ADDRESSING HEALTH CARE NEEDS FOR FRAIL SENIORS IN CANADA: THE ROLE OF INTERRAI INSTRUMENTS

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Abstract

Fiscal pressure on the Canadian health care system results from rising numbers of frail seniors with multiple concurrent medical co-morbidities and geriatric syndromes. Improving outcomes in such seniors is contingent on a comprehensive geriatric assessment (CGA) to identify strengths and deficits and to facilitate the development of a comprehensive care plan. InterRAI instruments are standardized, reliable, and validated suites of tools to conduct CGAs; they offer several benefits, including helping clinicians identify important health issues among patients, develop appropriate care plans, and monitor patient progess. These instruments also provide several benefits beyond the bedside, including quality indicators to assess care quality, and case-mix classification algorithms to facilitate funding of health services. Finally, interRAI instruments, which are implemented in several health care settings across Canada and abroad, provide a standardized and common language that is compatible with electronic medical records and will facilitate greater integration of the health care system.

Résumé

La pression fiscale sur le système de santé canadien résulte de l'augmentation du nombre de personnes âgées fragiles souffrant de multiples comorbidités et de syndromes gériatriques. L'amélioration du pronostic de ces personnes dépend d'une évaluation gériatrique globale (Comprehensive Geriatric Assessment, CGA) afin d'identifier les capacités préservées et les déficits et de faciliter une prise en charge globale. Les instruments InterRAI représentent une série d'outils standardisés, fiables et validés, permettant de guider l'évaluation gériatrique globale; ils ont de multiples avantages incluant la facilitation de l'identification par le clinicien de conditions médicales importantes chez le patient, le développement de plans de traitement appropriés et le suivi des progrès du patient. Ces instruments ont aussi des avantages au-delà de leur utilité clinique, tels que fournir des indicateurs de qualité et des algorithmes de classification des besoins pour faciliter le processus de financement des soins de santé. Finalement, les outils interRAI, qui sont déjà implantés dans divers secteurs de santé au Canada et ailleurs, représentent un langage standardisé commun compatible avec le dossier médical électronique, ce qui facilitera une meilleure intégration du système de santé.

Much has been stated about the aging of the Canadian population and the resulting impact on health care spending. In 2011, persons aged 65 years and over accounted for 14.1% of the Canadian population, a proportion expected to approach 25% by 2036.[1] However, recent evidence confirms that rising health care spending results less from aging per se, but rather from the growing burden of chronic diseases among seniors.[2] At least three quarters of Canadians over the age of 65 years report having at least one chronic condition, and over 40% have three or more chronic conditions.[2,3] Multimorbidity (the coexistence of multiple chronic diseases) in seniors has been associated with greater health care utilization and poorer health status. Management of chronic disease in Canada remains suboptimal due, at least in part, to uncoordinated and fragmented service delivery.[4–6] Comprehensive assessment tools such

as the interRAI family of instruments represent a valuable source of evidence to inform clinician responses to multimorbidity and frailty in seniors. At the individual level these assessments can help to improve care planning and outcomes, and at the health system level they can lead to greater integration and efficiency of services.

Frailty and Multimorbidity

Frailty is a state of increased physiologic vulnerability that arises from decreased reserve across multiple physiological systems.[7] Features may include weakness, weight loss, reduced activity, falls, and cognitive impairment, resulting in loss of independence and ultimately death.[7] Frailty most often, but not exclusively, affects seniors. Frailty is usually associated with chronic disease and multimorbidity tends to confer a greater frailty risk.[7] However, most persons with chronic diseases are not frail, and thus a simple count of International Classification of Diseases diagnostic codes is insufficient to explain why some seniors experience poor outcomes while others continue to age successfully.[7] Other factors must be considered.

The Health and Retirement Study surveyed 11,093 Americans 65 years and over and residing in a variety of community and residential care settings.[8] This study demonstrated that the *geriatric syndromes*, including sensory impairment, cognitive impairment, falls, urinary incontinence, dizziness, and weight loss, were as common as specific co-morbidities such as diabetes, cancer, and heart disease, and were also associated with a greater burden of disability. Similarly to multimorbidity, the prevalence of multiple geriatric syndromes also increased with age. These data suggest that considering the concurrent burden of geriatric syndromes in addition to that of multimorbidity may permit a more accurate assessment of the health status and prediction of risk for frail seniors.

Table 1. Overview of interRAI Instruments and Features

Instruments

AC (Acute Care)

CHA (Community Health Assessment) with supplements:
- AL (Assisted Living)
- FS (Functional Supplement)
- DB (Deaf-blind)
- MH (Mental Health)

ChYMH (The Child and Youth Suite of Instruments) with supplement:
- Child and Youth Intellectual and Developmental Disability

CMH (Community Mental Health)

HC (Home Care)

ID (Intellectual Disability)

LTCF (Long Term Care Facilities)

CF (Mental Health for Correctional Facilities)

MH (Mental Health for In-patient Psychiatry)

PC (Palliative Care)

PAC (Post Acute Care)

Screeners:
- AUS (Assessment Urgeny Algorithm)
- CA (Contact Assessment)
- BMHS (Brief Mental Health Screener)
- ESP (Emergency Screener for Psychiatry)

Commonly Used Embedded Scales and Algorithms

Aggressive Behaviour Scale (ABS)

Short and Long Activities of Daily Living (ADL) scales

Anhedonia

Changes in Health, End-Stage Disease, Signs, and Symptoms (CHESS – health instability)

CAGE (for substance use)

Cognitive Performance Scale (CPS)

Depression Rating Scale (DRS)

Depressive Severity Index (DSI)

Instrumental ADL (IADL) performance and capacity scales

Mania Scale

MAPLe (Method for Assigning Priority Levels – based on risk of poor outcomes)

Pain Scale

Positive Symptoms Scale (PSS)

Risk of Harm to Others (RHO)

Self-Care Index (SCI)

Severity of Self-harm (SoS)

CAPs for Community and LTC Instruments

Functional Performance
- Physical activities promotion
- ADLs
- IADLs
- Home environment optimization
- Physical restraints
- Institutionalization risk
- Delirium
- Communication

Cognition/Mental Health
- Cognitive loss
- Delirium
- Communication
- Mood
- Behaviour
- Abusive relationship

Social Life
- Social relationships
- Activities
- Informal supports

Clinical Issues
- Pain
- Falls
- Cardiorespiratory conditions
- Pressure ulcers
- Undernutrition
- Feeding tube
- Dehydration
- Appropriate medications
- Urinary incontinence
- Bowel conditions
- Prevention
- Tobacco and alcohol use

Indeed, among several proposed operational definitions of frailty, a commonly used approach is to consider frailty as the result of accumulated deficits, including symptoms, signs, disabilities, abnormal clinical measures and illnesses.[9–11] Under this approach, deficits not only include the presence of co-morbidities such as heart failure or diabetes, but also the presence of geriatric syndromes and other conditions poorly captured by usual diagnostic classifications, such as gait abnormalities or the presence of primitive reflexes.[12] Frailty indices reflecting the burden of deficits affecting an individual have been shown to be more powerful predictors of poor outcomes than chronological age.[10–12] Several frailty indices have been proposed, some counting as many as 70 possible deficits.[12,13]

Yet, even such models are insufficient to fully identify all factors related to poor outcomes, and which must be addressed for proper care planning. These include economic and demographic factors, lifestyle choices, informal support networks, social isolation, and caregiver stress.[14] The consideration of all of these factors can be operationalized in a procedure known as the Comprehensive Geriatric Assessment (CGA), which is a *multidimensional interdisciplinary diagnostic process focused on determining a frail older person's medical, psychological and functional capacity in order to develop a coordinated and integrated plan for treatment and long-term follow-up.*[14,15] A CGA has two components: comprehensive data collection to identify an individual's strengths and deficits, followed by the development of a comprehensive management plan. Use of the CGA for appropriately targeted frail seniors has been associated with improved prescribing of medications, better quality of life, fewer falls, and reduced rates of hospitalization, institutionalization and death.[16–18] While cost-effectiveness data remain limited, a number of studies suggest that appropriately targeted CGA does not increase, and may reduce, health care expenses.[19–21] First generation CGA relied on the ad hoc assembly of batteries of tools measuring individual domains such as cognition and mood, and selected primarily based on assessor familiarity.[22] While such batteries are likely effective in addressing local needs, lack of standardization has been associated with under-reporting of issues important to frail seniors, redundant documentation of other issues, the creation of barriers to information sharing leading to repeated assessments and inefficiency, and the prevention of system managers from conducting the cross-sectoral program evaluations necessary to understanding how to allocate funding and improve the health care system.[23,24]

Second-Generation Comprehensive Geriatric Assessment with interRAI Instruments

interRAI is a non-profit research network of over 60 health researchers and clinician-scientists from over 30 countries.[25] interRAI develops and maintains an integrated suite of instruments to assess vulnerable persons across multiple care settings (Table 1). These instruments are designed to promote interdisciplinary collaboration, with assessments based on clinical observation. Each instrument consists of an assessment system with individual items, embedded scales, and Clinical Assessment Protocols (CAPs). Items include the following:

- A common core set of about 70 items that is present and uniformly defined in all instruments (e.g., activities of daily living, cognition)
- Over 100 optional items that appear in many, but not all, instruments (e.g., hearing assessment is present in most instruments but not those for mental health)
- Setting-specific specialized items (e.g., assessment of home environment in the interRAI Home Care)

Embedded scales assess the severity of, or the risk of acquiring, various domains or syndromes relevant to geriatric assessment (see Table 1). CAPs are automatically triggered based on the values of individual items and scales, and provide best-practice guidance on the primary care and management of particular clinical problems (see Table 1). These instruments are also accompanied by Quality Indicators, Case-Mix classification algorithms, and specifications for software implementation. A rapid Assessment Urgency Algorithm and brief Contact Assessments have been developed as screening tools to efficiently target individuals most likely to benefit from a CGA.[26]

Clinical Use of interRAI Instruments: An Example from Acute Care

The interRAI AC (Acute Care) instrument was first introduced in 2006, has been extensively field tested and its reliability established.[27–29] The interRAI AC is designed for use in acute care hospitals in order to support effective assessment of hospitalized older persons so that common geriatric syndromes and functional and psychosocial problems that would benefit from treatment are not overlooked.[30] Consider the following case:

Mr. John B. Goode is 83 years old. He was admitted to hospital after he was found on the floor of his living room by his neighbour, who calls on him each morning. He was confused, and unable to give an account of how he had fallen, or how long he had been there. Assessment in the emergency department identified no injury, but he was found to have pneumonia, and he was therefore admitted to the general medical ward and treated with appropriate antibiotics. He was assessed on the ward by a nurse assessor within 48 hours after admission and again at discharge. He made a gradual recovery and was discharged after 9 days to his daughter's home, with a referral to an outpatient geriatric assessment and rehabilitation program.

This case depicts a common scenario, in which an older community-dwelling person with underlying frailty develops an acute medical condition complicated by geriatric syndromes (in this case delirium and a fall). A summary of the interRAI AC assessment is presented in Figure 1 as a Personal Profile that can be automatically generated using software supporting the interRAI AC. In this case, the use of the instrument facilitated the early recognition of multiple other deficits contributing to the patient's overall complexity, including premorbid underlying chronic cognitive impairment and associated difficulties with Instrumental Activities of Daily Living, malnutrition and an increased risk of falls. Furthermore, the assessment identified new concerns, including behavioural and communication problems (likely

Personal Demographic Information

Name: *John B. Goode*
Age: *83 years*
Gender: *male*
Ethnicity and primary language spoken: *Canadian, English*
Marital status: *widowed*
Usual location of residence: *own home*
Lives with: *alone*
Support person available: *yes*
Suitable housing available: *yes*

Diagnoses (at Admission)

Primary diagnosis: *pneumonia*
Present, requiring active treatment: *delirium, dehydration*
Present, monitored but no active treatment: *osteoarthritis, hypertension*

Triggered Clinical Assessment Protocols (at Admission)

- ADL – risk of decline
- ADL – opportunity for improvement
- Delirium – opportunity for improvement
- Cognition
- Nutrition
- Institutional risk

Quality Indicators Triggered

Self-care
Continence

Problems, Scales, and Screeners

Clinical Domain	Premorbid	Admission	Discharge
Cognition, mood and communication			
Cognitive problem present	**Yes**	**Yes**	**Yes**
Dementia Screen	**+ve**	**+ve**	**+ve**
CPS score (/6)	**2**	**3**	**2**
Delirium screen	*	**+ve**	-ve
Delirium scale (/4)	*	**2**	0
Behaviour problem present	No	**Yes**	No
Mood problem present	dnr	dnr	No
Depression screen	dnr	dnr	-ve
Short depression scale (/6)	dnr	dnr	0
Communication scale (/8)	0	2	0
Physical function			
Problem present	**Yes**	**Yes**	**Yes**
ADL hierarchy score (/6)	0	**2**	**1**
Short ADL score (/16)	0	**5**	**2**
IADL Performance (/48)	**25**	*	*
IADL Capacity (/48)	*	*	**30**
ADL Decline Risk	*	**+ve**	*
Mobility and falls			
Mobility problem	No	**Yes**	No
Walking aid	No	No	No
Balance problem	*	**Yes**	No
Recent fall	**Yes**	n/a	No
Falls risk	*	**High**	*
Continence			
Bladder continence problem	No	**Yes**	No
Indwelling catheter	No	**Yes**	No
Bowel continence problem	No	**Yes**	No
Nutrition and swallowing			
Swallowing problem	No	No	No
Nutrition screen	*	**+ve**	*
BMI	*	**17.4**	*
Pain			
Pain present	No	**Yes**	**Yes**
Pain scale (/4)	0	**2**	**1**
Pressure ulcer			
Pressure ulcer present	No	No	No
Pressure ulcer risk	*	-ve	*
General			
Institutional risk	*	**+ve**	*
Readmission risk	*	-ve	*
Advanced directive	No	*	*
Community services received prior to admission	**Yes**	*	*

dnr = patient did not respond to self-reported mood questions. Please refer to Table 1 for a list of abbreviations.
*His clinical domain is not assessed by the interRAI AC in this time period.

Figure 1. Sample clinical profile based on an interRAI AC assessment of a hospitalized senior.

Table 2. Use of interRAI instruments across Canadian jurisdictions

Province/ Territory	RAI 2.0 (Nursing Home)	RAI Home Care	RAI Mental Health	interRAI Contact Assessment	interRAI Community Health Assessment	interRAI Acute Care	interRAI Community Mental Health	interRAI Palliative Care	interRAI Intellectual Disability	interRAI Emergency Screener for Psychiatry	interRAI Emergency Department Screener	interRAI Self-Reported Quality of Life Surveys
NL	M	M	M				M					
PEI												
NS	P	M						M			R	R
NB												
QC												
ON	M	M	M	M	M	R	P	M	P	R	R	R
MB	P	P	P	R							R	R
SK	M	M						P				R
AB	M	M						R				
BC	M	M									R	R
YT	M	M						M				
NT												
NU												

M = mandated implementation complete or underway; P = partial implementation for individual organizations/health regions; R = research or pilot studies only.
Source: Dr. John Hirdes, interRAI Canada.

related to delirium), incontinence, pain, mobility problems, acute decline in basic Activities of Daily Living, as well as an increased risk of subsequent functional decline and institutionalization. The instrument is able to characterize differences in a patient's admission and premorbid function, facilitating accurate prognostication required for planning post-acute and rehabilitation services. The clinical information captured within the interRAI AC can assist with care planning during the hospital stay, improve the comprehensiveness and efficiency of multidisciplinary ward team meetings, identify seniors who might require referral to a specialized geriatric service, increase the efficiency of the geriatric consultation, and facilitate comprehensive, timely discharge planning and seamless transitions of care from one level of care to the next.

interRAI instruments have undergone extensive validity testing and the inter-rater reliability of the various items and scales has been established in several large multinational studies.[24,27,28,31–33] interRAI instruments have been assessed in multiple clinical trials. The effectiveness of using the Home Care instrument for care planning was evaluated in a randomized controlled trial (RCT) with blinded outcome assessment of 187 Italian home care clients.[34] All clients received case management and care planning from the regional integrated community geriatric evaluation unit and their general practitioners. Clients in the intervention group were assessed with the MDS-HC (predecessor to the RAI-HC), whereas control clients were assessed with the Barthel Index, Lawton-Brody and Mini-mental state examinations, with additional information collected when judged necessary by the case manager. The results of the assessments were utilized for planning care interventions, which included physician and nursing care, home support services, and physiotherapy. After a follow-up period of 1 year, intervention clients received more home support and nursing and experienced less functional and cognitive decline. Costs in the intervention group were reduced by 21%, primarily because of fewer hospitalizations. A comprehensive geriatric care planning intervention based on the interRAI Long Term Care Facility (LTCF) in five Dutch residential care homes was compared using a cluster RCT design to usual care in five other homes.[35] Trained nurses assessed residents with the interRAI LTCF. The information collected was used to develop a care plan in collaboration with the resident, family caregivers and family physician, including regular multidisciplinary meetings for the most complex residents. After 6 months of follow-up, there was no difference in the frequency of multidisciplinary meetings or assessments by geriatricians in either group. However, in homes in which care planning was driven by interRAI LTCF assessments, family physicians were more often

involved with ongoing care and residents were more likely to undergo interventions such as medication changes, nursing interventions, referrals to allied health professionals or to other specialists. Overall care quality improved in the intervention homes, as measured by a sum score of 32 risk-adjusted quality indicators, and overall better pain control, reduced frequency of problematic behaviours, and less antipsychotic use. A third RCT, in which the interRAI CHA will be used in the context of a primary care chronic disease management intervention, is underway in the Netherlands.[36] The interRAI AC has been successfully used to facilitate geriatric telemedicine consultations in Australia, where it has been shown to be safe, reliable, efficient and appealing to both patients and clinicians.[37,38] Preliminary data suggest that triage and prognostic judgements rendered by a geriatrician can be as accurate when based on online review of the interRAI AC administered by a trained nurse assessor as they are when the patient is seen at the bedside.[39] In summary, these data suggests that the use of standardized interRAI instruments to conduct CGA can facilitate more optimal and efficient care planning and lead to better patient and system outcomes.

Beyond Clinical Use: System Benefits of interRAI Instruments

In addition to their clinical utility, interRAI instruments offer distinct advantages over first generation instruments, including Quality Indicators, Case-Mix classification algorithms to support payment systems, and a common assessment language to support system integration.[25] First introduced in 1996 in the Complex Continuing Care sector in Ontario, interRAI instruments are in use, or in various states of testing and implementation, across multiple health care settings and in eight Canadian provinces and the Yukon, with the exception of Quebec, New Brunswick, Nunavut, and the Northwest Territories (Table 2). The instruments are most widely used in the home care and long-term care settings, with Ontario recently deploying the interRAI CHA to Community Support Services. The Canadian Institute for Health Information (CIHI) is the repository for interRAI data collected from long-term care, complex continuing care, home care and mental health. These data collected are being extensively used by regional health authorities and ministries of health for administrative purposes, including the public reporting of Quality Indicators, which permits comparisons of care quality across provincial boundaries.[40–42] Algorithms embedded within interRAI systems facilitate decision-support at the individual and organizational levels, including funding of Complex Continuing Care Hospitals in Ontario, and nursing homes in Alberta and Ontario.[43] In contrast to instruments currently use in hospital settings to monitor outcomes and support payment systems, such as the Functional Index Measure (FIM – primarily an ADL scale), interRAI systems not only deliver the same capability but they also provide a wealth of other clinical and administrative measures, without additional cost.[44]

Finally, the widespread implementation of interRAI instruments across Canada presents a significant opportunity to promote greater integration of the Canadian health care system, which has been described as highly fragmented.[6,45] An important characteristic of fragmented health care systems is the limited use of standardized tools, which result in inefficient care transitions and a significant burden of redundant assessment on patients.[46] Various models of care integration have been developed to improve health services for older patients, and evaluative studies have demonstrated improved patient outcomes as well as reductions in hospital admissions and emergency department visits, either without increasing costs or actually reducing them.[45–50] An essential feature of a successfully integrated system includes the adoption and clinical use of standardized assessment instruments.[51–53]

Conclusion

Fiscal pressure on health care systems is primarily driven by the rising burden of multimorbidity and complexity in an aging population. The most complex and frail seniors can benefit from Comprehensive Geriatric Assessment, an interdisciplinary and comprehensive assessment of a frail individual's strengths and problems, followed by the development of a comprehensive management plan. Evidence suggests that targeted CGA can lead to better care planning and outcomes among frail seniors and potentially lower health care costs. Compared to non-standardized ad hoc batteries of assessment tools, interRAI instruments offer several distinct advantages, all for the cost of one instrument:

- Brief screening algorithms to identify individuals most likely to benefit from a CGA
- Facilitation of comprehensive care planning and longitudinal follow-up through embedded scales and CAPs
- Features to support health care system integration, including standardization, comprehensiveness, and compatibility with electronic medical records
- Facilitation of cross-sectoral comparison and program evaluation
- Care Quality Indicators and Case-Mix algorithms to support hospital payments
- Facilitation of high-quality research to improve the care of frail seniors and for continuous improvement of the instruments themselves

Despite broad administrative use, the clinical functionality of interRAI instruments remains significantly underutilized in Canada. Challenges to fully realizing the clinical potential of these instruments include clinician unfamiliarity, privacy concerns that limit information exchange between organizations that use interRAI instruments, and existing care processes that need to be reorganized in order to make efficient use of the instruments and eliminate the collection of redundant clinical data.[20] In mandating the use of these instruments, regional health authorities must provide adequate investments to facilitate their implementation, including ongoing training for clinicians focused on clinical applications, and robust and standardized electronic medical records.[20] With appropriate and targeted investments to adjust these extensively embedded interRAI processes, including optimizing software configurations and paying attention to clinical workflows and clinician training, the full capacity of these tools to target individuals most likely to benefit from a CGA,

Table 3. Potential Benefits of interRAI Instruments

To clinicians	Facilitate improved patient outcomes
	Access to comprehensive, standardized and reliable clinical information to improve efficiency of care and promote inter-professional collaboration through a common assessment language
	Improve the efficiency of comprehensive geriatric assessment and geriatric consultation by reducing time required to perform the assessment
	Clinical Assessment Protocols to inform care planning
	Embedded scales to assist in diagnosis and monitor patient progress
	Risk assessment algorithms to ascertain patient-level risk and inform management urgency
	Assessment of the quality of care provided
	Ability to assess reliably at a distance/online
To organizations	Facilitate earlier identification of geriatric syndromes and targeting of interventions to improve outcomes in high-risk seniors
	Case-mix algorithms to more accurately and appropriately target resources
	Assessment of the quality of care provided
	Promote efficient use of resources
To the health care system	Facilitate system integration though standardized and common assessment systems compatible with electronic medical records
	Standardized platform for telemedicine
	Facilitate cross-sectoral comparisons and outcomes measurement
	Improve the efficiency of the health care system and potentially reduce costs
To researchers	Access to high-quality data on patients who otherwise would typically be excluded from clinical trials
	As CIHI is the Canadian repository for this data, researchers are able to link interRAI data to other health databases

and to drive clinical assessment and care planning could be harnessed and lead to substantial improvements in the effectiveness and efficiency of clinical care of frail seniors across the health care system. It is crucial for Canadian clinicians to be aware of the valuable role that interRAI instruments can have in improving and integrating the care of frail seniors across all health care sectors, and from bedside to boardroom. Some of the potential benefits of interRAI instruments are outlined in Table 3.

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Key Points

- *It is crucial for Canadian clinicians to be aware of the valuable role that interRAI instruments can have in improving and integrating the care of frail seniors across all health care sectors.*
- *In mandating the use of these instruments, regional health authorities must provide adequate investments to facilitate their implementation, including ongoing training for clinicians focused on clinical applications, and robust and standardized electronic medical records.*
- *interRAI instruments are standardized, reliable, and validated suites of tools to conduct CGA and which offer several benefits, including helping clinicians identify important health issues among patients, develop appropriate care plans, and monitor patient progress.*
- *interRAI instruments, which are implemented in several health care settings across Canada and abroad, provide a standardized and common language compatible with electronic medical records and that will facilitate greater integration of the health care system.*

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