Development of a Metric to Detect and Decrease Low-Value Prescribing in Older Adults

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Abstract

IMPORTANCE Metrics that detect low-value care in common forms of health care data, such as administrative claims or electronic health records, primarily focus on tests and procedures but not on medications, representing a major gap in the ability to systematically measure low-value prescribing.

OBJECTIVE To develop a scalable and broadly applicable metric that contains a set of quality indicators (EVOLV-Rx) for use in health care data to detect and reduce low-value prescribing among older adults and that is informed by diverse stakeholders’ perspectives.

DESIGN, SETTING, AND PARTICIPANTS This qualitative study used an online modified-Delphi method to convene an expert panel of 15 physicians and pharmacists. This panel, comprising clinicians, health system leaders, and researchers, was tasked with rating and discussing candidate low-value prescribing practices that were derived from medication safety criteria; peer-reviewed literature; and qualitative studies of patient, caregiver, and physician perspectives. The RAND ExpertLens online platform was used to conduct the activities of the panel. The panelists were engaged for 3 rounds between January 1 and March 31, 2021.

MAIN OUTCOMES AND MEASURES Panelists used a 9-point Likert scale to rate and then discuss the scientific validity and clinical usefulness of the criteria to detect low-value prescribing practices. Candidate low-value prescribing practices were rated as follows: 1 to 3, indicating low validity or usefulness; 3.5 to 6, uncertain validity or usefulness; and 6.5 to 9, high validity or usefulness. Agreement among panelists and the degree of scientific validity and clinical usefulness were assessed using the RAND/UCLA (University of California, Los Angeles) Appropriateness Method.

RESULTS Of the 527 low-value prescribing recommendations identified, 27 discrete candidate low-value prescribing practices were considered for inclusion in EVOLV-Rx. After round 1, 18 candidate practices were rated by the panel as having high scientific validity and clinical usefulness (scores of ≥6.5). After round 2 panel deliberations, the criteria to detect 19 candidate practices were revised. After round 3, 18 candidate practices met the inclusion criteria, receiving final median scores of 6.5 or higher for both scientific validity and clinical usefulness. Of those practices that were not included in the final version of EVOLV-Rx, 3 received high scientific validity (scores ≥6.5) but uncertain clinical usefulness (scores <6.5) ratings, whereas 6 received uncertain scientific validity rating (scores <6.5).

CONCLUSIONS AND RELEVANCE This study culminated in the development of EVOLV-Rx and involved a panel of experts who identified the 18 most salient low-value prescribing practices in the care of older adults. Applying EVOLV-Rx may enhance the detection of low-value prescribing (continued)
practices, reduce polypharmacy, and enable older adults to receive high-value care across the full spectrum of health services.


Introduction

Low-value care, which is defined as the use of health services whose harms or costs exceed their benefits, is a major factor in wasteful health care spending and has been associated with physical, psychological, and financial harms. In the US, more than $100 billion per year has been spent on the delivery of low-value care, affecting up to 43% of Medicare beneficiaries. However, low-value care metrics primarily consist of tests and procedures and exclude the low-value prescribing of medications. This exclusion represents a major gap in the ability to systematically detect low-value prescribing and low-value care across the full spectrum of health services.

Characterizing and reducing low-value prescribing are especially important for individuals who are 65 years or older. More than 40% of older adults have been subjected to polypharmacy (prescribed ≥5 medications), and 30% to 50% have been prescribed a potentially inappropriate medication, increasing their risk for adverse drug events and hospitalizations. In addition, 35% of Medicare Part D beneficiaries have experienced hardship in paying for their medications.

There is currently no metric that consolidates and prioritizes the hundreds of recommendations from professional societies and the Choosing Wisely campaign for health systems and third-party payers to detect, quantify, and reduce low-value prescribing. Many current recommendations, such as avoiding the use of testosterone to treat nonspecific symptoms of aging, provide only general guidance to clinicians and have not been operationalized to measure low-value prescribing using administrative claims or electronic medical record data, which would ensure the scalability and automation of these measures. Other tools, such as the Beers Criteria, may be applied to health care data but focus primarily on medication safety and do not incorporate other components of health care value, such as cost. The perspectives of patients or their caregivers were not integral to the development of these and other low-value care metrics.

In this qualitative study, we aimed to develop a scalable and broadly applicable metric that contains a set of quality indicators to detect and reduce low-value prescribing among older adults and that is informed by diverse stakeholders’ perspectives. We named this metric EVOLV-Rx (Evaluating Opportunities to Decrease Low-Value Prescribing).

Methods

We developed EVOLV-Rx in 2 sequential steps. First, we generated the criteria to detect candidate low-value prescribing practices. For this step, we synthesized the preexisting recommendations from the Choosing Wisely campaign and other medication safety criteria (eg, the Beers Criteria), peer-reviewed literature, and the results of 3 qualitative studies on low-value prescribing. Second, using an online modified-Delphi approach, we convened a panel of physicians and pharmacists to codify the final components of EVOLV-Rx (Figure 1). Members of this panel serve as health system leaders, practicing clinicians, and researchers. This study was deemed exempt by the institutional review boards of the University of Pittsburgh and the RAND Corporation.

Step 1: Generating the Criteria to Detect Candidate Low-Value Prescribing Practices

We compiled a collection of low-value prescribing recommendations according to previously applied approaches to identifying low-value health services. We considered prescribing practices whose costs or harms generally outweigh their benefits for older adults (aged ≥65 years). Practices were...
assessed on the following 4 value domains, which were adapted from the Lown Institute approach to characterizing medication appropriateness\textsuperscript{15}: (1) lack of effectiveness for a stated indication, either in general or because of inappropriately prolonged use; (2) potential for harm because of the risk of an adverse drug event, drug-drug or drug-disease interaction, or overly intensive treatment; (3) excessive cost because of the unnecessary use of a costly brand-name medication or specific preparation; or (4) use of a medication to treat the adverse effects of another medication as part of a prescribing cascade.

We acquired low-value prescribing recommendations from the Choosing Wisely campaign\textsuperscript{8} and the most up-to-date versions of the following medication safety and appropriateness guidelines: the Beers Criteria,\textsuperscript{10} FORTA (Fit for the Aged) list,\textsuperscript{16} STOPP/START (Screening Tool of Older Persons’ Prescriptions and Screening Tool to Alert to Right Treatment),\textsuperscript{17} and STOPPFrail (Screening Tool of Older Persons’ Prescriptions in Frail Adults With Limited Life Expectancy).\textsuperscript{18} We also considered the findings from published studies and medications or medication classes that were most associated with adverse drug events requiring hospital admission.\textsuperscript{19} We integrated the findings from 3 qualitative studies (which were conducted by some of us and other members of our research team), which used focus groups with patients and caregivers as well as semistructured interviews with primary care physicians to characterize their perspectives on and specific examples of low-value prescribing (eTable 1 in the Supplement).\textsuperscript{11,13}

To focus on those candidate low-value prescribing practices that were current and had the potential to affect the greatest number of older adults, we narrowed down our initial collection of low-value prescribing recommendations to those that overlapped with the 100 most frequently prescribed or costly medications among Medicare beneficiaries in fiscal year 2017 (the most recent year of available data at the beginning of this study). We also included medications whose frequency of use was comparable to drugs that were most frequently prescribed in Medicare Part D but may be purchased over the counter, such as aspirin or docusate sodium.\textsuperscript{20}

All of the investigators on the research team met monthly to generate operational definitions that could be applied to health care data for each candidate low-value prescribing practice. An external advisory panel of 6 geriatricians, pharmacoepidemiologists, and medication safety experts also met every 3 months to provide general feedback and ensure that EVOLV-Rx remained focused on the prescribing practices that were most relevant to older adults.

To define each candidate low-value prescribing practice, we developed both sensitive and specific criteria, applying an approach developed by Schwartz et al.\textsuperscript{3,21} The goal of the sensitive criteria was to identify patients who could be subjected to potential low-value prescribing, whereas the goal of the specific criteria was to identify the subset of older patients for whom the prescribing practice would most likely be of low value, according to a priori low-value criteria we had established. For example, regarding the prolonged use of proton pump inhibitors (PPIs), the proposed sensitive criteria may identify patients who were prescribed a PPI for more than 2 months. Recognizing that the prolonged use of a PPI may at times be clinically appropriate, the specific criteria would build on

Figure 1. The Development of Evaluating Opportunities to Decrease Low-Value Prescribing (EVOLV-Rx)

Step 1: Generate criteria to detect candidate low-value prescribing practices

Step 2: Convene online modified Delphi panel

18 Final low-value prescribing practices (EVOLV-Rx)
the sensitive criteria to recognize situations in which PPI use would most likely be of low value, such as among patients without a guideline-concordant indication, without concurrent long-term use of NSAIDs and corticosteroids, or with a prescription for a brand-name PPI.

To facilitate the deliberations of the online modified-Delphi panel, we generated a 2-page peer-reviewed infographic for each candidate low-value prescribing practice. The infographic contained the proposed sensitive and specific criteria as well as an evidence-based synopsis and related utilization, cost, and qualitative data (3 examples are provided in the eFigure in the Supplement). Before implementing them in the study, we received feedback on the criteria for each candidate low-value prescribing practice as well as on the accuracy and content of the infographic from a multidisciplinary clinical faculty that was affiliated with the Center for Pharmaceutical Policy and Prescribing at the University of Pittsburgh.

**Step 2: Convening an Expert Panel**

To establish consensus on and refine the criteria to identify the most salient low-value prescribing practices for EVOLV-Rx, we convened a panel of 15 physicians and pharmacists using an online modified-Delphi method. This panel comprised practicing clinicians; health system leaders; and international experts in deprescribing, pharmacoepidemiology, and health care value (Box). Panelists were recruited on the basis of their record of scholarly publications, academic or industry leadership,

<table>
<thead>
<tr>
<th>Box. Online Modified-Delphi Panel of Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panelists included members of the external advisory panel and were recruited on the basis of their record of scholarly publications, academic or industry leadership, or referral by the advisory panel or research team.</td>
</tr>
<tr>
<td><strong>Member Specialties, Affiliations, and Geographic Locations</strong></td>
</tr>
<tr>
<td>Tim Anderson, MD, MAS, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts</td>
</tr>
<tr>
<td>Elizabeth Bayliss, MD, MSPH, University of Colorado School of Medicine and Kaiser Permanente Colorado, Aurora, Colorado</td>
</tr>
<tr>
<td>Winfred Frazier, MD, MPH, New Kensington Family Health Center, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania</td>
</tr>
<tr>
<td>Mark Friedberg, MD, MPP, Blue Cross Blue Shield of Massachusetts, Boston, Massachusetts</td>
</tr>
<tr>
<td>Chester B. Good, MD, MPH, Center for Value-Based Pharmacy Initiatives, UPMC Health Plan, Pittsburgh, Pennsylvania</td>
</tr>
<tr>
<td>Holly Holmes, MD, MS, University of Texas McGovern Medical School, Houston, Texas</td>
</tr>
<tr>
<td>Matthew Joseph, MD, PharmD, Northern Medical Associates, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania</td>
</tr>
<tr>
<td>Zach Marcum, PharmD, PhD, University of Washington School of Pharmacy, Seattle, Washington</td>
</tr>
<tr>
<td>Chris Moriates, MD, University of Texas at Austin Dell Medical School, Austin, Texas</td>
</tr>
<tr>
<td>Natasha Parekh, MD, MS, Queens Health System, Honolulu, Hawaii</td>
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<tr>
<td>Emily Reeve, BPharm, PhD, University of South Australia, Adelaide, South Australia</td>
</tr>
<tr>
<td>Gordon Schiff, MD, Brigham and Women’s Hospital, Harvard Medical School, Boston, Massachusetts</td>
</tr>
<tr>
<td>Kenneth Schmader, MD, VA Durham Healthcare System, Duke University School of Medicine, Durham, North Carolina</td>
</tr>
<tr>
<td>Michael Steinman, MD, VA San Francisco Healthcare System, University of California, San Francisco, San Francisco, California</td>
</tr>
<tr>
<td>Justin Turner, BPharm, M Clin Pharm, PhD, Canadian Deprescribing Network, Centre de Recherche de l’Institut Universitaire de Gériatrie de Montréal, Québec, Canada</td>
</tr>
</tbody>
</table>

* General internal medicine specialty.  
* Geriatrics specialty.  
* Family medicine specialty.  
* Academia affiliation.  
* Payer organization affiliation.  
* Community practice affiliation.  


February 15, 2022 4/13
and referral by members of the external advisory panel or research team. To conduct the activities of the panel, we applied a validated, 3-round approach using ExpertLens software package (RAND).\textsuperscript{22-25} Before its use in this study, the data collection protocol using ExpertLens was tested by 3 local clinicians.

The panel was engaged for 3 rounds between January 1 and March 31, 2021, and each round lasted 1 to 2 weeks. In round 1, the panelists rated the scientific validity and clinical usefulness of the criteria to detect each candidate low-value prescribing practice using a 9-point Likert scale (median score ranges: 1 to 3 indicating low validity or usefulness; 3.5 to 6, uncertain validity or usefulness; and 6.5 to 9, high validity or usefulness\textsuperscript{26}) and provided corresponding comments to explain their ratings (eTable 2 in the Supplement provides a full description of the panel questions and rating interpretation). In round 2, the panelists reviewed each other’s numeric and free-text responses for each candidate low-value prescribing practice, as depicted by descriptive statistics, statements about the existence of agreement among panelists, and bar charts that were automatically generated by ExpertLens. Next, the panelists participated in an anonymous and asynchronous online discussion, which one of us moderated (T.R.R.). Informed by the round 1 findings and round 2 discussion, we revised or clarified the proposed sensitive and specific criteria. In round 3, informed by the scores and deliberations in rounds 1 and 2, the panelists provided their final ratings for each candidate low-value prescribing practice. In each round, individual members of the panel reviewed the practices in random order to ensure that robust ratings were given across all candidate low-value prescribing practices.

Statistical Analysis

We applied the RAND/UCLA Appropriateness Method to panelists scores in rounds 1 and 3 to ascertain whether there was agreement among the panelists and to identify the degree of scientific validity and clinical usefulness for each candidate low-value prescribing practice.\textsuperscript{26} This validated method has been used to achieve consensus on the content of clinical guidelines and quality metrics in an online modified-Delphi process.\textsuperscript{26}

Using the RAND/UCLA Appropriateness Method, we looked for the presence of agreement by first calculating the interpercentile range (IPR) between the 70th and 30th percentiles of panelist scores. Next, we calculated the IPR adjusted for symmetry with the following equation: IPRAS = 2.35 + (AI × 1.5), where AI represented the asymmetry index, which is defined as the distance between the central point of the IPR and 5, the central point of the 9-point Likert scale used by panelists to rate each candidate low-value prescribing criteria. If the IPR was greater than the IPR adjusted for symmetry, then there was no agreement. If the IPR was less than the IPR adjusted for symmetry, then there was agreement. For the low-value prescribing criteria wherein agreement was found, we characterized their scientific validity and clinical usefulness according to the median scores. The final metric included only candidate low-value prescribing practices that showed panel agreement and received median scores of 6.5 or higher, which indicated both high scientific validity and high clinical usefulness.

Results

Low-Value Prescribing Practices

A total of 527 low-value prescribing recommendations were compiled from the Choosing Wisely campaign, other medication safety criteria, and peer-reviewed literature, along with an additional 101 medications or medication classes that were cited as being potential low-value prescribing practices by the participants of the qualitative studies we examined (eTable 1 in the Supplement). Of these medications, 63 overlapped with the costliest or most frequently prescribed medications among Medicare beneficiaries in 2017. We further consolidated medications from the same class or category into a single operationalized definition (eg, antibiotics, anticoagulants, or opioids for pain), resulting
in 27 discrete candidate low-value prescribing practices that were considered for inclusion in EVOLV-Rx (eTable 3 in the Supplement provides a full list of practices and definitions).

**Overall Ratings of the Expert Panel**

The round 1 ratings of the online modified-Delphi panel of experts for the scientific validity and clinical usefulness of each of the 27 candidate low-value prescribing practices are shown in Table 1. There was agreement among the panelists regarding the candidate practices except for prescribing statins for the primary prevention of atherosclerotic cardiovascular disease (ASCVD). At the conclusion of round 1, 19 candidate practices received a median score of 6.5 or higher, indicating high scientific validity. Eight candidate practices received a median score of 3.5 to 6 (an uncertain degree).

**Table 1. Expert Panel Ratings and Characterizations of Scientific Validity and Clinical Usefulness of Candidate Low-Value Prescribing Practices**

<table>
<thead>
<tr>
<th>Candidate low-value prescribing practice</th>
<th>Median score</th>
<th>Scientific validity</th>
<th>Clinical usefulness</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Round 1</td>
<td>Round 3</td>
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<tr>
<td>Ineffective useb</td>
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<tr>
<td>Thyroid hormone for subclinical hypothyroidism</td>
<td>8</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Testosterone for nonspecific aging symptoms</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Docusate sodium for constipation</td>
<td>7</td>
<td>7</td>
<td>8</td>
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<tr>
<td>Gabapentinoids for non-neuropathic pain</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Prolonged usec</td>
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<tr>
<td>PPIs</td>
<td>7</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>8</td>
<td>8</td>
<td>7</td>
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<tr>
<td>DAPT after PCI</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Inappropriate used</td>
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<tr>
<td>Vitamin B12 supplementation</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Antipsychotic drugs in patients with dementia</td>
<td>8</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Antibiotics for respiratory conditions</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Antiparkinsonian medications in patients prescribed an antipsychotic drug or metoclopramide hydrochloride</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>AChE inhibitors for severe Alzheimer dementia</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Potentially unsafe usee</td>
<td></td>
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<tr>
<td>DAPT and systemic anticoagulation drugs</td>
<td>7.5</td>
<td>7.5</td>
<td>8</td>
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<tr>
<td>Benzodiazepines</td>
<td>8</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Skeletal muscle relaxants</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Anticholinergic drugs</td>
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<td>7</td>
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<tr>
<td>Overly intensive treatmentf</td>
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<tr>
<td>Type 2 diabetes</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>COPD</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Candidate prescribing practices that did not meet inclusion criteria</td>
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<td></td>
<td></td>
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<tr>
<td>Candidate prescribing practices rated as scientifically valid but of uncertain clinical usefulness</td>
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<td></td>
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<tr>
<td>Aspirin for primary prevention of ASCVD</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Sedative or hypnotic sleeping aids</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Opioids for treatment of noncancer pain</td>
<td>6</td>
<td>6.5</td>
<td>5</td>
</tr>
<tr>
<td>Candidate prescribing practices rated as having uncertain scientific validity</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Statins for primary prevention of ASCVD</td>
<td>5</td>
<td>5</td>
<td>4&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>Inappropriate use of iron supplementation</td>
<td>6</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Nitrofurantoin for the treatment or prevention of UTI</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Loop diuretics with a calcium channel blocker as part of a prescribing cascade</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Gentaurinary antispasmodic drugs in patients prescribed a cholinesterase inhibitor as part of a prescribing cascade</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Over-treatment of hypertension</td>
<td>6</td>
<td>6</td>
<td>7</td>
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</tbody>
</table>

Abbreviations: AChE, acetylcholinesterase; ASCVD, atherosclerotic cardiovascular disease; COPD, chronic obstructive pulmonary disease; DAPT, dual antiplatelet therapy; NSAID, nonsteroidal anti-inflammatory drug; PCI, percutaneous coronary intervention; PPI, proton pump inhibitor; UTI, urinary tract infection.

<sup>a</sup> Key for scientific validity or clinical usefulness scores on a 9-point Likert scale: 1 to 3 indicating low validity or usefulness; 3.5 to 6, uncertain validity or usefulness; and 6.5 to 9, high validity or usefulness.

<sup>b</sup> Ineffective use: use for a common indication despite evidence of minimal to no benefit and possible harm or excessive cost.

<sup>c</sup> Prolonged use: use beyond a certain time threshold when the harms or costs may outweigh the benefits.

<sup>d</sup> Inappropriate use: use for inappropriate indications for which the harms or costs may outweigh the benefits.

<sup>e</sup> Potentially unsafe use: use in situations in which the harms may outweigh the benefits.

<sup>f</sup> Overly intensive treatment: treatment involving an excessive dose or number of medications that may result in harm or excessive cost.

<sup>g</sup> Represents disagreement in round 1 as determined by the RAND/UCLA Appropriateness Method.
Twenty candidate practices received a high clinical usefulness score of 6.5 or higher, and 7 candidate practices were rated as having uncertain clinical usefulness.

After considering the panelists' scores, comments, and deliberations from rounds 1 and 2, we revised the sensitive and/or specific criteria that defined 19 candidate low-value prescribing practices (eTable 3 in the Supplement). Round 3 ratings are also shown in Table 1. In round 3, 18 candidate practices received high validity and clinical usefulness scores of 6.5 or higher and were included in EVOLV-Rx (Table 2).

Of those candidate low-value prescribing practices that were not incorporated in the final metric, 3 (aspirin for primary prevention of ASCVD, opioids for treatment of noncancer pain, and potentially unsafe use of sedative or hypnotic sleeping aids) were rated as having high scientific validity but uncertain clinical usefulness (eTable 3 in the Supplement). Six candidate practices received an uncertain scientific validity rating. One candidate low-value prescribing practice had a median validity score of 5, whereas the other 5 candidate practices received a median score of 6 (Table 1). For example, for the practice of prescribing statins for the primary prevention of ASCVD (final median score of 5 in scientific validity), the panelists commented that trials were ongoing to evaluate the effectiveness of statins for the primary prevention of ASCVD in older adults and that data from observational studies were insufficient to rate this candidate practice as being scientifically valid. In another example, the practice of prescribing potentially unsafe use of antihypertension medications received a final median score of 6 in scientific validity. The explanation for this rating was the presence of conflicting evidence of the reasonable blood pressure target in older adults and the anticipated challenges in operationalizing this practice given other indications for common blood pressure medications, such as β-blockers.

Discussion
We convened an online modified-Delphi panel of experts to codify the components of EVOLV-Rx (Table 2). Of the 27 candidate low-value prescribing practices derived from 527 low-value prescribing recommendations, the panel identified the 18 most scientifically valid and clinically useful prescribing practices and related criteria for detecting low-value prescribing in the care of older adults. In addition, these practices and criteria reflect the perspectives of patients, caregivers, and practicing physicians. EVOLV-Rx contains a set of quality indicators that may be scaled and automated to detect low-value prescribing in large administrative or other clinical data sets for thousands of patients. We believe this metric would enable health systems, third-party payers, and policy makers to reduce low-value prescribing in ways that are both clinically sound and broadly acceptable.

EVOLV-Rx is distinct from other metrics in that it applies a value-based paradigm to consolidate the hundreds of existing low-value prescribing recommendations to define, prioritize, and systematically measure low-value prescribing practices in a way that can be operationalized in payer and provider data. Kerr et al14 recently applied a similar approach to identify high-priority recommendations for deintensifying care within the Veterans Health Administration. Rather than develop additional broad-based guidelines, we sought to specify operational definitions for the components of a metric that were intended for use in administrative claims and other health data. Thus, because of measurement concerns, we excluded candidate low-value prescribing practices, such as the overtreatment of hypertension, from the final version of EVOLV-Rx. With clearly defined sensitive and specific criteria for each low-value prescribing practice, EVOLV-Rx may serve as a useful adjunct to the Schwartz low-value care metric, which contains 31 distinct low-value tests and procedures but not medications and is currently used by the Medicare Payment Advisory Commission, Veterans Health Administration, and private insurers.30,31

Furthermore, EVOLV-Rx is unique in the way it integrates the perspectives of patients, caregivers, and practicing physicians about low-value prescribing and health care value. The panelists acknowledged these perspectives in their deliberations. Consequently, the individual components of EVOLV-Rx reflect stakeholder views on specific medications and their adverse effects; medical
Table 2: Final Components of EVOLV-Rx Codified by the Expert Panel

<table>
<thead>
<tr>
<th>Final low-value prescribing practice</th>
<th>Criteria for defining low-value prescribing</th>
<th>Additional specific criteria: patients satisfying any 1 of value-based criteria for each individual practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ineffective use</strong></td>
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</table>
| Thyroid hormone for subclinical hypothyroidism | Use in patients with subclinical hypothyroidism and no history or active diagnosis of hypothyroidism | • Age ≥80 y, or new prescription for thyroid hormone with a TSH <10 mIU/L
• Use of a brand-name thyroid hormone replacement |
| Testosterone for nonspecific aging symptoms | Use without a diagnosis of hypogonadism or panhypopituitarism | • History of VTE, ASCVD, or prostate cancer
• Use of a brand-name or transdermal preparation |
| Docusate for constipation | Any use | • Concurrent use with other laxatives
• Use without a history of hemorrhoids |
| Gabapentinoids for non-neuropathic pain | Use without a diagnosis of postherpetic neuralgia or neuropathic pain (excluding patients with a history of epilepsy) | • Risk factors for fall or fracture
• Therapeutic duplication or concurrent use with an antidepressant or other high-risk psychoactive medication
• Use of brand-name gabapentin or pregabalin |
| **Prolonged use**                    |                                             |                                                                                             |
| PPIs | Use for >2 consecutive mo | • No guideline-concordant indication for prolonged use (eg, erosive esophagitis, refractory GERD)
• No concurrent use of chronic NSAIDs or steroids
• Use of a brand-name PPI |
| NSAIDs | Use for >90 consecutive d, excluding patients with pericarditis or a rheumatologic condition | • COX-1 selective NSAID in patients at an increased risk for a GIB and not prescribed a PPI
• COX-2 selective NSAID in patients with ASCVD
• Any NSAID in patients aged ≥75 y or with CKD |
| DAPT after PCI | Use of DAPT for >6 mo in patients after PCI for stable ischemic heart disease | • DAPT for >12 mo
• DAPT use for >6 mo in patients at increased risk of bleeding associated with a history of PUD or GIb or concurrent use of an anticoagulant |
| **Inappropriate use**                |                                             |                                                                                             |
| Vitamin B12 supplementation | Use without an appropriate or active diagnosis (anemia, B12 deficiency, or gastric bypass surgery) | • Administered intramuscularly or subcutaneously |
| Antipsychotic drugs in patients with dementia | Use for >90 consecutive d in patients with dementia without evidence of an underlying serious mental illness that would otherwise warrant use | • Prolonged QT or risk factors for fall or fracture
• Therapeutic duplication or concurrent use with another high-risk psychoactive medication
• Use of a brand-name antipsychotic |
| Antibiotics for respiratory conditions | Use of antibiotics for conditions where antibiotics have been characterized as sometimes indicated (eg, acute or chronic pharyngitis) or never indicated (eg, asthma exacerbation) | • Use for conditions where antibiotics have been characterized as never indicated (eg, asthma exacerbation)
• Use of a brand-name antibiotic |
| Antiparkinsonian medications in patients prescribed an antipsychotic drug or metoclopramide | Concurrent use of an antiparkinsonian medication and an antipsychotic drug or metoclopramide (excluding patients with a history of serious mental illness that would otherwise warrant use) | • New use of an antiparkinsonian medication within 6 mo after receiving a new prescription for an antipsychotic drug or metoclopramide |
| AChE inhibitors for severe Alzheimer dementia | Use of an AChE inhibitor to treat severe or end-stage Alzheimer dementia | • Risk factors for fall or fracture
• Use of a brand-name dementia medication |
| **Potentially unsafe use**           |                                             |                                                                                             |
| DAPT and systemic anticoagulation | Any concurrent use of 2 antiplatelet agents and an anticoagulant for >1 mo | • History of PUD, upper GIb, or coagulopathy
• Use of a brand-name antiplatelet agent |
| Benzodiazepines | Use for >4 wk without a guideline-concordant indication (ie, seizure disorder, severe generalized anxiety disorder) | • Risk factors for fall or fracture
• Therapeutic duplication or concurrent use with another high-risk psychoactive medication
• Use of a brand-name benzodiazepine drug |

(continued)
The application of EVOLV-Rx may advance a variety of research and policy priorities. There is growing interest in deprescribing low-value medications among older adults, as evidenced by the emergence of federally funded Deprescribing Research Networks in the US and in other countries. EVOLV-Rx may help researchers, third-party payers, and health system leaders involved in deprescribing efforts to identify a research focus, given the hundreds of low-value prescribing recommendations, and conduct more rigorous audit and feedback of prescribing practices.33,34 From
a policy perspective, Medicare has been increasingly discouraging the provision of low-value care through value-based payment reforms. In addition, third-party payers are implementing arrangements, such as bundled payments and shared savings plans, to promote the delivery of high-value care. The application of EVOLV-Rx may enable such efforts to readily incorporate low-value prescribing.

**Limitations**

This study and EVOLV-Rx have several limitations. First, the low-value prescribing practices contained in the metric are not exhaustive given that our goal was to create a focused, acceptable, and scalable metric. Therefore, its use does not preclude the application of traditional tools, such as the Beers Criteria. Second, the infographics we provided to each panelist were intended to guide their deliberations but did not depict the findings of a systematic review for each candidate low-value prescribing practice. However, each infographic underwent peer review to ensure its accuracy and each included a summary, links, and references to systematic reviews or guidelines based on such reviews. The panelists were instructed to use these infographics as a reference or supplementary material rather than as a sole resource for their deliberations and when rating each candidate low-value prescribing practice. Third, the results (the criteria in EVOLV-Rx) are sensitive to the composition of the Delphi panel, and it is not known to what degree these results would be different with a different set of experts. Fourth, EVOLV-Rx has not yet been fully operationalized for use in administrative claims or electronic health record data. The research team is currently working to operationalize and establish the specification validity of EVOLV-Rx. Fifth, each component of EVOLV-Rx may not be applicable in all forms of health data (e.g., administrative claims vs electronic health records) or in all populations, which was a necessary tradeoff in developing criteria that best characterize each form of low-value prescribing.

**Conclusions**

In this qualitative study, a panel of experts identified 18 scientifically valid and clinically useful prescribing practices and related criteria for detecting low-value prescribing practices in the care of older adults, resulting in the development of the EVOLV-Rx metric. The application of EVOLV-Rx may also enhance the detection of low-value prescribing alongside other low-value tests and procedures, reduce polypharmacy, and enable older adults to receive high-value care across the full spectrum of health services in a way that aligns with their perspectives and values.
Author Contributions: Dr Radomski had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Radomski, Thorpe, Hanlon, Fine, Gellad.

Acquisition, analysis, or interpretation of data: Radomski, Decker, Khodyakov, Thorpe, Roberts, Gellad.

Drafting of the manuscript: Radomski.

Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: Radomski, Khodyakov.

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REFERENCES


SUPPLEMENT.

**eTable 1.** Low-Value Prescribing Practice Candidates Solicited from Patients, Caregivers, and Practicing Physicians

**eFigure.** Infographic Examples for 3 Candidate LVPMetrics

**eTable 2.** Questions Posed to the Delphi Panelists to Assess Scientific Validity and Usefulness in Clinical Practice for Each Candidate LVPMetric

**eTable 3.** Changes Made to the Sensitive and Specific Criteria for Each Candidate LVPMetric After Rounds 1 and 2