

Analyzing the Use of Beers Criteria Guidelines through ATLAS Operationalization

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Background

Geriatric pharmacy management is a growing area of focus in clinical guideline development. Two of the most important errors targeted by these guidelines are overprescribing, which involves the inclusion of more medications than necessary to control a certain disease state, and misprescribing, which includes incorrect or potentially dangerous medication selection for a patient's condition and demographic. Incorrect or inappropriate medications have the potential to cause a variety of health risks to older adults, including an increase in fall risk, electrolyte abnormalities, and adverse neurological reactions. The most prominent guideline, the American Geriatrics Society Beers Criteria for Older Adults, establishes a list of medications considered inappropriate for use based upon their mechanism of action, adverse event profile, or contraindicated disease state. In Pennsylvania, the Pharmaceutical Assistance Contract for the Elderly (PACE) program seeks to offer low-cost prescription medications for eligible individuals, as well as to eliminate overprescribing and misprescribing. Potentially inappropriate medications are utilized in around 24 percent of geriatric patients; however, estimates vary widely based on factors related to providers, healthcare programs, and institutions. While small-scale, institution-only studies have been conducted to determine individual adherence to the Beers criteria, larger studies at the health system or population levels are scarce. This investigation of adherence to the Beers criteria is a first step towards the integration of a pharmaceutical decision aid that can be implemented at scale as well as establish trends that can lead to better pharmaceutical prescribing methods on any level.

Methods

The purpose of this study is to utilize Atlas to create a system that assesses the curation of medications for older adults by comparing real life prescribing data to the Beers criteria. Therefore, our investigation will seek to compare two groups in terms of their frequency of inappropriately prescribed medications. We have created a data set represented using the OHDSI common data model containing outpatient drug claims from University of Pittsburgh Medical Center (UPMC) set between 2015-2018, both from a subset of patients enrolled in PACE and a subset of patients not enrolled in the program. To compare these two groups, we created Atlas concept sets and cohort definitions to develop an operationalized version of Beers criteria to apply to the drug claims data sets. The cohort definitions will then be used to compare the prescription of potentially inappropriate medications between PACE enrollees and non-enrollees.

Results

The data set contains 89,600 PACE enrollees and 557,000 non-enrollees. Concept sets were created for 348 medication classes or subgroups referenced in the Beers criteria. All of these required more specific tailoring using Atlas cohort definitions and concept sets to fit the Beers criteria provided. For example, while avoiding dipyridamole in geriatric patient populations is recommended, the combination of extended-release product with aspirin is an appropriate medication to use for antithrombosis in geriatric patients. Following concept set development, we utilized Atlas-generated cohorts to capture the prevalence of use of medication based upon the Beers guidelines. For example, short-acting insulins such as Humalog (insulin Lispro) or Humulin R (regular insulin) are considered potentially inappropriate medications in adults over 65 years of age, except when used concomitantly with a long-acting insulin

such as Lantus (insulin glargine). To isolate individuals at risk, our cohort definition, included all the patients within each group over 65 that received short-acting insulin but had no outpatient script record of simultaneously receiving a long-acting insulin. The logic for determining potentially inappropriate insulin use is captured in Figure 1. Using this process, we were able to assess prescriber adherence to the Beers Criteria, both on an individual medication level and on a full-criteria scope. Select results from specific medication criteria are included in Figure 2, while overall use of potentially inappropriate medications in each enrollment group are displayed in Figure 3.

[Beers PIM] Insulins

Initial Event Cohort
 People having any of the following:

- a drug exposure of [test] Short/Rapid-Acting Insulins²
 - occurrence start is on or after 2015-01-01
 - occurrence end is on or Before 2018-12-31
 - drug type is any of EHR prescription

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **all events per person**.

Inclusion Rules
 Inclusion Criteria #1: Concomitant w/ Long-Acting
 Having all of the following criteria:

- with the following event criteria:
 - with age >= 65
- and at most 0 occurrences of a drug era of [test] Intermediate/Long-Acting Insulins¹
 - where event starts between 90 days Before and 0 days After index start date and event ends between 0 days Before and all days After index start date

Limit qualifying cohort to: **earliest event per person**.

End Date Strategy
 No end date strategy selected. By default, the cohort end date will be the end of the observation period that contains the index event.

Cohort Collapse Strategy:
 Collapse cohort by era with a gap size of 0 days.

Figure 1 The logic used to evaluate the short-acting insulin Beers guidelines. The output generated removes patients who are less than 65 years of age at the onset of short-acting insulin exposure and removes patients who are on a long-acting insulin at the same time.

Medication subgroups	Beers Recommendation	# of uses in PACE cohort	# of uses in non-PACE cohort	% of use considered unacceptable (PACE)	% of use considered unacceptable (non-PACE)
Short-Acting Insulins (lispro, regular, etc)	Avoid use of short-acting insulin monotherapy; use with concomitant long-acting insulin	3,073	12,046	24.28% (746/3073)	25.06% (3,019/12,046)
Peripheral alpha-1 blockers (prazosin, doxazosin, etc)	Use unacceptable for hypertension; other uses appropriate	1,125	7,948	71.20% (801/1,125)	69.93% (5,558/7,948)
Amiodarone	Avoid use for atrial fibrillation UNLESS concurrent condition with heart failure	1,636	7,881	30.32% (496/1,636)	34.27% (2,677/7,881)

Figure 2 Examples of results for 3 medication subgroups, the Beers recommendation for that drug, and the incidence of use and potentially inappropriate use within our two enrollment groups.

	Number of Inappropriate Drug Exposures	Number of Total Outpatient Drug Orders	Percentage of Outpatient Drug Orders deemed inappropriate
PACE enrollees	43,425	1,751,078	2.48%
Non-PACE enrollees	216,805	8,579,643	2.53%

Figure 3 The accumulated statistics from the entire Beers criteria guidelines. These results suggest that PACE enrollees are less likely to experience a potentially inappropriate outpatient drug order than those not enrolled in PACE.