IMPROVING MEDICATION AND OUTCOMES FOR OLDER FRAIL RESIDENTS OF LONG-TERM CARE FACILITIES

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On behalf of FRAILTY AND RECOGNIZING APPROPRIATE MEDICATION USE IN GERIATRICS AND LONG-TERM CARE (FRAMING-LTC) Research Team

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BACKGROUND

Older adults in long-term care (LTC) have an increased risk for potentially inappropriate medication (PIM) use which places them at risk for drug-related errors and adverse events.

- increased comorbidity and polypharmacy
- age-related physiological changes (altered pharmacokinetics)
- rarely included as subjects in clinical trials

Optimal prescribing for frail populations may be influenced by various system, provider, individual, and caregiver factors.

- given lack of empirical data, our understanding of benefits, harms, and economic implications of medications commonly prescribed in LTC remains inadequate and underdeveloped

Concept of frailty offers a promising avenue for identifying older adults who may be less able to tolerate or benefit from PIMs and may require an alternative approach to their care.

- risk may be heightened in frail, compared to robust individuals
- frailty status is relatively unexplored with regard to medication-related adverse events
OVERALL PROJECT OBJECTIVES

This mixed methods program of research will move beyond documenting variations in the quality of potentially inappropriate medication (PIM) prescribing and towards improving our understanding of the relationships between factors associated with prescribing decisions and will:

OBJECTIVE 1. QUANTITATIVE
Utilize population-based, linked Resident Assessment Instrument (RAI) and administrative health data for LTC residents across Ontario, Alberta and Saskatchewan to:

a) examine the distribution in use of 4 priority classes of PIM measures across LTC homes and by residents’ frailty status;

b) evaluate whether associations between PIM measures and health outcomes (mortality, hospitalization, functional decline) are modified by residents’ frailty status; and,

c) identify LTC facilities (defined by frailty, PIM quintiles) for in-depth qualitative analyses.

OBJECTIVE 2. QUALITATIVE
Employ targeted interviews (healthcare providers, LTC residents, and family members), chart reviews, and characterizations of contextual factors to examine contextual factors contributing to PIM utilization at the LTC facility and resident levels.

OBJECTIVE 3. SYNTHESIS
Synthesize evidence from the quantitative and qualitative components of the study in order to identify national and international applications our findings including pinpointing possible interventions at the resident, provider and LTC facility levels and relating possible applications of population-based data at a policy level (i.e. the development of national quality indicators, standards of care).
One might suggest that there is no universal consensus on how best to identify or define frailty in an older person, but most agree ... “increased vulnerability to stressors due to impairments in multiple, inter-related systems that lead to decline in homeostatic reserve and resiliency”*

- Vulnerability to decline and poor outcomes
- More common with age and among women
- Two approaches: phenotype model** & cumulative deficit model***

Cumulative Deficit Model
- Frailty Index (FI), # of deficits present / # deficits measured
- Biomedical, Clinical, Functional AND Psychosocial factors
- Items from comprehensive geriatric assessment (40-80+)
  - signs, symptoms, diseases, impairments, abnormal lab tests
  - Resident Assessment Instrument (RAI) tool: Full FI [72 items] & Modified FI [48 items]****
- The more individuals have wrong with them – more likely to be frail

*Bergman H, et al. 2007  
**Fried L, et al. 2001  
***Rockwood K, et al.  
OBJECTIVE
Use linked, population-based data to understand the relationship between PIM and 4 priority classes of medications (antimicrobials; cholinesterase inhibitors; antipsychotics; and, lipid-lowering medications) and frailty across LTC homes.

— Although these four medication classes share a deficit in risk-benefit calculations, they each may have different drivers for utilization, adverse effects, and economic implications.
Retrospective cohort study of adults aged 66 and older
- Resident level: newly admitted to LTC (or longer)
- Physician level: residents aggregated to most responsible physician
- Time period: between January 1, 2010 and March 31, 2016

Other key concepts
- Dementia and/or meaningful cognitive impairment

Analyses
- Cox proportional hazards models (adjusted for clustering of residents within facilities)
  - Risk of outcome/exposure based on frailty status
  - Risk of outcome/exposure in medications
  - Risk of outcome/exposure in medications, stratified by frailty status
• Health system encounters – at the time providers bill for services, admit-discharge individuals or dispense drug therapies
• LTC resident assessments – on admission and quarterly thereafter
• Demographic information – when report/updated
• Provider characteristics – when reported/updated
METHODS: FRAILTY INDEX

- 72-item index
- Derived from Resident Assessment Instrument (RAI) MDS
- Domains:
  - Psychosocial well-being
  - Mood
  - Cognition
  - Communication
  - Functional Status
  - Incontinence
  - Disease diagnoses
  - Health conditions
  - Nutrition/Medications
DISTRIBUTION OF FULL FRAILTY INDEX ACROSS LTC RESIDENTS in Ontario

Mean = 0.33 (sd 0.12)
DISTRIBUTION OF FRAILTY ACROSS LONG-TERM CARE HOMES

% cohort with Full Frailty Index >= 0.3 (FRAIL) in Ontario

Funnel plotting percent of LTC residents with full Frailty Index >= 0.3

- Within limits
- Average
- 2SD limits
- 3SD limits
- Below 3sd

Residents in LTC home

Percent of Residents considered frail

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OBJECTIVES

To estimate the prevalence of potentially inappropriate medication (PIM) use among older adults with cognitive impairment or dementia prior to and following admission to nursing homes and in relation to frailty.

PATTERN OF POTENTIALLY INAPPROPRIATE MEDICATION USE at admission, Beers Criteria 2015

Prevalence

- Benzodiazepines: 17%
- Antipsychotics*: 27%
- H2-receptor antagonists: 4%
- Anticholinergics: 14%
PATTERN OF POTENTIALLY INAPPROPRIATE MEDICATION USE at admission and during 180-day follow-up, Beer Criteria 2015

Benzodiazepines
- 9% Maintained
- 9% Discontinued

Antipsychotics*
- 21% Maintained
- 6% Discontinued

H2-receptor antagonists
- 3% Maintained
- 1% Discontinued

Anticholinergics
- 9% Maintained
- 4% Discontinued

*Antipsychotics include all antipsychotic medications.
PATTERN OF POTENTIALLY INAPPROPRIATE MEDICATION USE at admission and during 180-day follow-up, Beer Criteria 2015
At admission, 44% of residents with cognitive impairment or dementia were on a PIM and prevalence varied by frailty status

- 38.7% non-frail, 42.8% pre-frail, and 48.1% frail, p<0.001

Following admission, many residents discontinued PIMs

- 23.5% for antipsychotics, 49.3% benzodiazepines, 32.2% anticholinergics, and 30.9% H₂-receptor antagonists

However, PIMs were also introduced

- 10.9% newly started on antipsychotics, benzodiazepines (10.1%), anticholinergics (6.6%), and H₂-receptor antagonists (1.2%)

After adjustment for other characteristics, frail residents had a similar risk of PIM discontinuation as non-frail residents except for anticholinergics (HR=1.21, 95% CI 1.06-1.39) but were more likely to be newly prescribed benzodiazepines (HR=1.32, 95% CI 1.20-1.44), antipsychotics (HR=1.36, 1.23-1.49), and anticholinergics (HR=1.34, 95% CI 1.20-1.50).
STATINS


OBJECTIVES

To examine the variability of statin use among nursing home residents and prescribing physicians, and to assess statin use by resident frailty.
<table>
<thead>
<tr>
<th>Frailty index</th>
<th>Number of LTC residents</th>
<th>Number (%) prescribed statins&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted* OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-frail (values &lt;0.2)</td>
<td>11,241</td>
<td>4,442 (39.5%)</td>
<td>1.00 [Reference]</td>
<td>1.00 [Reference]</td>
</tr>
<tr>
<td>Pre-frail (values between 0.2-0.3)</td>
<td>20,695</td>
<td>7,875 (38.1%)</td>
<td>0.93 (0.89 - 0.98)</td>
<td>0.86 (0.82 - 0.91)</td>
</tr>
<tr>
<td>Frail (values &gt;0.3)</td>
<td>44,290</td>
<td>13,331 (30.1%)</td>
<td>0.66 (0.63 - 0.69)</td>
<td>0.62 (0.58 - 0.65)</td>
</tr>
</tbody>
</table>

*Adjusted for demographics, cardiovascular comorbidities, other comorbidities.
PROPORTION OF RESIDENTS RECEIVING A STATIN BY PHYSICIAN
between April 1, 2013 and March 31, 2014
Among 76,226 nursing home residents assigned to 1,919 physicians, 25,648 (33.6%) were statin users.

- There were 13,331 (30.1%) statin users among the 44,290 residents categorized as frail.

In an adjusted mixed-effects logistic regression model, frail residents (adjusted Odds Ratio=0.62, 95% Confidence Interval 0.58-0.65) were significantly less likely to be statin users compared with non-frail residents.

- After adjustment for resident characteristics, the intraclass correlation coefficient indicated that between-physician variability accounted for 9.1% of the residual unexplained variation in statin use (P<0.001).

Among the 894 physicians assigned 20 or more residents, funnel plots confirmed there were more low-outlying (17.4%) and high-outlying (12.0%) prescribers of statins than expected by chance.

- Physicians who were high-outlying prescribers had higher historical rates of statin prescribing.

**OBJECTIVES**
To examine associations between baseline frailty measures, antipsychotic use, and hospitalization over 1 year and whether hospitalization risk associated with antipsychotic use varies by frailty level.
HOSPITALIZATION ASSOCIATED WITH ANTIPSYCHOTIC USE
stratified by frailty status

HR Hospitalization (95% CI)

Frailty Status

Robust  Pre-frail  Frail
Baseline frailty status, but not antipsychotic use, was significantly associated with hospitalization over 1 year.

When stratified by frailty, FI-defined frail residents using antipsychotics showed a significantly increased risk for hospitalization (adjusted HR: 1.54; 95% CI: 1.01-2.36) compared with frail nonusers.

Non-frail residents using antipsychotics were significantly less likely to be hospitalized compared with non-frail nonusers whether defined by the FI (adjusted HR: 0.62; 95% CI: 0.39-0.99) criteria.

Frailty measures may be helpful in identifying those who are particularly vulnerable to adverse effects and those who may experience benefit with treatment.

**OBJECTIVES**

Do LTCF antibiotic prescribing behaviours vary across prescribers more so than would be expected by random chance or patient characteristics, with respect to:

- tendency to initiate antibiotics?
- tendency to prescribe prolonged treatment durations (>7d)?
- tendency to select a specific antibiotic class (fluoroquinolones)?

Does historical prescribing behaviour predict current antibiotic prescribing behaviour for LTCF antibiotic prescribers, with respect to:

- tendency to initiate antibiotics?
- tendency to prescribe prolonged treatment durations (>7d)?
- tendency to select a specific antibiotic class (fluoroquinolones)?

Understanding the extent to which current antibiotic prescribing behaviour is influenced by clinicians’ historical patterns of practice will help target interventions to optimize antibiotic use in long-term care.
Antibiotic *initiation*

PCC = 0.66
Antibiotic prolonged duration

PCC = 0.64
Antibiotic class selection (FQs)

PCC = 0.58

Percent of antibiotic treatments being fluoroquinolone-based in 2013

Percent of antibiotic treatments being fluoroquinolone-based in 2014

Indicator level in 2014
- High

# Residents
- 200
- 400
- 600

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No correlation between metrics

PCC = 0.08

Percent of antibiotic treatments being prolonged in 2014 vs. Percent of residents prescribed antibiotic in 2014

Indicator levels:
- High/high

# Residents:
- 200
- 400
- 600

ICES
ANTIMICROBIALS - FINDINGS

There is wide variability in prescribers’ tendencies to initiate antibiotics, use prolonged durations, and select fluoroquinolones.

These prescribing tendencies are consistent over time.

After accounting for resident characteristics, a prescribers’ historical tendencies are strongly predictive of current prescribing behaviour.

High outlier prescribers tend to remain high outliers.

High outliers for one antibiotic prescribing behaviour are not necessarily outliers for other antibiotic prescribing behaviours.

Prescriber audit-and-feedback may be a useful way to improve antibiotic prescribing in LTC.
Frailty exists as a spectrum within long-term care.

Many residents with cognitive impairment or dementia enter nursing homes on PIMs. PIMs are more likely to be started in frail individuals following admission. Interventions to support deprescribing of PIMs should be implemented targeting frail individuals during the transition to nursing home.

Statin prescribing was substantial within nursing homes, even among frail residents. After controlling for resident characteristics, the prescribing of statins was not randomly distributed across physicians. Further studies are required to evaluate the risks and benefits of statin use, and discontinuation, among nursing home residents to inform clinical practice in this setting.
A state of frailty may increase the risk of adverse outcomes associated with the use of antipsychotic medications

- The FI identified residents vulnerable to hospitalization when using antipsychotic drugs
- Frailty may be a means of identifying residents vulnerable to adverse medication outcomes
  - ...may also differentiate those likely to experience benefit?
  - ...opportunity for improved drug management and monitoring of these residents

Antibiotic prescribers exhibit individual, measurable, historical tendencies towards antibiotic initiation, use of prolonged treatment duration and class selection; prescriber audit-and-feedback may be a promising tool to optimize antibiotic use in long-term care.
Additional Slides
We will be using a framework for complex interventions to use our study results to design pilot interventions aimed at improving the quality of pharmacotherapy and health outcomes for vulnerable populations in LTC.

We will be aligning our interventions with priorities guided by our national partners and stakeholders to ensure uptake within the Canadian long-term care sector.

We will be using an integrated knowledge translation framework to provide input into the interpretation and reporting of findings, and facilitating dissemination of the results provincially, nationally, and internationally.

– Combined with findings from the qualitative studies and the knowledge translation activities, our series of studies represents a novel framework for this issue, combines disparate medication groups in a unifying theme, and will provide a springboard from which to develop policy- and practice- interventions of national importance.
Why consider frailty in drug use?

...thus, need for different / special approach to prescribing drugs in persons living with frailty – with careful consideration of goals of care [ may mean a more conservative approach with focus on QoL]

Few pharmacological agents have been investigated in frailty...priority for future research

Role as predictors?

Role in prevention / treatment?

Role of frailty in predicting or modifying risk of potential ADE (beyond age & comorbidity)

- Pharmacokinetic alterations (A – D - M – E)?
- Pharmacodynamic alterations (receptors / sensitivity)?
- Cognitive, psychological & social vulnerability
- Refine existing HR/PIM criteria to include consideration of frailty (or frailty components)

Frailty measures to be incorporated into RCTs and clinical practice guidelines for care of older adults
Frailty & Medication Use

What do we know from existing research?

– Frailty status may be associated with altered medication clearance
  • (Hilmer, et al., 2011; Johnston, et al., 2015)

– Cognitive, psychological and social vulnerabilities are associated with medication management problems
  • (Hayes, et al., 2009; Osborn, et al., 2012)

– Some (although not all) studies show greater risk of adverse outcomes in frail older adults using suboptimal medication compared to non-frail older adults
  • (Bennet et al., 2014; Pugh et al., 2014; Runganga et al., 2014)