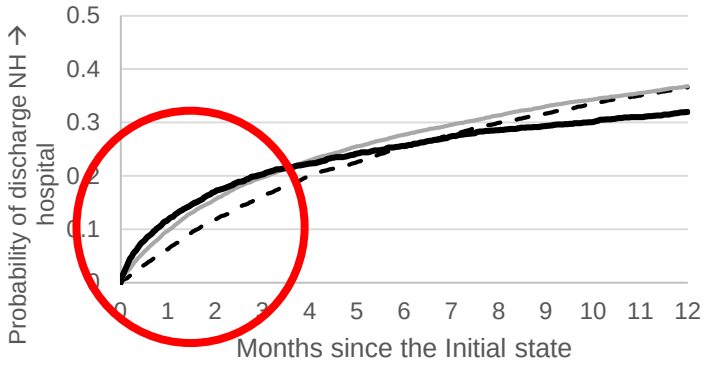
Target higher risk residents

- Any of these 4 criteria (from MDS/interRAI LTCF):
  - CHESS score 3-5
  - Heart Failure
  - Cancer
  - Leave >25% of food uneaten

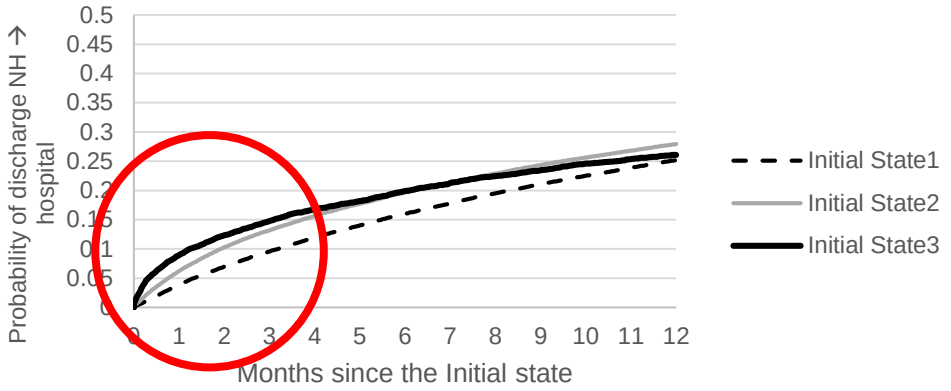
- High event rates early post-admission and over the year

Cumulative Incidence Function plots for 1-year hospitalization and mortality in long term care by admission CHESS score, Ontario, Alberta and BC

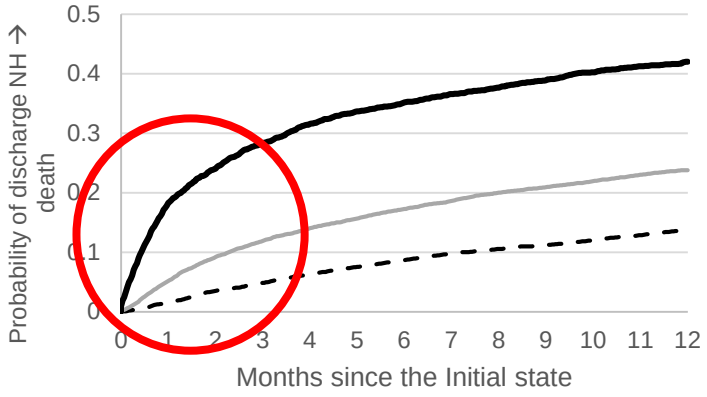
a) Hospitalization: Residents with Heart Failure



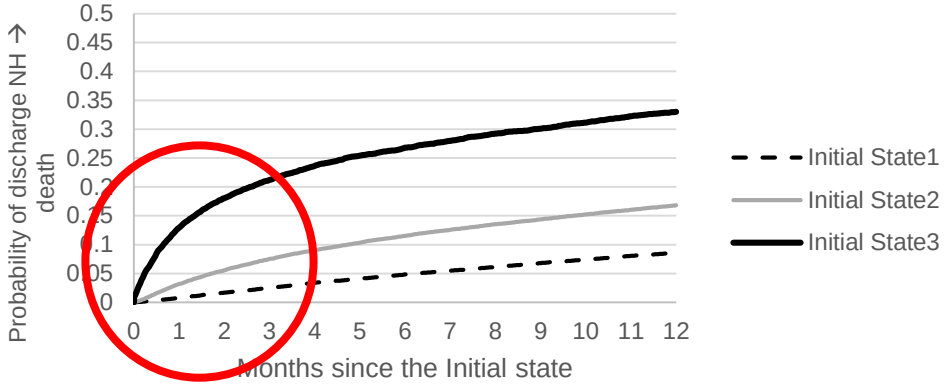
b) Hospitalization: Residents without Heart Failure



c) Death in NH: Residents with Heart Failure

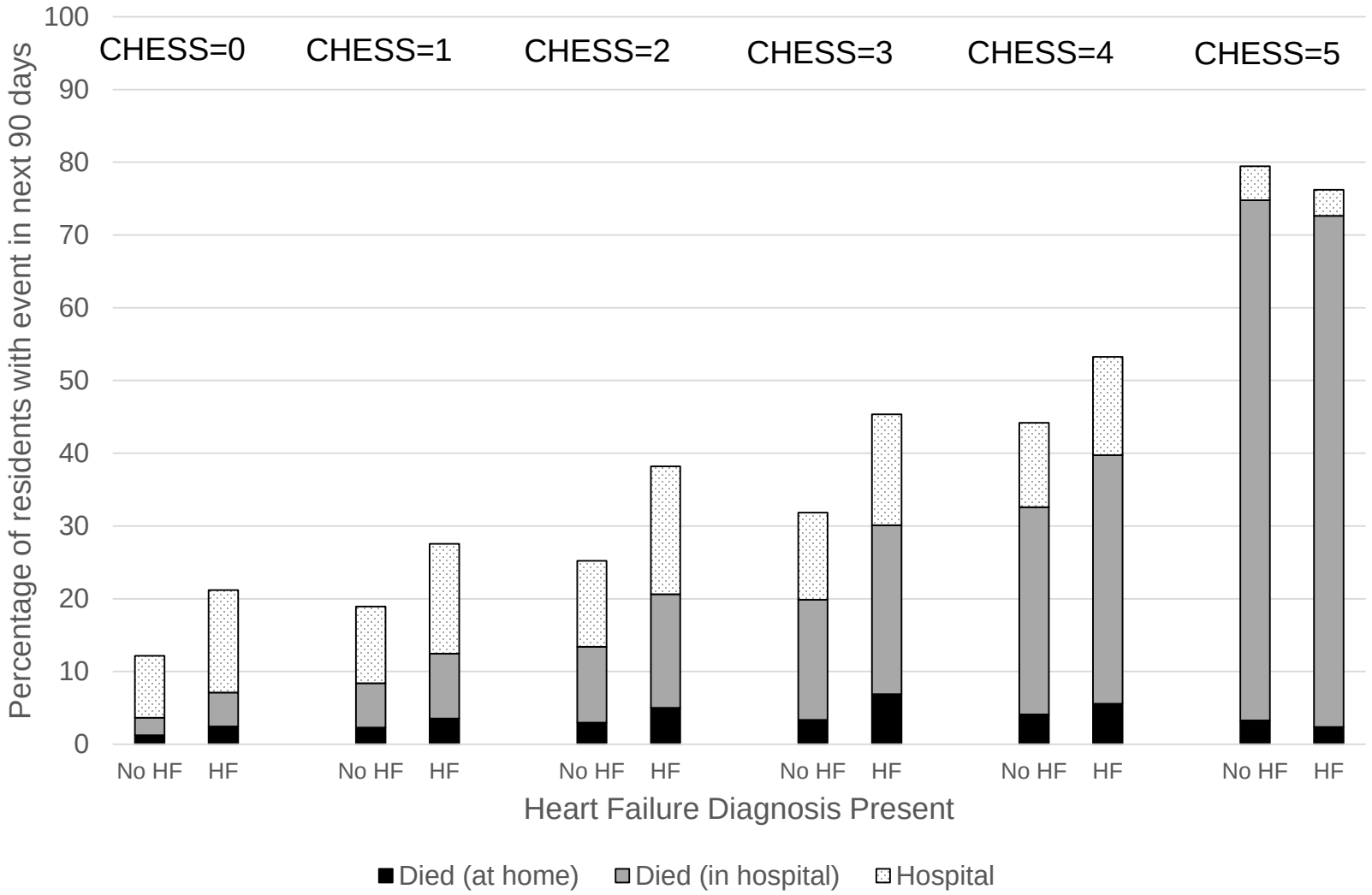


d) Death in NH: Residents without Heart Failure



Note: risk is highest in first three months

Percentage of nursing home residents who died (in nursing home or hospital) or were admitted to hospital but did not die there within 90 days of admission assessment, by CHESS score at admission, Ontario, Alberta and BC



Activities

- Stakeholder conference held in Sept 2017
- All documentation for the trial completed – workbooks, scripts, protocols, consent forms
- Ethics approval in Manitoba, Alberta and Ontario
- Trial began in August 2018 in four homes in Manitoba and one in Ontario

Stakeholder meeting

Toronto, September 15, 2017

- Knowledge users: 24 homes, ethicists, patients & caregivers (4)
- Workshops and breakout sessions (3) followed by whole group discussions held on *Gaps in Knowledge* and *Treatment options in context of achievable goals of therapy*
- Analysis of data was used to build documentation and the knowledge transfer intervention
- Planning manuscript for submission to a peer-reviewed journal

Designing intervention

- **Stakeholder meeting instrumental in designing intervention**
  - Despite different ethical and regulatory frameworks, consistent “pitfalls” in the ACP process exist across Provinces

- 2 sequential discussions with resident & substitute decision maker (and others)
  - 1st conversation: brief, aimed at CPR and hospitalization status
  - 2nd conversation: more involved discussion of resident specific potential scenarios, using clinical and MDS 2.0 indicators

- Scalability factors:
  - Supports, does not replace, existing process
  - Uses existing MDS 2.0 information

Status

- We are underway
- Looking for a couple of homes in Ontario
- Interested?