# MedSafer: Working Towards Safer Prescribing

Recipient of the *Marika Z. Roy* Clinical Innovation Prize

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Canadian Frailty Network | Réseau canadien des soins aux personnes fragilisées

Centre universitaire de santé McGill Institut de recherche | McGill University Health Centre Research Institute

CIHR IRSC
Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

CENTRE FOR AGING + BRAIN HEALTH INNOVATION
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# Conflict of Interest Statement

- Co-creator and owner of MedSafer
- Chief Scientific Officer of MedSafer Corp; IP jointly owned with McGill University and Dr. T. Lee
- Pharma or industry funding: none
- Public operating funds (grants) from the CIHR, CFN and CABHI
- Scientific Director of the Canadian Medication Appropriateness and Deprescribing Network



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# MedSafer Study Team Across Canada

- MUHC co-Principal Investigator: Todd Lee
- Other QC Co-Is:
  - *André Bonnici and the MUHC pharmacy team;*
  - *Louise Papillon-Ferland (U de M);*
- MUHC research team: Lina Petrella, Sarah Elsayed, Liliane Mefanche, Kristen Moran, Manoja Chandralingam, Yejim Kim
- Software Developer: Alek Lefebvre

- The Ottawa and Ottawa Civic Hospitals: James Downar, Allen Huang, Babak Rashidi, Alan Forster
- The University Health Network (TGH/TWH): Pete Wu, Sandra Porter, Rachel Whitty, Kiran Battu, Rodrigo Calvalcanti, Tom MacMillan
- Kingston General Hospital: Johanna Murphy
- University of Alberta/Foothills: Gabriel Fabreau
- University of Edmonton: Finlay McAlister, Miriam Fradette
- University of British Columbia/St. Paul's: Anita Palepu, Nadia Kahn

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# Overmedicating seniors: an epidemic

- Seniors prescribed an average of 7 different drug classes
- 25% of older people prescribed 10 or more drug classes
- More drugs prescribed to people in rural regions, low-income neighbourhoods or residing in long-term care
- *The number of drugs* prescribed is the factor most responsible for *hospitalizations* due to adverse drug events

A 2016 CIHI report: https://www.cihi.ca/sites/default/files/document/drug-use-among-seniors-2016-en-web.pdf

# MEDICATION OVERLOAD

## POLYPHARMACY

5 or more meds

Indicated and beneficial

## MEDICATION OVERLOAD

Medications where:

risk>benefit for **most**

risk>benefit for **some**

Do not really work

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# Why it matters



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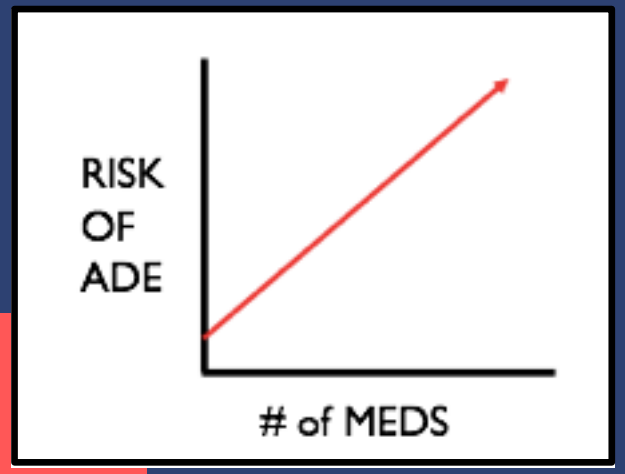
# Polypharmacy and adverse drug events (ADEs)




A patient's risk of an adverse drug event increases by **7 to 10%** with each medication prescribed.


MEDICATION OVERLOAD www.LownInstitute.org/pills

Taking 10 or more Mediations is associated with a 50% increase in falls

MEDICATION OVERLOAD

Taking 6 to 9 medications is associated with a **59% greater chance of death** in older adults.

LOWN

MEDICATION OVERLOAD www.LownInstitute.org/pills

Older patients taking 6 or more drugs in the hospital are **twice as likely to experience delirium** than those taking fewer drugs.

MEDICATION OVERLOAD www.LownInstitute.org/pills

# Polypharmacy is harmful

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# Adverse drug events

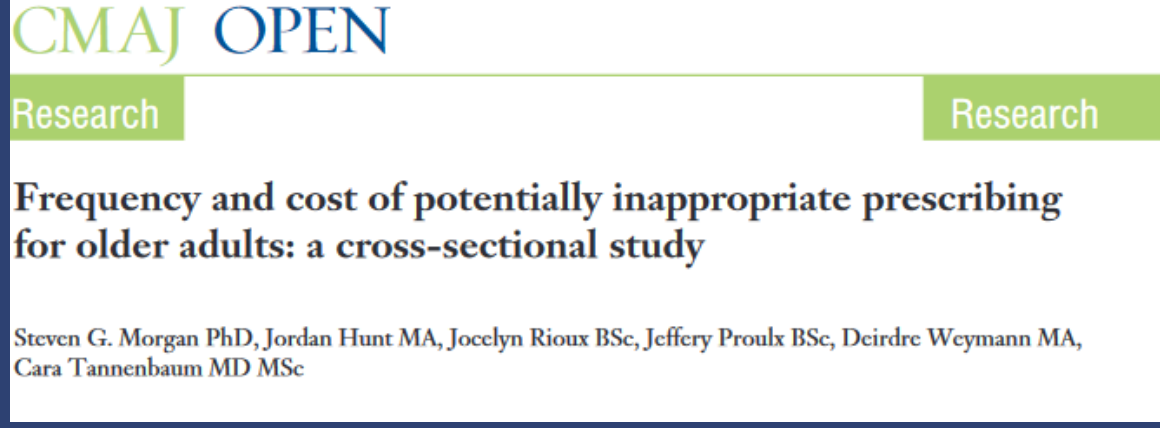

- Respiratory depression or severe constipation from opioids
- Hypoglycemia from diabetic agents
- Swollen legs and feet from gabapentinoids (leading to diuretic use → prescription cascade)
- Fall with hip fracture → sedative hypnotics
- Gastrointestinal hemorrhage → us of combination blood thinners beyond indicated duration

# What do these have in common?

- Well described
- **Frequent**
- Predictable
- Preventable
- Can be ***life altering***
  - *Unnecessary hospitalizations*
  - *Reduced autonomy*
  - *Reduced Quality of Life*



# Potentially inappropriate medications "PIMs" are costly!


CMAJ OPEN

Research Research

**Frequency and cost of potentially inappropriate prescribing for older adults: a cross-sectional study**

Steven G. Morgan PhD, Jordan Hunt MA, Jocelyn Rioux BSc, Jeffery Proulx BSc, Deirdre Weymann MA, Cara Tannenbaum MD MSc

- Outpatient 2013 data from 6 provinces and Beers List
- "We estimated that $75 per older Canadian, or **$419 million** in total, was spent on potentially inappropriate medications or PIMs"
- "Indirect health care costs attributable to potentially inappropriate prescribing […] would be about **$1.4 billion**"
- US estimate for ADE hospitalizations – 280,000 hospitalizations at an annual cost of $3.8 billion

The solution is **deprescribing**

# What can be done about Medication Overload?

- A "Prescription Checkup" or deprescribing
- Medication reconciliation→ medication *rationalization*



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# Patient story (used with permission): my grandmother Nora McDonald

Mom continues to struggle.

She is unable to toilet herself, dress or undress, comb her hair or wash herself.

ital for a subdural hematoma

She is unable to do her jigsaw puzzles or play games on the computer.

are facility

*and cognitive impairment*

She no longer is interested in reading, can't knit due to her physical limitations and ditto for her crossword puzzles.

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# What are the person's and family goals?

- To maximize functional independence and cognition
- To spend quality time interacting with family

# Medication list:

- Allopurinol 200 MG in the morning (gout prevention)

Could some of these medications have caused her initial fall?

Could some of these medications be contributing to her functional impairment?

- Ropinirole 0.25MG 1 in the morning, 1 in the afternoon, 2 at bedtime (restless legs)
- **Trazodone 100MG. 1 at bedtime (sleep)**



# Barriers to deprescribing

100s OF RULES for prescribing from MULTIPLE professional societies

10+ CONDITIONS and 10+ MEDICATIONS

Cross-referencing is TIME CONSUMING

Requires specialized medical EXPERTISE

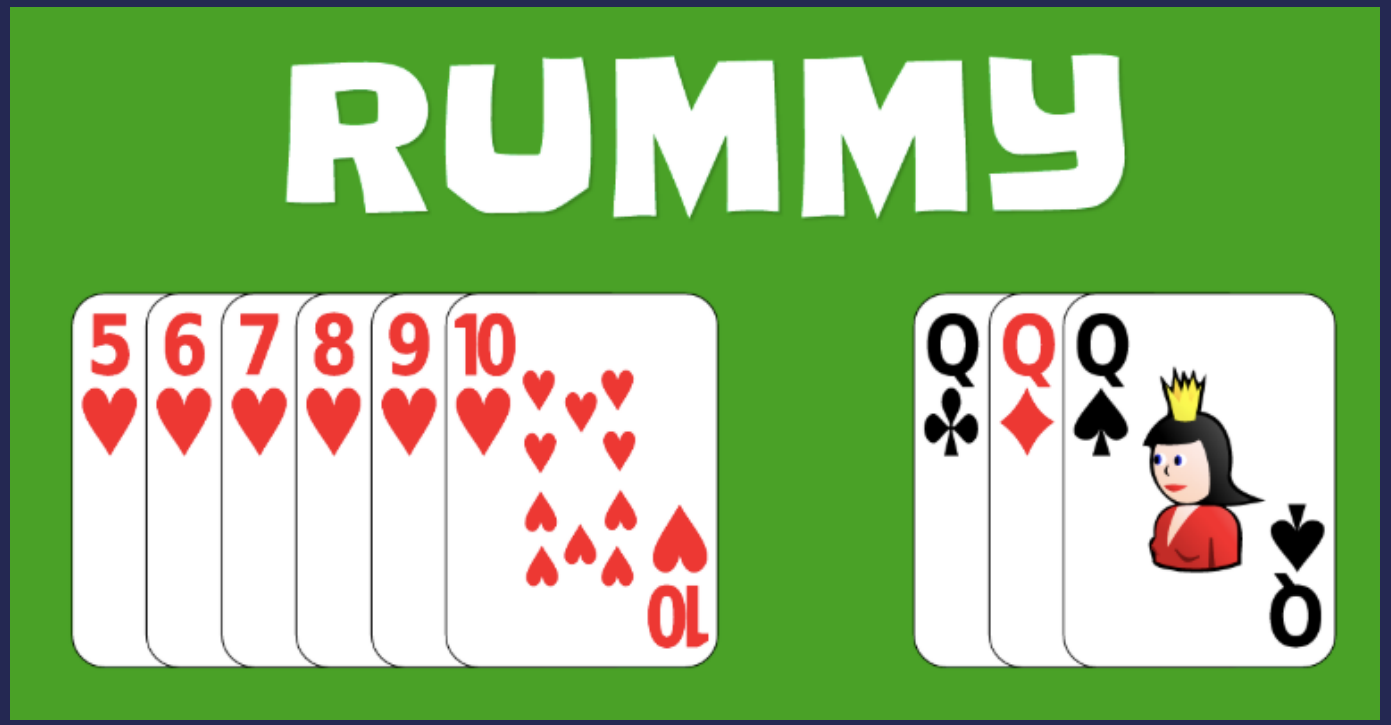
Resources ARE NOT universally available

Doctors may FEAR stopping medications

# What was the medication plan?

- Taper opioids, benzodiazepines, trazodone and ropinirole to lowest possible doses (ideally stopping) with a close eye on symptoms and cognition
- Accept blood pressure 140-160mmHg and minimize orthostatic hypotension (fall with traumatic brain injury)






# What happened?

- Over 3-6 months most of the drugs were weaned off
- Tylenol, tiotropium, melatonin
- "Her cognitive skills have improved"
- "[We] taught her how to play the card game "rummy." She beats me 2 out of 3 games regularly."

Nana McDonald

# MedSafer

- Identify *deprescribing opportunities* and facilitate a Rx checkup
- Cross-reference medical conditions, lab values, life expectancy, and frailty with the medication list
- Integrate for use in EMR/EHR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# MedSafer Deprescribing Opportunities

The American Geriatrics Society

STOPP criteria

Choosing Wisely

Canadian Deprescribing Network


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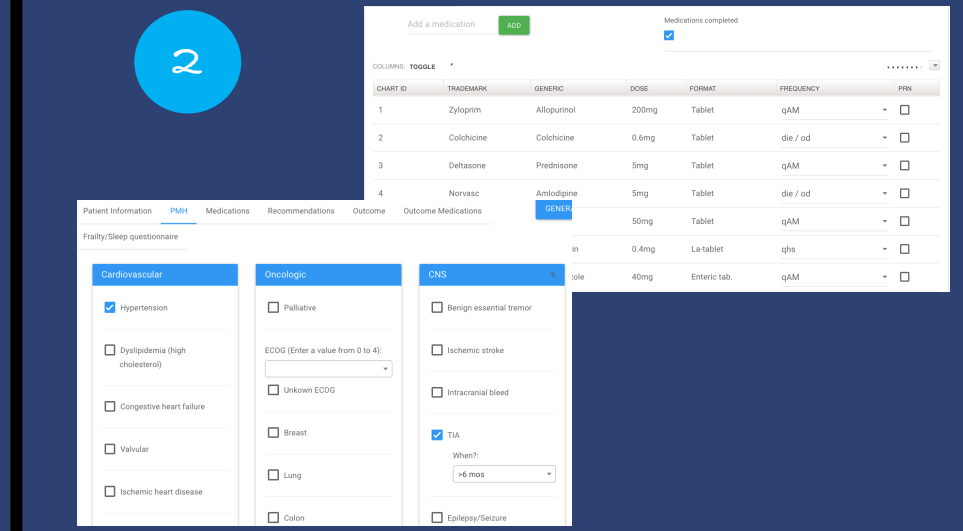
# HOW IT WORKS

1

2





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# MedSafer Report - Deprescribing Opportunities

as of 2021-10-18

## James Bond Male 101yo - TEST

This document contains prioritized **opportunities** for a **reassessment** of the listed medications. Any decisions should take into context what you know about your patient and your clinical assessment of the **risks** and **benefits** of what has been presented.

If you have questions, suggestions, or you would like to report an error, please email support@medsafer.org with the subject line "MedSafer Report"

### Tapering instructions or withdrawal concerns?

Please refer to the tapering instructions on last page.

## Drugs considered high risk for adverse drug events

| # | DRUG | CAUSE OF ALERT | WHY MIGHT THIS BE INAPPROPRIATE? | TAPERING INSTRUCTIONS |
|---|---|---|---|---|
| 1 | clopidogrel (clopidogrel bisulfate) (Abbott-Clopidogrel) | acetylsalicylic acid (Asa) | Dual antithrombotic therapy increases the risk of major hemorrhage and prolonged therapy | No |

## Drugs considered **intermediate risk** for adverse drug event

| # | DRUG | CAUSE OF ALERT | WHY MIGHT THIS BE INAPPROPRIATE? | TAPERING INSTRUCTIONS |
|---|---|---|---|---|
| 1 | trazodone tab (tablet) 50mg (Trazodone Tab (Tablet) 50mg) | General | Avoid using trazodone as a sleeping pill in older adults. Increased risk of falls, daytime drowsiness, and impaired cognition.<br><br>For patient material related to this class of medications see link below. | Yes |
| 2 | lansoprazole dr cap (delayed release capsule) 30mg (Lansoprazole Dr Cap (Delayed Release Capsule) 30mg) | General | Chronic PPI therapy should be reevaluated regularly. For patients aged 60 years and older along with two or more of the following, ongoing therapy may be beneficial: antiplatelet, NSAID, systemic steroids, anticoagulation, prior upper gastrointestinal bleed. Other scenarios requiring ongoing therapy include: hypersecretory conditions, dual antiplatelet therapy, variceal banding within 14 days, and H. Pylori treatment.<br><br>For patient material related to this class of medications see link below. | Yes |

# Tapering Instructions

| NOTE # | DRUG | INSTRUCTIONS |
|---|---|---|
| 1 | **QUEtiapine TAB (Tablet) 25mg**<br>**QUEtiapine TAB (Tablet) 25mg** | RECOMMENDATION: for higher doses withdraw gradually over days to weeks.<br><br>For patient material and a tapering regimen with patient/caregiver involvement, please see the following link on antipsychotics: http://www.criugm.qc.ca/fichier/pdf/ANTIPSYCHOTIC.pdf<br><br>For more information on the potential harms of antipsychotics please refer to the following link: https://www.journalofhospitalmedicine.com/jhospmed/article/195967/hospital-medicine/things-we-do-no-reason-use-antipsychotic-medications |
| 1 | **OLANZapine TAB (Tablet) 2.5mg**<br>**OLANZapine TAB (Tablet) 2.5mg** | RECOMMENDATION: for higher doses withdraw gradually over days to weeks.<br><br>For patient material and a tapering regimen with patient/caregiver involvement, please see the following link on antipsychotics: http://www.criugm.qc.ca/fichier/pdf/ANTIPSYCHOTIC.pdf<br><br>For more information on the potential harms of antipsychotics please refer to the following link: https://www.journalofhospitalmedicine.com/jhospmed/article/195967/hospital-medicine/things-we-do-no-reason-use-antipsychotic-medications |
| 1 | **traZODone TAB (Tablet) 50mg**<br>**traZODone TAB (Tablet) 50mg** | Reduce by 50% every week at doses higher than 25 mg QHS.<br><br>For patient material and a tapering regimen with patient/caregiver involvement, please see the following link on sedative-hypnotics:<br>http://www.criugm.qc.ca/fichier/pdf/BENZOeng.pdf |

# Funding history

2015 CFN Funding for a Pilot (800 participants)

2015 CIHR Funding for Cluster Randomized Trial (6000 participants)

2018 CABHI Funding to integrate with Med e-care EMR

2019 Healthy Seniors Pilot Project funding to integrate with Momentum EMR in NB

2021 CIHR/FRQS funding to integrate with Point Click Care

Total funding: $3.1 million over 5 years

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# The MedSafer Pilot:

- Canadian Frailty Network ($100,000)
- Principal Investigators: Todd C. Lee and Emily G. McDonald
- Co-Investigators:
  - *James Downar, Allen Huang, Alan Forster, Robyn Tamblyn*
- Three sites/four hospitals, controlled trial in older hospitalized adults using MedSafer in Quebec and Ontario
- Published in Journal of the American Geriatrics Society

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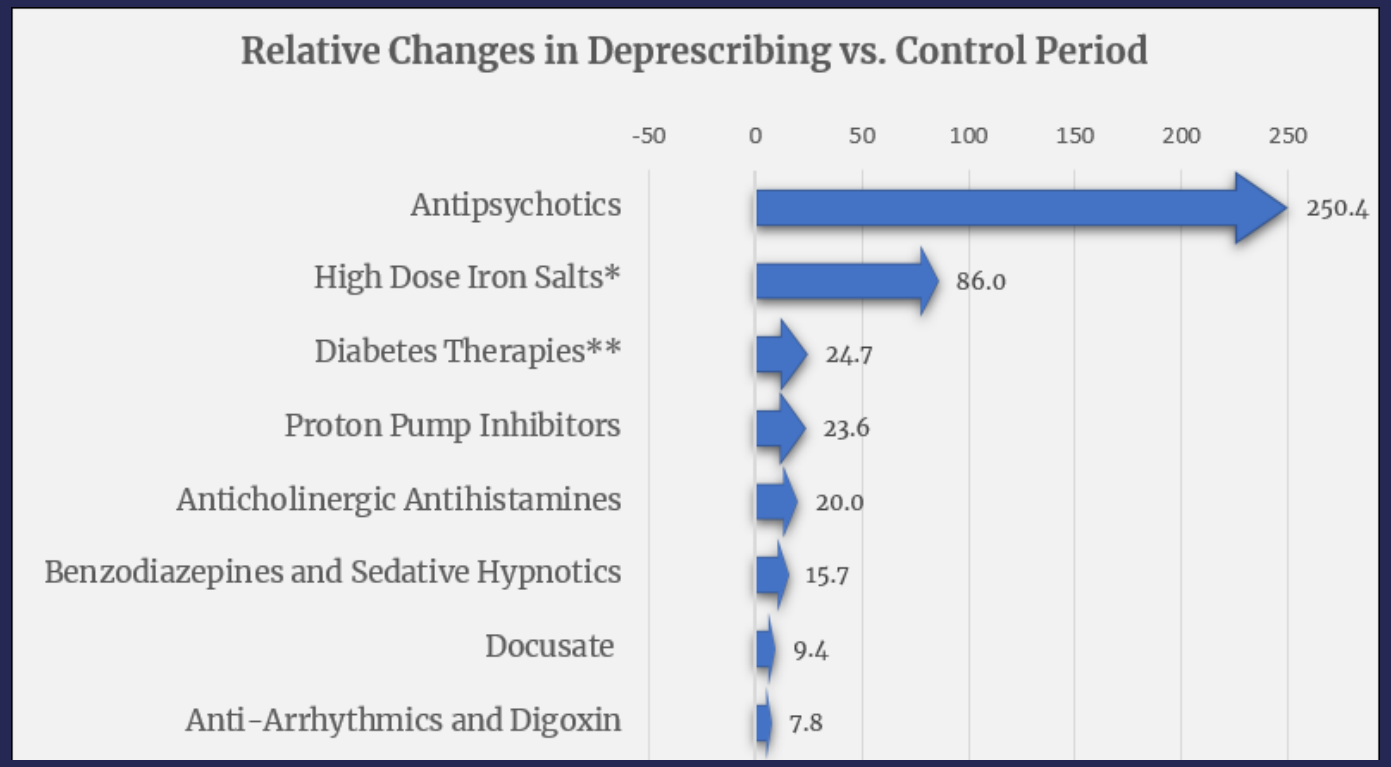
# Results




Absolute reduction in 1 or more PIMs 8.3% (2.9-13.9%)

NNT of 12

Annual cost savings $75-100 per patient exposed

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# CIHR clinical trial

- Eleven hospitals divided into 3 clusters:
  - Western Canada: Alberta Foothills Medical Center and University of Alberta Health Centre, British Columbia: St. Paul's Hospital
  - Quebec: Montreal General Hospital, Royal Victoria Hospital, and Lachine Hospital
  - Ontario: Kingston General Hospital, The Ottawa Hospital, The Ottawa Civic Hospital, The Toronto General Hospital, and The Toronto Western Hospital




"This really is an innovative approach, but I'm afraid we can't consider it. It's never been done before."

# Cluster randomized trial: if we knew then what we know now (2015→2021)

- Powered for a reduction in 30-day ADEs
  - *25% RR reduction in ADEs at 30-days post discharge*
  - *Estimate 16% (Forster 2004 + 2005) to 12%*
- Completed enrolment in January 2020
- Completed Adjudication of ADEs in 2021

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JAMA Network

JAMA Internal Medicine

Original Investigation | Less Is More

ONLINE FIRST

January 18, 2022

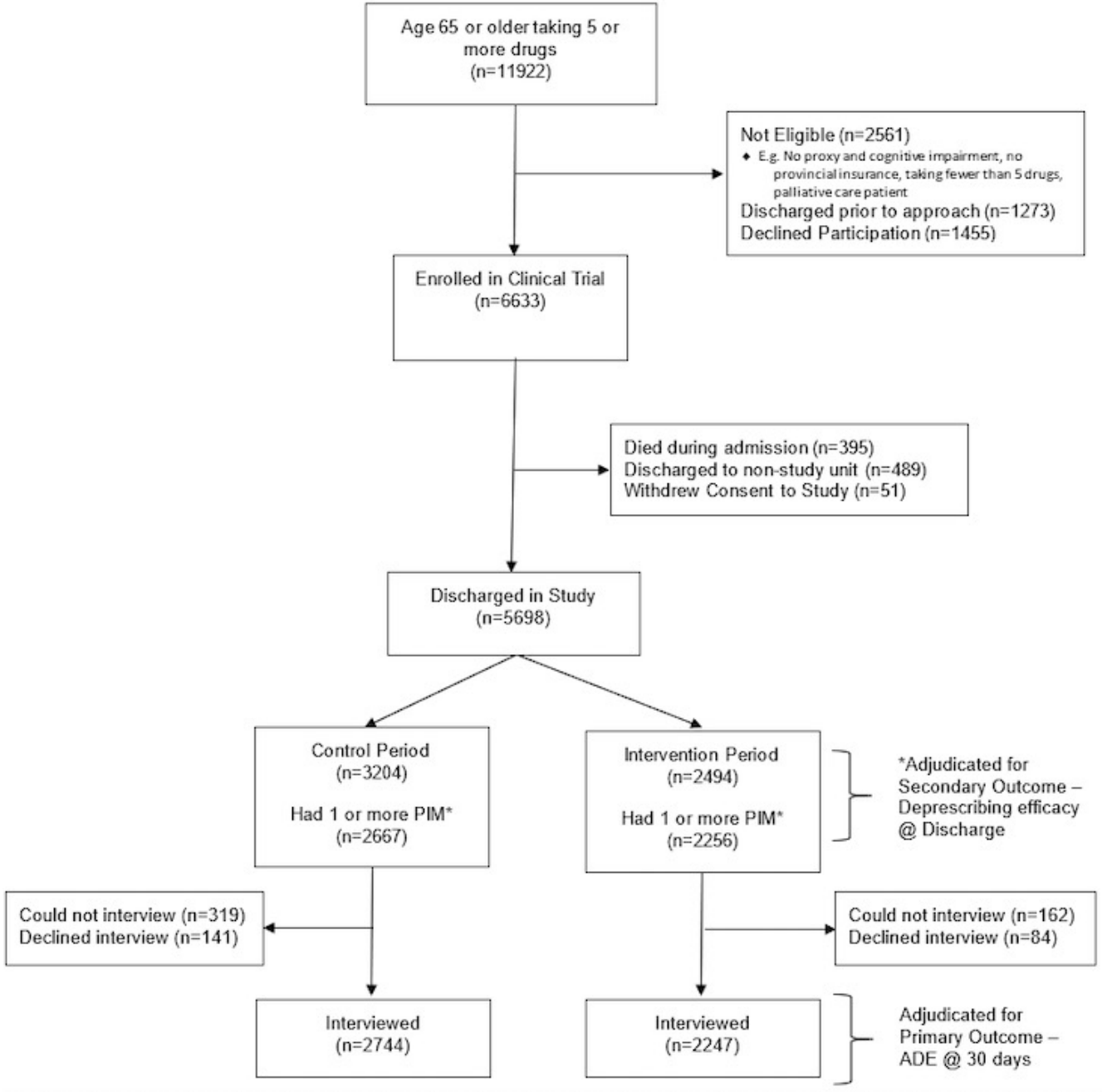
# The MedSafer Study—Electronic Decision Support for Deprescribing in Hospitalized Older Adults

## A Cluster Randomized Clinical Trial

Emily G. McDonald, MD, MSc[1,2,3]; Peter E. Wu, MD, MSc[4]; Babak Rashidi, MD, MHI[5]; et al

» Author Affiliations | Article Information

*JAMA Intern Med.* Published online January 18, 2022. doi:10.1001/jamainternmed.2021.7429


Age 65 or older taking 5 or more drugs (n=11922)
Not Eligible (n=2561)
E.g. No proxy and cognitive impairment, no provincial insurance, taking fewer than 5 drugs, palliative care patient
Discharged prior to approach (n=1273)
Declined Participation (n=1455)
Enrolled in Clinical Trial (n=6633)
Died during admission (n=395)
Discharged to non-study unit (n=489)
Withdrew Consent to Study (n=51)
Discharged in Study (n=5698)
Control Period (n=3204)
Had 1 or more PIM* (n=2667)
Intervention Period (n=2494)
Had 1 or more PIM* (n=2256)
*Adjudicated for Secondary Outcome – Deprescribing efficacy @ Discharge
Could not interview (n=319)
Declined interview (n=141)
Could not interview (n=162)
Declined interview (n=84)
Interviewed (n=2744)
Interviewed (n=2247)
Adjudicated for Primary Outcome – ADE @ 30 days

| Characteristic | Control (n=3204) | Intervention (n=2494) | P-value |
|---|---|---|---|
| Demographics | | | |
| Age (Median, IQR) | 78 (71-85) | 78 (72-86) | 0.0043 |
| Female | 1619 (50.5) | 1239 (49.7) | 0.88 |
| Anglophone | 2859 (89.2) | 1782 (71.5) | <0.001 |
| Francophone | 270 (8.4) | 579 (23.2) | |
| Other Language | 75 (2.3) | 133 (5.3) | |
| Admitted from Long Term Care Facility | 165 (5.1) | 185 (7.4) | <0.001 |
| Medications | | | |
| Number of Home Medications (Median, IQR) | 10 (8-13) | 10 (8-14) | 0.25 |
| Number of PIMs Identified (Median, IQR) | 2 (1-3) | 2 (1-4) | <0.001 |
| Length of Stay (Median, IQR) | 7 (4-13) | 8 (5-15) | <0.001 |

Table 4. Deprescribing Rates of Commonly Alerted Potentially Inappropriate Medications

| | | Control (n = 2667) | | | Intervention (n = 2256) | | | % Difference (95% CI) | |
|---|---|---|---|---|---|---|---|---|---|
| Specific PIMs | Possible problem | Users (%) | PIM (%) | PIM deprescribed (%) | Users (%) | PIM (%) | PIM deprescribed (%) | Unadjusted | Adjusted |
| Benzodiazepines and sedative hypnotics[a] | Increased risk of delirium, falls, death | 665 (24.9) | 553 (83.2) | 113 (20.4) | 538 (23.8) | 524 (97.4) | 210 (40.1) | 19.6 (14.3 to 25.0) | 22.7 (12.0 to 33.5) |
| Codeine and tramadol[b] | Unpredictably metabolized. If opioids are needed, a safer choice should be made | 272 (10.2) | 216 (79.4) | 74 (34.3) | 182 (8.1) | 179 (98.4) | 98 (54.7) | 20.5 (10.8 to 30.1) | 43.0 (30.5 to 55.5) |
| Combination antiplatelet and anticoagulants | Increased risk of bleeding; may be inappropriate | 269 (10.1) | 215 (79.9) | 75 (34.9) | 173 (7.7) | 146 (84.4) | 65 (44.5) | 9.6 (−0.6 to 19.9) | 24.8 (8.0 to 41.7) |
| Opioids (excluding codeine and tramadol) [b] | Opioid use outside of cancer pain is associated with risk of death | 430 (16.1) | 201 (46.7) | 57 (28.4) | 374 (16.6) | 210 (56.1) | 83 (39.5) | 11.2 (2.1 to 20.3) | 17.8 (−2.4 to 37.9) |
| Trazodone[a] | Off-label use for sleep is not indicated | 231 (8.7) | 156 (67.5) | 23 (14.7) | 132 (5.9) | 92 (69.7) | 30 (32.6) | 17.9 (6.8 to 28.9) | 24.3 (2.2 to 46.5) |
| Nonsteroidal anti-inflammatories | Can exacerbate congestive heart failure or hypertension | 230 (8.6) | 155 (67.4) | 36 (23.2) | 145 (6.4) | 120 (82.8) | 42 (35.0) | 11.8 (1.0 to 22.6) | 12.7 (−3.2 to 28.7) |
| Antipsychotics[a] | Not recommended as first line treatment for sleep or agitation in dementia | 239 (9.0) | 144 (60.3) | 33 (22.9) | 238 (10.5) | 206 (86.6) | 70 (34.0) | 11.1 (1.6 to 20.5) | 12.9 (−6.2 to 32.1) |
| Mirtazapine[a] | Off-label use for sleep is not indicated | 136 (5.1) | 54 (39.7) | 5 (9.3) | 122 (5.4) | 62 (50.8) | 12 (19.4) | 10.1 (−2.4 to 22.6) | 4.4 (−11.2 to 20.0) |
| Proton-pump inhibitors | Frequently used without indication | 1442 (54.1) | 1227 (85.1) | 127 (10.4) | 1149 (50.9) | 1056 (91.9) | 222 (21.0) | 10.7 (7.7 to 13.7) | 9.4 (2.5 to 16.4) |
| Diabetes therapies[c] | Demonstrated hypoglycemia; contraindicated agents in kidney failure | 948 (35.5) | 436 (46.0) | 159 (36.5) | 756 (33.5) | 381 (50.4) | 192 (50.4) | 13.9 (7.2 to 20.7) | 11.3 (−2.3 to 25.0) |
| Gabapentinoids | Frequently used off label and have many adverse effects (fluid retention, worsening cognition, and death) | 558 (20.9) | 406 (72.8) | 86 (21.2) | 367 (16.3) | 323 (88.0) | 114 (35.3) | 14.1 (7.6 to 20.7) | 0.6 (−11.6 to 12.9) |
| Thiazides | High risk of hyponatremia if prior hyponatremic event | 467 (17.5) | 152 (32.5) | 78 (51.3) | 356 (15.8) | 129 (36.2) | 101 (78.3) | 27.0 (16.3 to 37.6) | 32.8 (17.4 to 48.2) |
| SSRIs | Can contribute to recurrent falls in older adults | 407 (15.3) | 91 (22.4) | 16 (17.6) | 351 (15.6) | 88 (25.1) | 19 (21.6) | 4.0 (−7.6 to 15.6) | 14.8 (−4.6 to 34.1) |
| High-dose iron salts[d] | Less tolerated and no more effective than standard dosage | 535 (20.1) | 129 (24.1) | 21 (16.3) | 398 (17.6) | 109 (27.4) | 54 (49.5) | 33.3 (21.9 to 44.6) | 26.5 (1.2 to 51.7) |
| Docusate | Ineffective for treatment or prevention of constipation | 248 (9.3) | 248 (100.0) | 99 (39.9) | 208 (9.2) | 208 (100.0) | 133 (63.9) | 24.0 (15.1 to 33.0) | 23.4 (5.6 to 41.2) |
| Nonstatin cholesterol medications[c] | Limited evidence of efficacy | 145 (5.4) | 137 (94.5) | 12 (8.8) | 120 (5.3) | 120 (100.0) | 35 (29.2) | 20.4 (11.0 to 29.8) | 12.7 (−8.3 to 33.8) |

Abbreviations: PIM, potentially inappropriate medication; SSRI, selective serotonin reuptake inhibitors.

[a] Excludes patients with psychiatric indication (or seizure for benzodiazepines).

[b] Excludes patients in palliative care or with cancer as possible indication.

[c] Users may have been taking >1 medication, and user numbers represent ≥1.

[d] Excludes those already taking low-dose iron salts.

# Deprescribing in Acute Care: MedSafer Study

- Deprescribing increased from 795 (29.8%) of 2667 control to 1249 (55.4%) of 2256 intervention participants [aRD, 22.2%; 95% CI, 16.9% to 27.4%].
- NNT=4
- There was no significant difference in ADEs within 30 days of discharge (138 [5.0%] of 2742 control vs 111 [4.9%] of 2247 intervention participants; adjusted risk difference [aRD] −0.8%; 95% CI, −2.9% to 1.3%).
- There was no difference in ADWEs between groups.

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Why no change in ADEs?

- Power
- Duration
- Adjudication
- Not all PIMs are equal

# Government support for safer prescribing

- This year the Ontario government launched a funding opportunity that would compensate long-term care homes for medication management and included funding for MedSafer as one option for that program. This is a description of the funding they are providing:
- https://news.ontario.ca/en/release/60926/ontario-strengthening-medication-safety-in-long-term-care-homes.
- This would be effectuated via existing interfaces in Point Click Care and Med-E-Care which are the two dominant EMRs in Ontario.



NEWS RELEASE

# Ontario Strengthening Medication Safety in Long-Term Care Homes

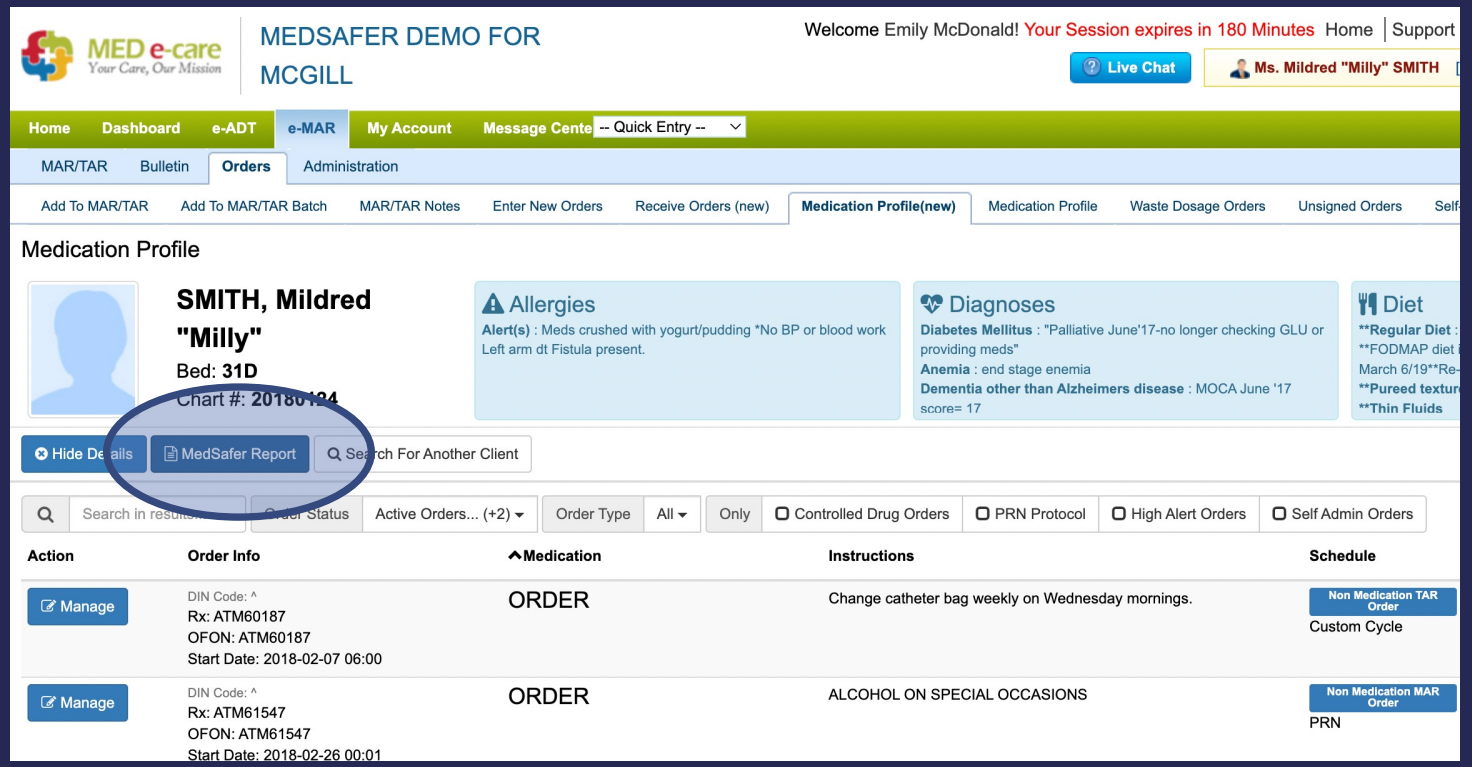
## Adopting New Technology will Better Protect Residents

**March 29, 2021**

Long-Term Care

Technology can make medication management safer and more efficient by automating and integrating processes across the medication lifecycle. This program will provide supplementary funding to help long-term care homes acquire medication management technologies that support:

- Secure and accurate electronic transmission and handling of prescription information.
- Optimization of medication regimens for long-term care home residents, including the identification of opportunities for deprescribing (stopping a medication or reducing a medication's dose) and decision support at the point of prescribing (e.g., electronic clinical decision support systems)
- Strengthening security of the drug supply (e.g., advanced drug storage solutions, like automated dispensing carts)
- Accurate administration of medication (e.g., software and devices that help support medication administration)
- Oversight and monitoring of the medication use process
- Improved functioning of the medication management system in the long-term care home.




# EMR INTEGRATION

## SMITH, Mildred "Milly"

Bed: **31D** Chart #: **20180124**

Report Date: 2022-04-05
Active Orders Future Orders Hold Orders

MED e-care
Your Care, Our Mission

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*This document contains prioritized opportunities for a reassessment of the listed medications. Any decisions should take into context what you know about your resident and your clinical assessment of the risks and benefits of what has been presented. If you have questions, suggestions, or you would like to report an error, please email support@medsafer.org with the subject line "MedSafer Study"*

| Medication | Contition/Second Medication | Rationale | Stopping Priority | Tapering Instructions |
|---|---|---|---|---|
| Gravol 50 Mg. Supp* | Any | Avoid using gravol in older adults. May precipitate delirium. If needed for the short-term treatment of nausea, doses of less than 25 mg are recommended. | HIGH RISK for adverse event | No |
| Haloperidol Inj | Dementia | In general, antipsychotics should be avoided in patients with dementia unless symptoms of agitation are severe and non-pharmacological interventions have failed. Antipsychotics increase risk of stroke, falls, confusion, and extra-pyramidal side effects. For patient material related to this class of medications see link below. | HIGH RISK for adverse event | Yes |
| Scopolamine Inj | Dementia | May worsen or precipitate delirium. Consider weighing the risks and benefits of using medications with anticholinergic properties in older adults. | HIGH RISK for adverse event | Yes |
| HYDROmorphone Amp | Any | Don't initiate or maintain opioids long-term for chronic pain until there has been a trial of non-pharmacologic treatment and of non-opioid medications. Non-pharmacologic modalities for chronic pain include exercise, weight loss, cognitive-behavioural therapy, massage and physical therapy. Depending on the pain mechanism and co-morbidities, non-opioid medications include: acetaminophen, NSAIDS and other molecules. An opioid trial should be guided by clear criteria for | HIGH RISK for adverse event | Yes |

# Questions, Comments, Discussion

- @DrEmilyMcD on Twitter
- emily.mcdonald@mcgill.ca
- MedSafer.org



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