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The Future of Assessment:
Implications for the health of aging populations

John P. Hirdes, PhD FCAHS

Professor

School of Public Health and Health Systems

University of Waterloo

CANADA

Agenda

- History of assessment
  - Pre-history
  - First Generation
  - Second Generation
  - Integrated Systems of Assessment

- Future of assessment
  - Near term → what is achievable "now"?
  - Longer term view → what new opportunities and challenges lie ahead?

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Butterworths Series on Individual and Population Aging - 1986

WF Forbes

- Founding President Canadian Association and Ontario Gerontology Association

- Vice-President of Gerontological Society of America

- Mentor and PhD Supervisor

INSTITUTIONALIZATION OF THE ELDERLY IN CANADA

William F. Forbes / Jennifer A. Jackson / Arthur S. Kraus

Butterworths **Perspectives** on **Individual** and **Population** **Aging** series

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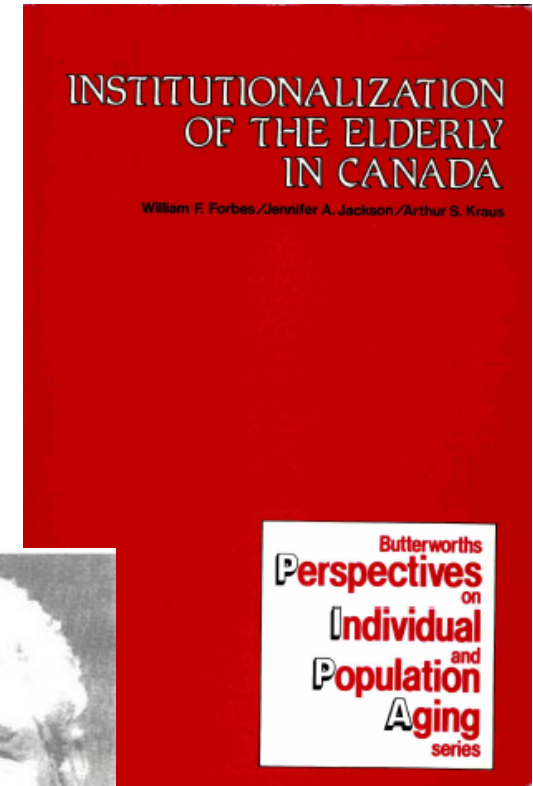
State of the Art in LTC Circa 1986

- No national data for LTC beyond age and sex
  - Had to cite small pilot studies for basic clinical information
- Called for implementation of standardized assessment systems
  - But concerned that introduction of computers into LTC may be difficult
- Limited conceptualization of quality measurement
  - Focus on survey based methods
  - Could not conceive of QI based methods because standardized clinical information was far-fetched at the time
- Worried about adequacy of evidence for informing placement into long term care

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What did we know about disability levels in Canadian nursing homes in 1986?

DEPENDENCY BY LEVEL OF CARE,[1]
SASKATCHEWAN, 1980, PERCENTAGES

Activity[2]	Level of Care			
	I	II	III	IV
Bathing	43.8	57.0	79.1	94.9
Dressing	3.1	10.6	49.8	89.7
Eating	1.2	3.3	20.9	48.4
Transferring	0.6	4.4	40.7	87.0
Use of Toilet	~	3.9	33.5	85.6
	N = 160	N = 179	N = 230	N = 158

1. Level I: individuals require no more than an average of 20 minutes of supervisory care per day.

   Level II: individuals require no more than an average of 45 minutes of supervisory and personal care per day.

   Level III: individuals require an average of two hours of personal and basic nursing care per day.

   Level IV: for long-term restorative or palliative care. All persons at this level require care on a 24-hour basis.

2. Needs at least occasional assistance.

SOURCE: Stolee et al. 1981. pp. 13–14. 31. Reproduced with permission of the authors.

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Prehistorical Assessments

Lots of open-ended text
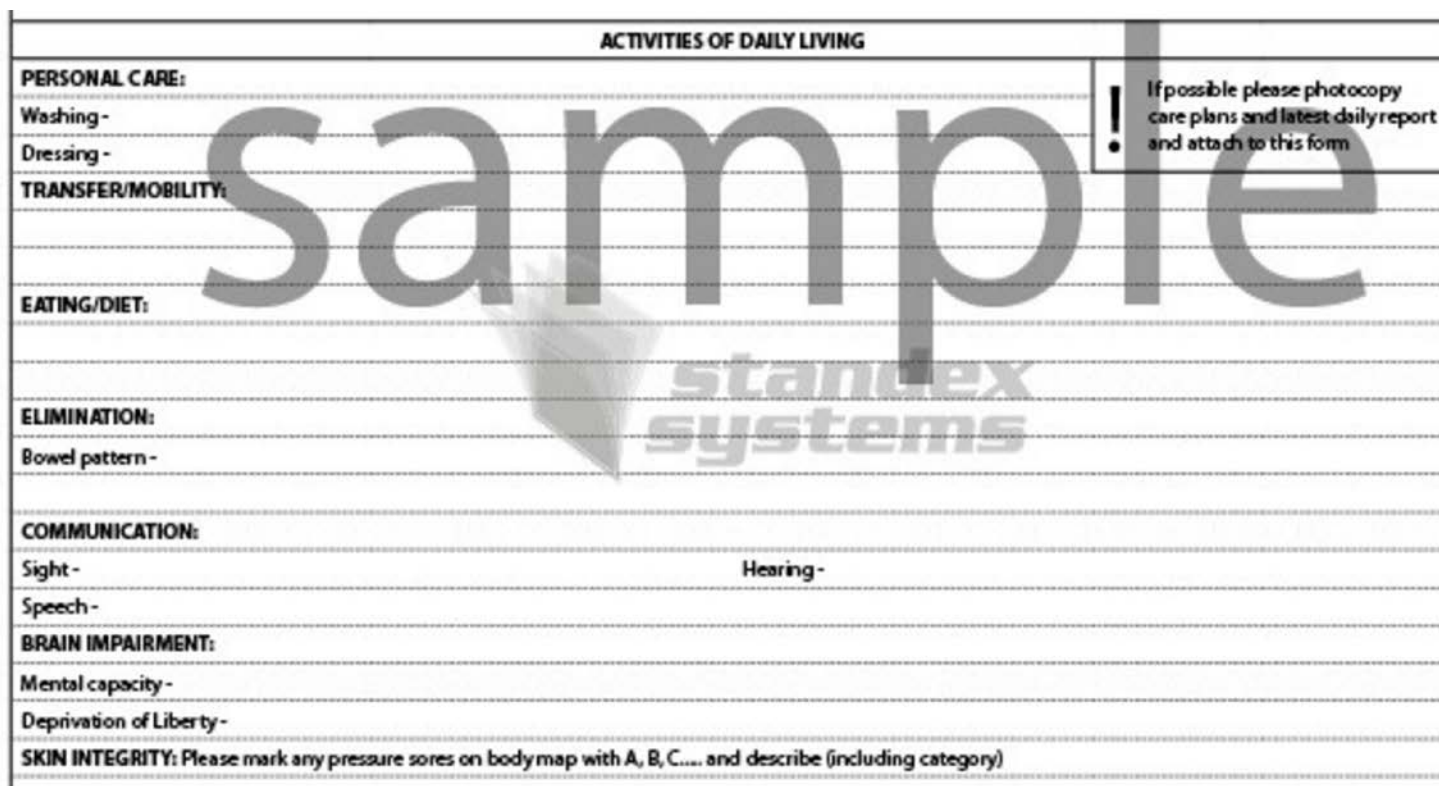
No computerization

Keywords only

No standards

Cumbersome

Little to no utility

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1980's
First Generation Assessments

- Standardized
- Some attention to psychometrics
- Single applications
- Stand alone
- Lots of data, little information

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Early 1990's
Second Generation
Assessments

Copyright 1990 by
The Gerontological Society of America

In response to the Omnibus Reconciliation Act of 1987 mandate for the development of a national resident assessment system for nursing facilities, a consortium of professionals developed the first major component of this system, the Minimum Data Set (MDS) for Resident Assessment and Care Screening. A two-state field trial tested the reliability of individual assessment items, the overall performance of the instrument, and the time involved in its application. The trial demonstrated reasonable reliability for 55% of the items and pinpointed redundancy of items and initial design of scales. On the basis of these analyses and clinical input, 40% of the original items were kept, 20% dropped, and 40% altered. The MDS provides a structure and language in which to understand long-term care, design care plans, evaluate quality, and describe the nursing facility population for planning and policy efforts.
Key Words: Nursing facilities, Quality assurance, Long-term care

Designing the National Resident Assessment Instrument for Nursing Homes[1]

John N. Morris, PhD,[2] Catherine Hawes, PhD,[3] Brant E. Fries, PhD,[4]
Charles D. Phillips, PhD, MPH,[3] Vincent Mor, PhD,[5]
Sidney Katz, MD,[6] Katharine Murphy, RN C, MS,[2]
Margaret L. Drugovich, MA,[7] and Alan S. Friedlob, MSSA[8]

Introduction

The provision of appropriate care in nursing facilities requires comprehensive knowledge of residents' strengths, weaknesses, and problems. As one feature of the Omnibus Budget Reconciliation Act of 1987 (OBRA '87), Congress sought to ensure the availability of this information by mandating a national resident assessment system that includes a uniform set of items and definitions for assessing all residents in nursing facilities in this country. Under contract from the Health Care Financing Administration (HCFA), our research consortium, in conjunction with expert consultant and advisory panels, has begun to identify, develop, and test the central element of this system, the mandated Minimum Data Set (MDS) for Resident Assessment and Care Screening. This paper describes progress to date in creating

the MDS, drawing on results of a two-state field trial. We describe the history and developmental process of the MDS, present findings for selected data elements, and provide a current draft version of the entire instrument.

Quality Assurance Concerns in Nursing Homes

As early as 1959, a Senate subcommittee identified problems of inadequate and inconsistent nursing home care, and a Health Education and Welfare investigation as well as a series of state studies in the early 1970s confirmed that the extent of compliance with extant regulations for care varied widely. In addition, existing certification regulations (the Conditions of Participation — those conditions that must be met for a nursing facility to participate in and receive reimbursement from Medicare or Medicaid) and the survey process placed more emphasis on a facility's capacity to provide required services than on the quality of services actually delivered (Institute of Medicine, 1986).

A series of legal actions in the late 1970s and early 1980s confirmed the responsibility of the Secretary of Health and Human Services (HHS) to ensure that certified nursing facilities meet regulatory standards (*Smith v. Heckler*, 1984). In addition, attempts by the Reagan Administration to reduce the regulatory burden on the nursing home industry generated considerable opposition among the elderly population and advocates for nursing home residents. Congress blocked the administration's proposed changes and directed HCFA to study how to improve nursing home regulation. In response, HCFA contracted with the Institute of Medicine (IOM) to con-

Vol. 30, No. 3, 1990   293

- ***Resident Assessment Instrument*** ushered in a new model of assessment
  - Multidimensional, not just one issue
  - More attention to psychometrics
    - Time frames, definitions, inclusion/exclusion criteria, examples,
    - Detailed manuals describing intent, assessment process, coding rules
  - Multiple applications for multiple audiences
    - Care plans, outcome measurements, quality, resource allocation, need analysis, risk management, planning, policy
  - Assessments that make you **DO** something
    - Clinical Assessment Protocols trigger action facilitate improvement, prevent decline

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Use of interRAI Instruments in Canada - 1996

RAI 2.0

Solid symbols – mandated or recommended by govt;
Hollow symbols – research/evaluation underway

www.interrai.org

Mid-1990's
Branching Out to New Populations & Settings

- RAI-Home Care
  - Recognized that some home care clients = nursing home residents
  - But needed to adapt assessment approach
    - Less opportunity for direct observation
    - Informal caregivers as major informants
    - New clinical content

- RAI-Mental Health
  - First interRAI assessment for adults of all ages 18+
  - Some clinical content retained, but lots of new content needs
  - Greater heterogeneity of population served

Silos → Integration

Potential for interRAI assessments as system rather than collection of stand alone instruments

interRAI Instrument and System Development Committee established

- Chair: John N. Morris, MSW PhD

Developed inventory of all interRAI items ever used

- Thousands of items, many with multiple variants
- Specified common core, recommended, specialized items

ORIGINAL ARTICLE

Integrated Health Information Systems Based on the RAI/MDS Series of Instruments

by
John P. Hirdes, Brant E. Fries, John N. Morris, Knight Steel, Vince Mor, Dinnus Frijters, Steve LaBine, Corinne Schalm, Michael J. Stones, Gary Teare, Trevor Smith, Mounir Marhaba, Edgardo Pérez, Palmi Jónsson

Abstract:

There is a growing need for an integrated health information system to be used in community, institutional and hospital based settings. For example, changes in the structure, process and venues of service delivery mean that individuals with similar needs may be cared for in a variety of different settings. Moreover, as people make transitions from one sector of the healthcare system to another, there is a need for comparable information to ensure continuity of care and reduced assessment burden. The RAI/MDS series of assessment instruments comprise an integrated health information system because they have consistent terminology, common core items, and a common conceptual basis in a clinical approach that emphasizes the identification of functional problems.

Healthcare is changing rapidly in Canada and around the world. Population aging, the introduction of new technologies, changing values about end-of-life care, fiscal constraints and the movement toward evidence-based practice are only some of the major trends affecting service provision as we approach the next millennium. It is widely recognized that to preserve the fundamental principles upon which healthcare in Canada is based (e.g., universal access, comprehensiveness, protection of vulnerable persons, high standards of quality), we must begin to implement different approaches to service delivery. A shift from hospital and institutional care toward a greater emphasis on community-based care has been one of the main change strategies implemented with the aim of allowing healthcare to be more responsive to people's needs and preferences, preserving Medicare in Canada and making the system more cost effective. In addition, all providers of health services are beginning to place a greater emphasis on disease prevention and health promotion as part of their role in improving population health.

The transition of Canadian healthcare toward an even more effective model is heavily dependent on the quality of information available to make key decisions related to policy formation, program development and service delivery. Existing health service information sources, such as waiting lists, have proven to be woefully inadequate for planning purposes
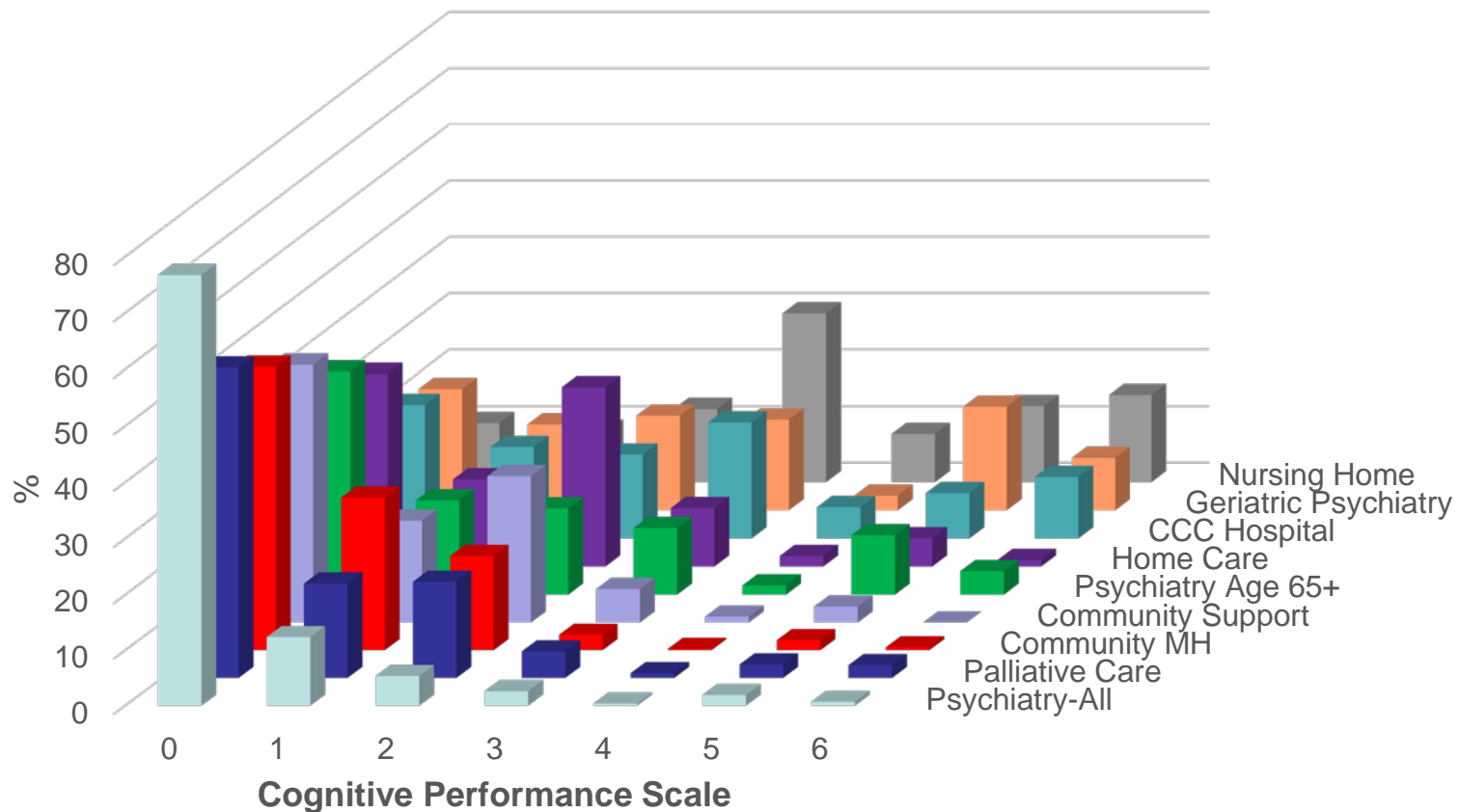
because they bear little resemblance to the actual needs of populations requiring healthcare.[1] Home care, like hospital and institutional care, is dependent on good assessments that relate in a meaningful way to other sectors of the healthcare system. However, the lack of information systems that allow home care to articulate clearly and effectively with other care sectors represents a major barrier to the provision of seamless, cost-effective care in the community. The lack of a valid, reliable and comprehensive assessment system providing consistent and comparable information across various healthcare sectors at the level of the individual means that:

- needs are not always identified appropriately;
- relevant treatments may not be attained;
- recovery may be slowed;
- disability and morbidity may be exacerbated;
- opportunities to promote health and prevent disease and disability are missed; and
- continuity of care is disrupted.

The adequacy of health information systems is relevant to individuals of all ages, but the elderly constitute a population for whom good assessment information is particularly important. Aging is associated with an increased complexity of health needs, differential presentation of health conditions and higher rates of comorbidity. In acute care settings, comprehensive assessment of older adults generally is not available in

What should be the "shape" of the health care system?
Distribution of the Cognitive Performance Scale in Various Care Settings

2000's
Birth of the "New Suite"

interRAI Suite of Assessments

What Makes interRAI Instruments an Integrated System?

- Common language
  - consistent terminology across instruments
- Common theoretical/conceptual basis
  - triggers for care plans
- Common clinical emphasis
  - functional assessment rather than diagnosis
- Common data collection methods
  - professional assessment skills
  - clinical judgement of best information source
- Common core elements
  - some domains in all instruments (e.g., ADL, cognition)
- Common care planning protocols
  - Adjacent sectors (e.g,. MH-CMH)

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Use of interRAI Instruments in Canada

- 🔴 **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**

Solid symbols – mandated or recommended by govt;
Hollow symbols – research/evaluation underway

US States Using interRAI Instruments

Brant E. Fries

Sept 2017

Statewide:

- ★ –HC/CHA
- ★ – MDS-HC
- ◆ –MH
- ☁ –CMH
- ♥ –SQoL
- ✹ –I/DD
- ▲ –Children I/DD
- ⬭ –Children MH
- ▱ –Children HC

Open symbol for Regional/Managed Care, shaded for planned

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interRAI in Canada by the numbers
(based on CIHI reporting systems only)

13 PROVINCES & TERRITORIES USE interRAI INSTRUMENTS NOW/NEAR FUTURE

18 CANADIAN RESEARCHERS APPOINTED TO interRAI INTERNATIONAL NETWORK

9k CLINICIANS IN

1900 ORGANIZATIONS USE interRAI ASSESSMENTS

>9M IN-PERSON ASSESSMENTS BY END OF 2017

>3M CANADIANS ASSESSED IN-PERSON

645,180 NEW IN-PERSON ASSESSMENTS ANNUALLY

50+ GRADUATE THESES COMPLETED AT WATERLOO

MSc PhD

20+ YEARS OF DATA COLLECTION TO DATE

OVER

3B DATA POINTS AVAILABLE TO inerRAI CANADA RESEARCHERS

Individuals in CIHI Reporting Systems for interRAI Instruments

OMHRS
(358,582)

In OMHRS Only
318,742

In OMHRS & HC
29,304

In OMHRS & CC
794

In OMHRS, HC, & CC
9,742

In HC Only
2,222,967

In CC Only
256,327

HCRS
(2,757,608)

CCRS
(762,485)

In HC & CC
495,595

DataSource:OMHRS,HCRS,CCRS,2006-2016,CIHI

2
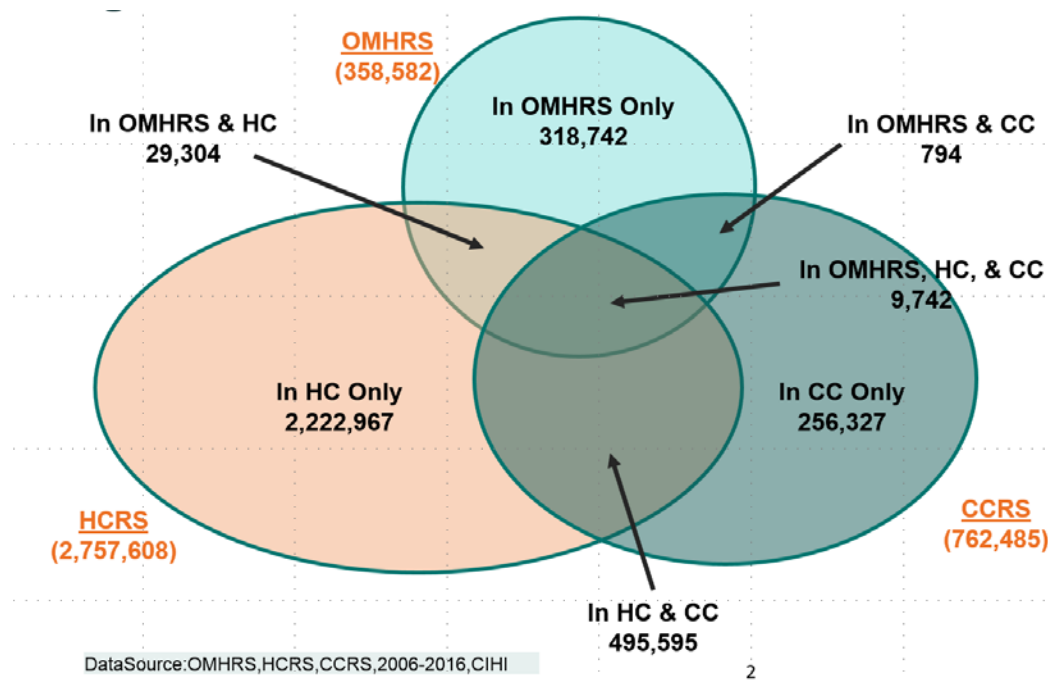
Setting	Individual
OMHRS Only	318,742
HC Only	2,222,967
CC Only	256,327
OMHRS & HC	29,304
OMHRS & CC	794
HC & CC	495,595
OMHRS, HC, & CC	9,742
Total Unique Individuals	3,333,471

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Data data everywhere but not a thought to think.

Theodore Roszak author of "The Making of a Counter Culture"
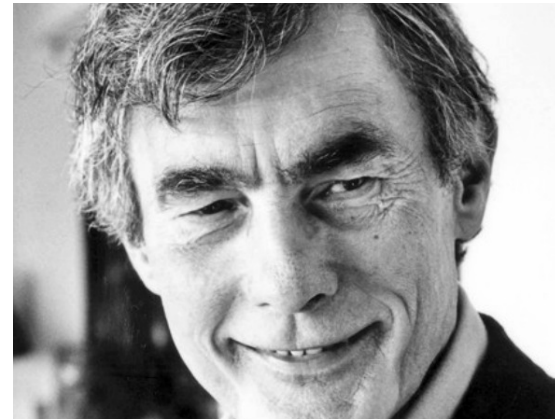
Big data are not enough to transform health care.
Big ideas tested with sound analytic methods should be the driving force for change.

The data speak for themselves

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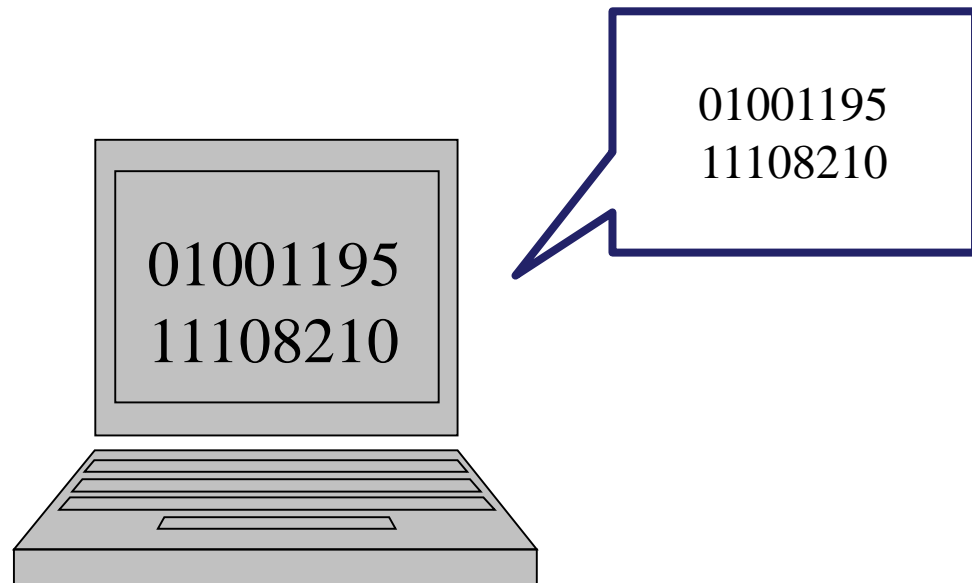
Some Questions of Interest

- Transitions across settings
  - Who moves from one setting to another?
  - Why do they make the transition?
  - What are the consequences of the transition?
- Needs in different care settings
  - What are the characteristics of service recipients in different settings?
  - What is the quality of care for comparable needs in different settings?
  - What needs are managed "in place" and which require outside expertise?

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Big Ideas in interRAI

- If we use a systematic approach to assessment we'll do a better job at detecting needs

Research Letters

Co-morbidity and functional limitation in older patients underreported in medical records in Nordic Acute Care Hospitals when compared with the MDS-AC instrument

SIR—Older persons are characterised by age-related changes, multiple diseases, multiple drug use and functional deficits. For optimal care, a holistic approach is needed; however, the health care systems of today are still essentially organised to provide acute medical care to relatively younger populations with little or no co-morbidity [1]. Health systems will have to adapt to this new situation.

ethical authority. Informed consent was sought from each patient or his/her nearest relative.

This study included 417 patients, 75 years of age and older, in which traditional hospital records were compared with MDS-AC as a part of a Nordic study with 770 participants. The patients were selected randomly from a numbered admission list the morning after admission.

The study utilised the MDS-AC, version 1.1, translated into each of the Nordic languages by translators experienced with the translation of InterRAI MDS tools [4]. Patients were assessed within 24 h of admission with the MDS-AC instrument. The data collectors reviewed the hospital records for variables documented during the first 48 h by doctors, nurses and therapists, corresponding to the MDS-AC record varia-

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When Nordic Researchers Compared What Was on the Chart to the Patient's interRAI AC Assessment ….

- Rates of no documentation among those with problems:
  - Impaired dressing – 50%
  - Impaired toilet use – 28%
  - Impaired ability to prepare meals – 56%
  - Impaired ability to manage medications – 53%
  - Impaired bladder continence – 25%
  - Impaired short term memory – 21%
  - Impaired decision making – 29%
  - Uncontrolled pain – 52%

Prevalence of Daily Use of Various Types of Restraints in Long Term Care Facilities in 5 inter*RAI* Countries

(Source: Hirdes et al., 1999)

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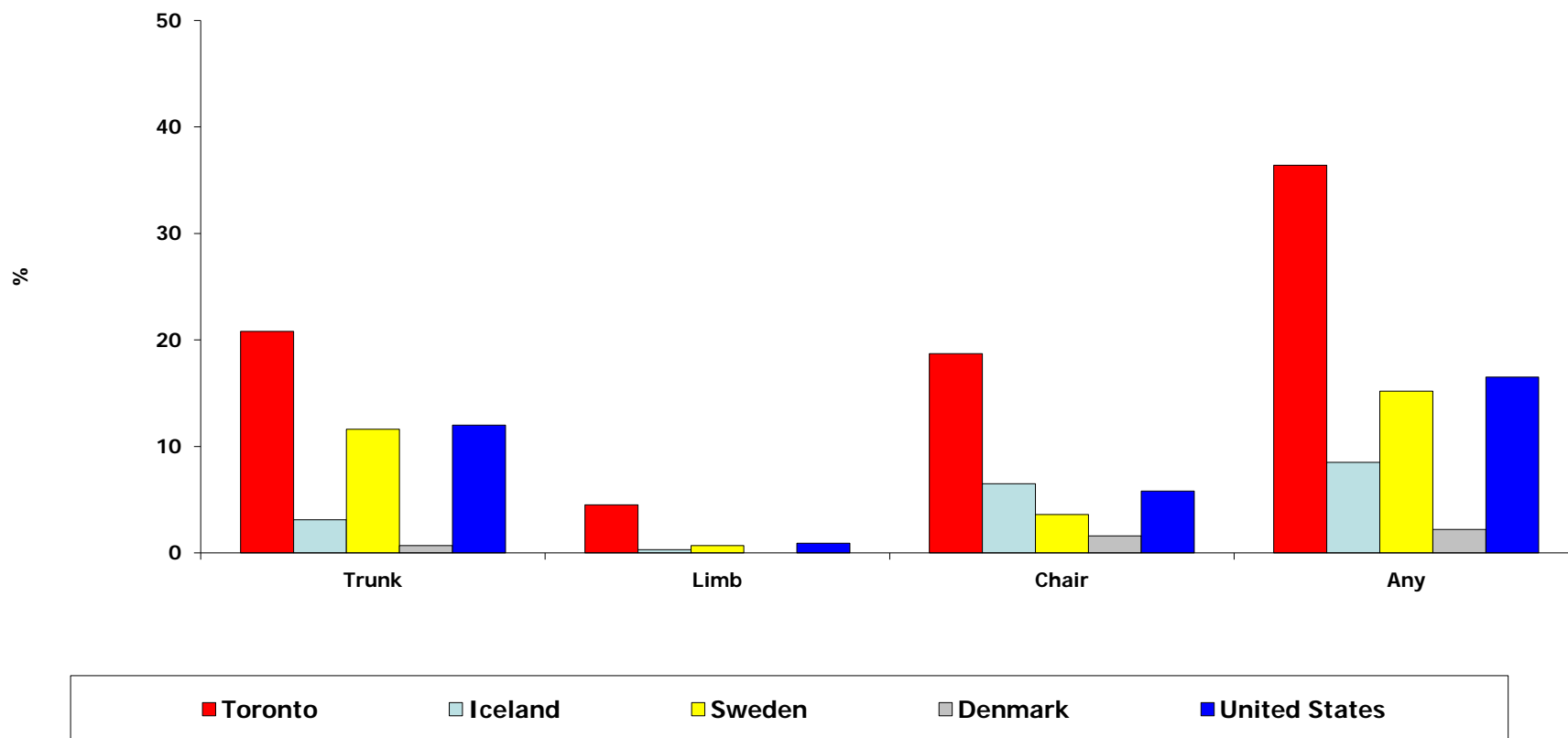
Big Ideas in interRAI

We can improve the quality of long term care

Figure 3.6. **Restraint use among nursing home residents without neurological conditions, by province, Canada, 1996-2010**
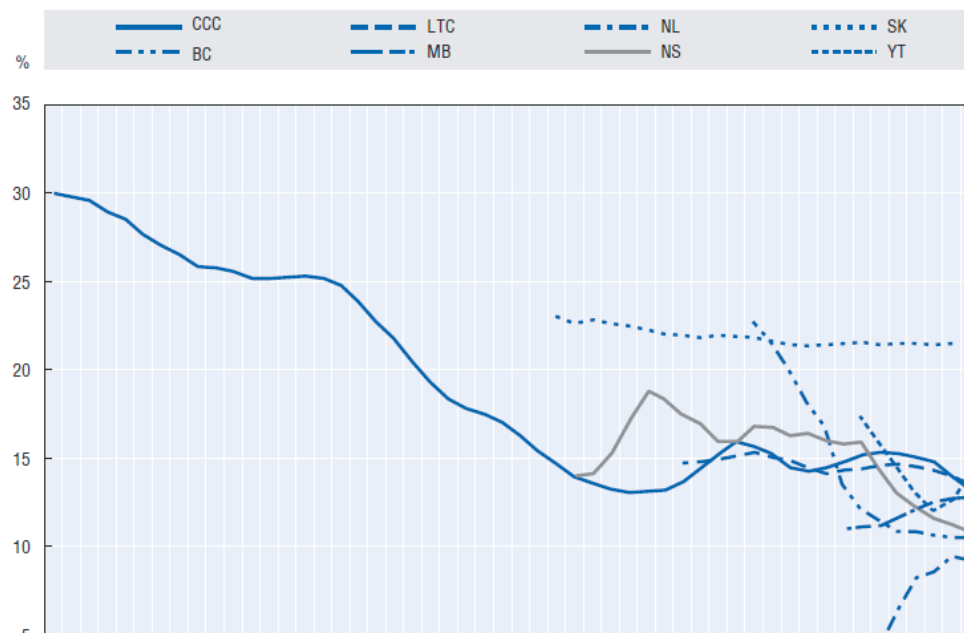
Restraint Use in Long-Term Care 2016–2017: 5.1% / 6.5%

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Yourhealthsystem.cihi.ca

Trend Over Time: Potentially Inappropriate Use of Antipsychotics in Long-Term Care (Percentage)

Data Export

ADD a province, territory, health region, long-term care organization or hospital using the search boxes below. You can also ADD a city to find results for the corresponding health region. At least 3 years of data must be available for trend results to appear on the graph.

Methodology

Legend: Winnipeg RHA, Alberta, British Columbia, Ontario, Canada

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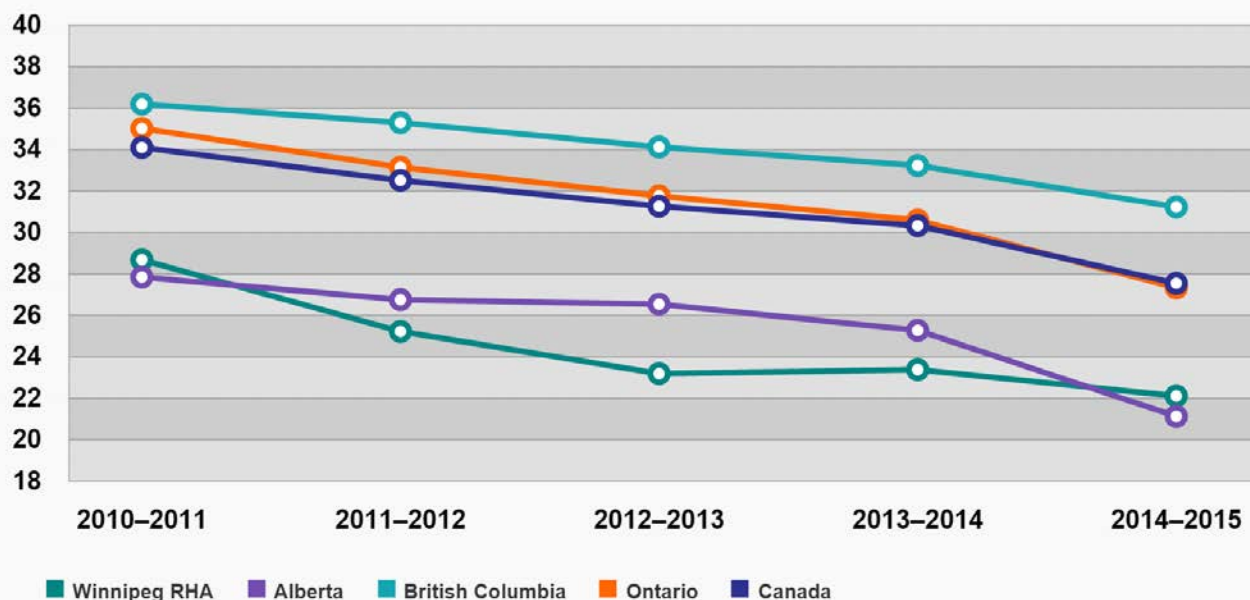
2010's
Next Major Innovations

- **Children and youth with complex medical needs, mental health issues, intellectual disabilities**
  - Eventually enter adult system, but have difficult transitions
  - Need to account for developmental changes, family variables
- **Patient reported measures**
  - Self-reported quality of life, needs and outcomes
- **Caregiver assessment**
  - Majority of care in home care comes from family & friends
  - Consider caregiver health & well-being, information & support needs, quality of life
- **Assessment & screening outside health system**
  - New sectors: schools, police

Integrated Mental Health Information System

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Ontario Provincial Police Commissioner J.V.N. (Vince) Hawkes makes the announcement at a press conference.

On May 8, 2014, the Ontario Provincial Police (OPP) announced their plans to implement the new interRAI Brief Mental Health Screener (BMHS) to assess mental health issues, allowing for improved transitions from police custody to hospital care.

'This has been a game changer'

By Vincent Ball, Brantford Expositor
Wednesday, April 20, 2016 8:54:05 EDT PM

Image: 1 of 8
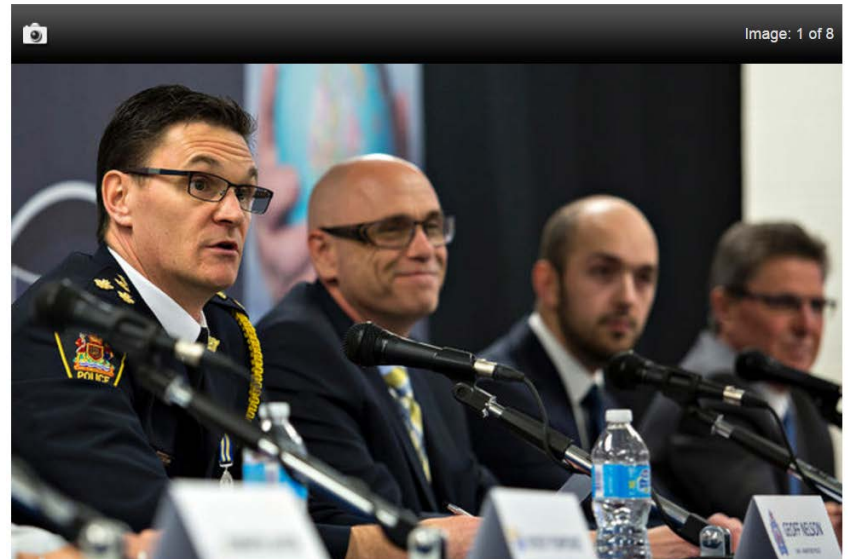
Brantford Police chief Geoff Nelson (left) speaks on Wednesday April 20, 2016 during the unveiling of the Brantford Collaborative Community Mental Health Response Strategy, at the police station in Brantford, Ontario. The initiative was developed in partnership with Laurier Brantford, Brant Community Healthcare System, St. Leonard's Community Services, Health IM and InterRAI to implement alternative responses in dealing with emotionally disturbed persons in crisis. Brian Thompson/Brantford Expositor/Postmedia Network

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What is achievable "now"?

- What has already been shown?
  - Implementation can happen on a national scale
  - Countries can gain insights about themselves through international comparisons of person level data
  - Substantial improvements in quality and cost-effectiveness are possible at the system level
  - Evidence can be used to transform health systems
  - Data can be mobilized for collaboration across sectors
  - Longitudinal views provide more information than snapshots in time
  - Patients and families can be engaged and empowered to engage in shared decision-making

- ***Just do it***

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Figure 1. State-space diagram for possible transitions in multistate Markov model
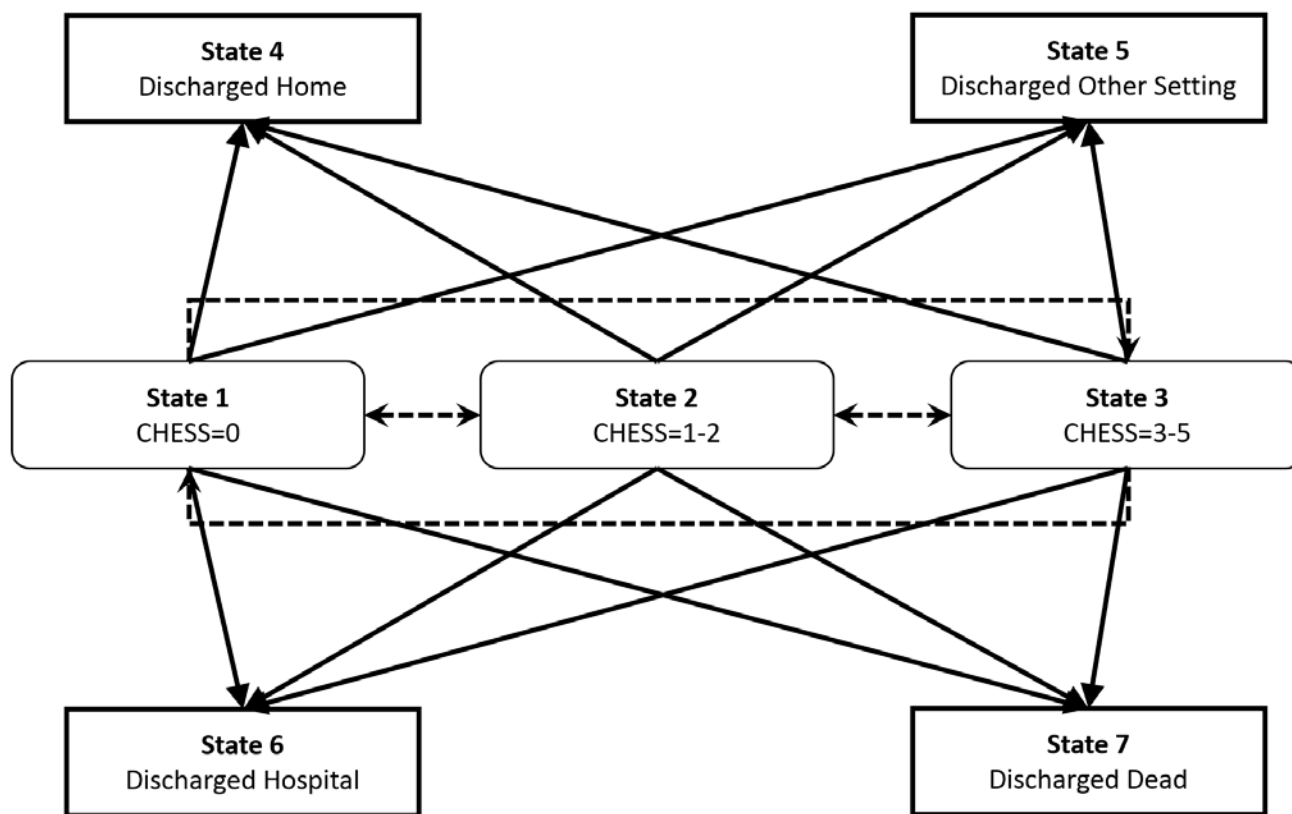
Note: Dashed lines reflect transitions between health states within the nursing home. Solid lines reflect transitions to "absorbing states" outside of the nursing home.

90-day Death and Hospitalization Among Nursing Home Residents, ON, AB & BC

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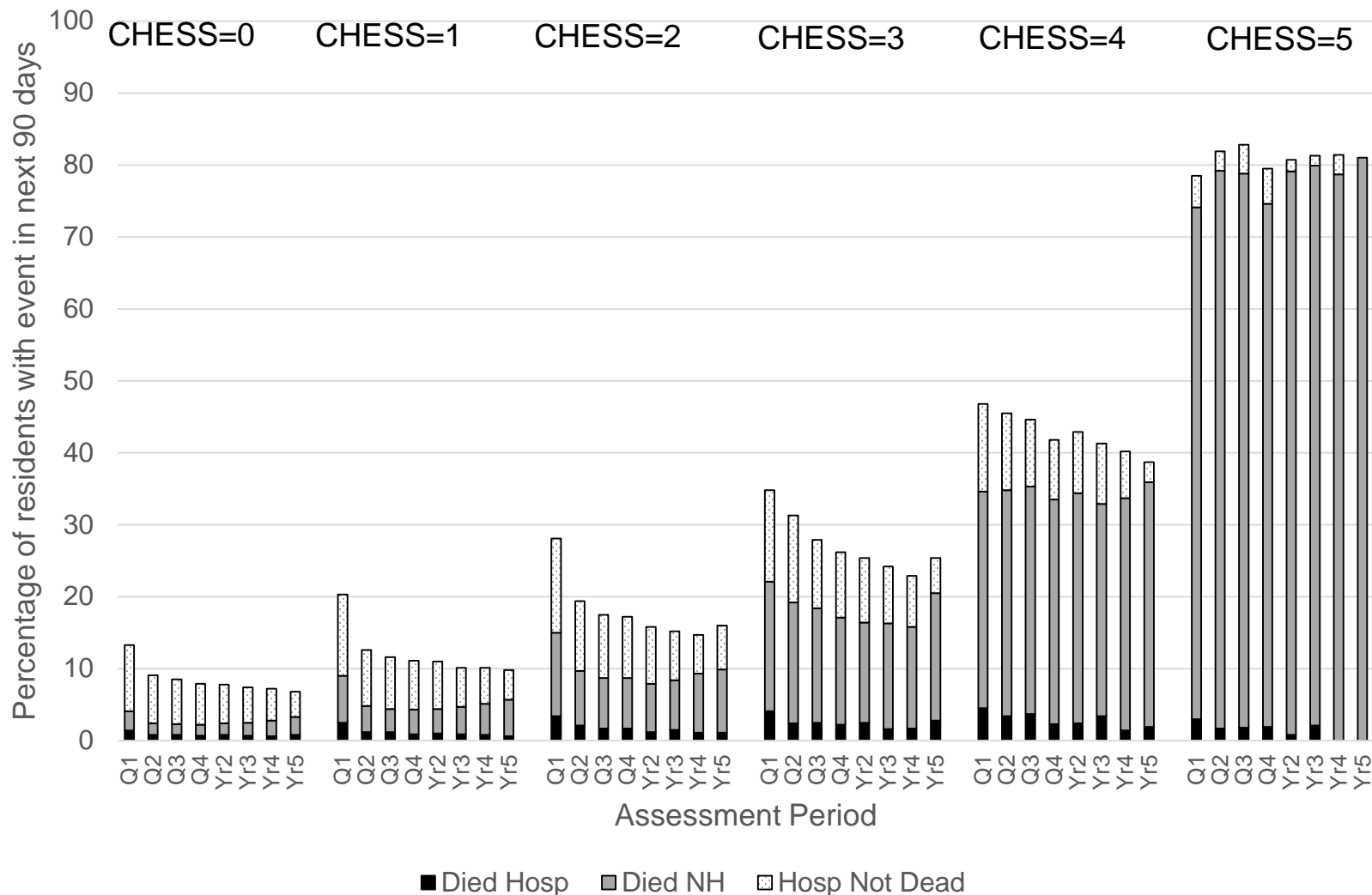
Figure 4. Cumulative Incidence Function (CIF) plots for 4 types of transitions 1 year after admission assessment by baseline CHESS score, Ontario, Alberta and BC

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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:
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
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	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:

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:

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

		Transitions at follow-up (T_2)						
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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

- New CFN funded project: intervention study to take a systematic approach to advanced care planning in LTC to improve end of life care
  - PI: Garland and Heckman

Next 30 years:
What is the future of assessment?

- Linking interRAI data with other clinical data sources:

  - "Simple" – drug data, lab values

  - "Trickier" – wearable technologies, geospatial analysis

  - "Complicated" – genetic data, diagnostic imaging

- More potential than using one to model the other
  - *Combined* data may give new insights

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Next 30 years:
Making use of massive data

- We already have big data in interRAI
  - New Zealand – over 400,000 assessments
  - Canada – approaching 10,000,000 assessments
  - United States – surpassed 100,000,000 assessments

- Imagine the future ChYMH data set
  - Ontario has 4 million children, 1 in 5 have mental health issues
  - 70% of mental health problems have onset in childhood
  - A database of 50,000 individuals with longitudinal interRAI mental health data from childhood to adulthood is imaginable in 20 years
  - *What would we do with a lifetime of clinical observations??*

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Next 30 years:
Employing new analytic strategies

- Implications of big data
  - Need new analytic strategies when $p < .0001$ for everything
  - End of conventional statistical methods?
  - Transition to machine learning

- Application of artificial intelligence + quantum computing
  - Robots already build cars
  - Drones will soon deliver pizza
  - Will humans will be the best data analysts 30 years from now?
  - Will we be ready to accept algorithms that no human understands?
    - What will that mean for "informed consent"?
    - Would we trade off clinical breakthroughs for human control?

What lies ahead?

It's difficult to make predictions, particularly about the future.

The future depends on what we do in the present. *Mahatma Ghandi*

Thank you!

Questions? Comments?