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

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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?
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

Twitter: @interRAI_Hirdes

www.interrai.org
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
What did we know about disability levels in Canadian nursing homes in 1986?

### Dependency by Level of Care,¹
Saskatchewan, 1980, Percentages

<table>
<thead>
<tr>
<th>Activity²</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
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<tbody>
<tr>
<td>Bathing</td>
<td>43.8</td>
<td>57.0</td>
<td>79.1</td>
<td>94.9</td>
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<tr>
<td>Dressing</td>
<td>3.1</td>
<td>10.6</td>
<td>49.8</td>
<td>89.7</td>
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<tr>
<td>Eating</td>
<td>1.2</td>
<td>3.3</td>
<td>20.9</td>
<td>48.4</td>
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<tr>
<td>Transferring</td>
<td>0.6</td>
<td>4.4</td>
<td>40.7</td>
<td>87.0</td>
</tr>
<tr>
<td>Use of Toilet</td>
<td>—</td>
<td>3.9</td>
<td>33.5</td>
<td>85.6</td>
</tr>
</tbody>
</table>

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.
2. Level II: individuals require no more than an average of 45 minutes of supervisory and personal care per day.
3. Level III: individuals require an average of two hours of personal and basic nursing care per day.
4. Level IV: for long-term restorative or palliative care. All persons at this level require care on a 24-hour basis.

Needs at least occasional assistance.

Prehistorical Assessments
Lots of open-ended text
No computerization
Keywords only
No standards
Cumbersome
Little to no utility
1980’s
First Generation Assessments

• Standardized
• Some attention to psychometrics
• Single applications
• Stand alone
• Lots of data, little information
Early 1990’s
Second Generation Assessments

- **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
Use of interRAI Instruments in Canada - 1996

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

RAI 2.0

Twitter: @interRAI_Hirdes
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 standalone 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

Abstract:
There is a growing need for an integrated health information system to be used to support 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, an increasing focus on the healthcare system as a whole, 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.
What should be the “shape” of the health care system?
Distribution of the Cognitive Performance Scale in Various Care Settings

Twitter: @interRAI_Hirdes
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

Twitter: @interRAI_Hirdes
US States Using interRAI Instruments

Sept 2017

Open symbol for Regional/Managed Care, shaded for planned

Statewide:
- HC/CHA
- MDS-HC
- MH
- CMH
- SQoL
- I/DD
- Children I/DD
- Children MH
- Children HC

Brant E. Fries
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

18

>9M IN-PERSON
ASSESSMENTS BY END
OF 2017

>3M CANADIANS ASSESSED IN-PERSON

20+
YEARS OF DATA
COLLECTION TO DATE

645,180
NEW IN-PERSON ASSESSMENTS ANNUALLY

50+
GRADUATE THESES COMPLETED
AT WATERLOO

9k CLINICIANS
IN
1900
ORGANIZATIONS USE interRAI
ASSESSMENTS

3B DATA POINTS
AVAILABLE TO
inerRAICANADA
RESEARCHERS

Twitter: @interRAI_Hirdes

www.interrai.org
Individuals in CIHI Reporting Systems for interRAI Instruments

<table>
<thead>
<tr>
<th>Setting</th>
<th>Individual</th>
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</thead>
<tbody>
<tr>
<td>OMHRS Only</td>
<td>318,742</td>
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<tr>
<td>HC Only</td>
<td>2,222,967</td>
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<tr>
<td>CC Only</td>
<td>256,327</td>
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<tr>
<td>OMHRS &amp; HC</td>
<td>29,304</td>
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<tr>
<td>OMHRS &amp; CC</td>
<td>794</td>
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<tr>
<td>HC &amp; CC</td>
<td>495,595</td>
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<tr>
<td>OMHRS, HC, &amp; CC</td>
<td>9,742</td>
</tr>
<tr>
<td>Total Unique Individuals</td>
<td>3,333,471</td>
</tr>
</tbody>
</table>

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

Twitter: @interRAI_Hirdes
The data speak for themselves
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?
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 pharmacists corresponding to the MDS-AC record varia...
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 interRAI Countries

(Source: Hirdes et al., 1999)
Big Ideas in interRAI

We can improve the quality of long term care
Yourhealthsystem.cihi.ca

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

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

![Graph showing trend over time for potentially inappropriate use of antipsychotics in long-term care. The graph compares data from different provinces and years (2010-2011 to 2014-2015). The trend shows a decrease in usage across all regions.]

- 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

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Integrated Mental Health Information System

ChYMH ChYMH-DD
Adol YJ QoL

ChYMH Screener

CMH
FS Add QoL

FS Add QoL

MH

CF

CHA

HC

LTCF

MH QoL QoL

Mainly elderly

0-3, 4-17
18+

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www.interrai.org
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.
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**
Figure 1. State-space diagram for possible transitions in multistate Markov model

State 1
CHESS=0

State 2
CHESS=1-2

State 3
CHESS=3-5

State 4
Discharged Home

State 5
Discharged Other Setting

State 6
Discharged Hospital

State 7
Discharged Dead

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

Percentage of residents with event in next 90 days

<table>
<thead>
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<th>Assessment Period</th>
<th>CHESS=0</th>
<th>CHESS=1</th>
<th>CHESS=2</th>
<th>CHESS=3</th>
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<td>Yr2</td>
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<td>Yr5</td>
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</tbody>
</table>

Legend:
- Died Hosp
- Died NH
- Hosp Not Dead

Twitter: @interRAI_Hirdes

www.interrai.org
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
Multistate transition model for nursing home residents:
Adjusted odds ratios for advanced directives (ref=not present), Nursing homes in Ontario, BC & Alberta

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<tbody>
<tr>
<td></td>
<td>0</td>
<td>1-2</td>
<td>3+</td>
<td></td>
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</tr>
<tr>
<td>Do Not Hospitalize (ref=Not Present)</td>
<td></td>
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</tr>
<tr>
<td>CHESS Score at baseline (T₁)</td>
<td>0</td>
<td>--</td>
<td>1.04 (1.02-1.07)</td>
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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

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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

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<th>Transitions at follow-up ($T_2$)</th>
<th>Remained in Nursing Home</th>
<th>Admitted to Hospital</th>
<th>Died</th>
<th>Discharged Other Setting</th>
<th>Discharged Home</th>
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<th>Transitions at follow-up (T₂)</th>
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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

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## Transitions at follow-up (T2)

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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
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??*
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?