Supplement 1: Additional prespecified criteria for potentially inappropriate prescribing (PIP)

Four additional pre-specified PIP were included in addition to the STOPP/START criteria. The STOPP/START criteria were developed in Europe and are not entirely reflective of common, high priority adverse prescribing practices in North America - for example frequent prescribing of inappropriately high doses of opioids. As a result, the study authors consisting of a clinical pharmacist, geriatrician, and pharmacologist suggested additional PIP criteria.

Four additional pre-specified PIP:

1) Use of high dose opioids, defined as ≥ 50 morphine milligram equivalents (MME) daily, as highlighted in US and Canadian guidelines[1,2]

Justification: opioid dosages ≥ 50 MME/day are associated with increased risk of overdose and not likely to add benefit

2) Concomitant use of 2 or more of the following central nervous depressants: opioids, benzodiazepines, and/or alcohol[1]

Justification: concurrent use increases the risk of fatal overdoses

3) Use of high alert medications which require therapeutic drug monitoring, with levels outside of the recommended therapeutic window. Medications recommended were digoxin, phenytoin, lithium, and carbamazepine. Digoxin is considered a high-risk medication in older adults. Drug levels were reviewed to determine appropriateness of drug dosing.[3,4]

Justification: drug levels outside of the recommended therapeutic window indicate potential risk for reduced efficacy or increased toxicity

4) Concomitant use of key drugs which interact with oral anticoagulants or antiplatelets:[5]

   i. Other antiplatelets or anticoagulants

   ii. Selective serotonin reuptake inhibitors (SSRIs)

   iii. Antibiotics

   iv. Nonsteroidal anti-inflammatory drugs (NSAIDs)

   v. Amiodarone with warfarin

Justification: concomitant use has been shown to increase the risk of bleeding

References

1. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain — United States, 2016. Morbidity and Mortality Weekly Report.

2. Busse JW, Craigie S, Juurlink DN, et al. Guideline for opioid therapy and chronic noncancer pain. *CMAJ*. 2017;189(18):E659-E666. doi:10.1503/cmaj.170363

3. Ruiz J, Array S, Lowenthal D. Therapeutic drug monitoring in the elderly. *Am J Ther*. 1996;3(12):839-60.

4. *Safer medication use in older persons information page*. Institute for Safe Medication Practices Canada; 2017 [cited 2017 Dec 11]. Available from: https://www.ismp-canada.org/beers_list/#l=tab2

5. Holbrook A, Schulman S, Witt DM, Vandvik PO, Fish J, Kovacs MJ, et al. Evidence-based management of anticoagulant therapy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest*. 2012;141(2 Suppl):e152S-e184S. doi:10.1378/chest.11-2295

Supplement 2: Sample data collection form.

Data Collection Summary Table

Elements	Definition	Areas that will be accessed	Data to be collected
Date Collected	Date at which chart was accessed and information was collected		
Subject ID number	Unique ID number given to each subject enrolled To be created by principal investigators		
MRN	Medical record number; unique number assigned to each patient at the hospital	Provided from decision support	
Admission date	Calendar date patient was admitted to the hospital		
Discharge date	Calendar date patient was discharged form hospital		
Age	Age at the time of admission (years)	Admission note	Age (years)
Sex	Sex of the patient	Admission note	Sex of the patient
Patient living situation	Where the patient resided prior to admission	Admission note	Living situation
Reason for admission	Diagnoses that contributed to the patient's current admission, as identified by the admission note	Admission note; admission orders	List of diagnoses
Past Medical History	Diagnosed past medical conditions the patient has on admission	Admission Note, previous discharge summaries	List of past medical conditions
Home medications	Medications (scheduled and prn) that the patient was taking prior to this admission	ODB DPV	- home medications ordered -Total number of unique medications the patient was on, determined by medications billed through ODB

Medications ordered in hospital	Medications started within first day of admission	Physician orders, admission note, medication tab on Meditech	
Discharge medications	Medications that patients were discharged on	Discharge summary, discharge prescriptions	
PIMs based on STOPP	Application of STOPP criteria to medications		
PPOs based on START	Application of STOPP criteria to medications ordered within first day of admission and all home medications	Previous consult notes, discharge summaries, diagnostic imaging to determine if there was a valid reason for omission	
Creatinine	Serum creatinine on admission	Lab data	Serum creatinine (mmol/L) on admission
eGFR	Estimated glomerular filtration rate (mL/min)	Lab data	eGFR (mL/min)
Baseline Creatinine	Baseline creatinine prior to admission, based on trends.	Lab data; admission note, consult notes	Classified into groups: <100, 100–149, 150–199, 200–249, 250–299, 300–349, 350–399, 400+
ER visits	# of emergency room visits the patient experienced after the admission of interest	Meditech visit history	
Admission to hospital	# of admissions to Hamilton Health Sciences hospitalsafter the admission of interest	Meditech visit history	

Note:
Clinical, laboratory, and imaging data may be accessed to assess if the STOPP or START criteria are met. However, this information will not be recorded.
Example: Blood pressure, hemoglobin A1C (HbA1C), bone mineral density, lipid profile, electrolytes, diagnostic imaging