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Review article

MEASURING INAPPROPRIATE PRESCRIPTIONS IN GERIATRIC POPULATION: OVERVIEW OF VARIOUS SCREENING TOOLS

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ABSTRACT

In this era of growing research, a plethora of effective therapeutic agents has been made available to treat chronic disorders that often accompany advancing age. However, medications often act as a “double edge sword”. Instead of medications being a cure, frequently they cause problems. Thus, managing the medications in elderly patients is truly a challenge for all health professionals. The use of a medication is generally considered appropriate if the expected benefits of the medication outweigh the potential risks. Because older adults are more sensitive to any adverse effects of medications, various lists of medications have been created for guiding clinicians to avoid certain drugs in elderly people. Various screening tools based on explicit (criterion-based) or implicit (judgment-based) prescribing indicators have been devised to detect inappropriate prescriptions of such drugs. The purpose of this evidence-based guideline or screening tool is to improve medication management practices for older adults. In this review we have discussed various methods of finding out inappropriate prescriptions in the elderly which can be referred by health care providers of this population. Therefore, regular application of such inappropriate prescription screening tools should hypothetically reduce the prevalence of adverse drug events, their related morbidity and health care cost.

Keywords: Geriatric population, inappropriate prescriptions, explicit criteria, implicit criteria

BACKGROUND

Rational drug therapy, though important at all ages, becomes more relevant in elderly. Aging is defined as progressive, universal decline first in functional reserve and then in function that occurs in organisms over time.¹ According to the WHO, generally accepted age is >65 years. Older people often experience multiple co-morbidities and are prescribed multiple medications thereby increasing the risk of adverse drug events, drug–drug, and drug–disease and drug–food

interactions.² This risk is heightened by age-related physiological changes, which influence pharmacokinetics and pharmacodynamics.^{3,4} Adverse effects of medications and drug related problems can have profound medical, safety and economic consequences for older adults. As population demographics is changing worldwide and there has been a rise in the aging population, inappropriate prescribing in older people is becoming a global health care concern. The

percentage of elderly in the world population is expected to increase rapidly from 9.5 in 1995 to 20.7 in 2050 to 30.5 in 2150.⁵

The purpose of this review is to discuss the various methods of finding out Inappropriate Prescriptions (IP) in elderly, so that appropriate measures can be taken. The intentions of the criteria are to improve the selection of prescription drugs by clinicians; educate them on proper drug usage; and evaluate health - outcomes, cost, and utilization data.

Inappropriate prescriptions: It is defined as overuse of drugs; irrational choice of drugs and/or under use of appropriate drugs.⁶ IP encompasses the use of medicines that pose more risk than benefit, particularly where safer alternatives exist. IP also includes under prescribing (failure to prescribe drugs that are needed), overprescribing (prescribing more drugs than are clinically needed) and misprescribing (incorrectly prescribing a drug that is needed).⁷ IP is associated with many risk factors like older age, polypharmacy and multiple attending physicians and pharmacists. IP also relates to increased morbidity, mortality and health care cost, largely because of an increased prevalence of adverse drug events (ADEs).

Measures of appropriateness of prescribing: Appropriateness of prescribing can be assessed by a process or outcome measures that are explicit (criterion-based) or implicit (judgment-based).⁸ They assess whether the prescription accords with accepted standards—they are direct measures of performance.

Explicit indicators: Explicit indicators are usually developed from published reviews, expert opinions, and consensus techniques. Expert opinion is usually needed in geriatric medicine because evidence-based aspects of treatments are frequently absent.⁹ These measures are usually drug-orientated or disease-oriented, and can be applied with little or no clinical judgment. Explicit criteria used with prescription data alone or with clinical data are commonly used to detect inappropriate

prescribing. Most criteria constitute a floor of quality below which no patient should go.

However all these Explicit criteria were followed drawbacks:

- 1) These criteria might not take into account all factors that define high quality health care for the individual.¹⁰
- 2) They generally do not address the burden of co morbid disease¹¹ and patients' preferences.
- 3) Consensus approaches have little evidence of validity and reliability.
- 4) The inclusion of some drugs in the list is subject to controversy, and there is insufficient evidence to support inclusion of several drugs.
- 5) This approach sometimes identifies appropriate prescribing as inappropriate (poor specificity).

Implicit indicators: In implicit approaches, a clinician uses information from the patient and published work to make judgments about appropriateness.¹² The focus is usually on the patient rather than on drugs or diseases. These approaches are potentially the most sensitive and can account for patients' preferences.

Drawbacks: 1) They are time-consuming 2) These depend on the user's knowledge and attitudes

3) They have low reliability.

There is no ideal measure, but the strengths and weaknesses of both approaches should be considered.

Tools to measure inappropriate prescriptions (IP): Due to the potentially serious consequences of inappropriate prescribing, researchers have designed screening tools (implicit and explicit criteria) to detect prescribing that is potentially inappropriate. Theoretically, the routine clinical application of these explicit or implicit prescribing criteria could represent an inexpensive and time efficient method to optimize prescribing practice. However, IP criteria must be sensitive, specific, have good inter-rater reliability and incorporate those medications most commonly associated with ADEs in older people. To be clinically relevant,

use of prescribing appropriateness tools must translate into positive patient outcomes, such as reduced rates of ADEs.² To accurately measure these outcomes, a reliable method of assessing the relationship between the administration of a drug and an adverse clinical event is required.

IPs can be identified by several instruments described as below: **I] Medication Appropriateness Index (MAI)**¹³⁻¹⁶ Initially developed by Dr. Joseph Hanlon and colleagues, the Medication Appropriateness Index (MAI) is an implicit tool which measures prescribing appropriateness according to ten criteria including indication, effectiveness, dose, correct directions, practical directions, drug-drug interactions, drug-disease interactions, duplication, duration, and cost. Out of these ten criteria, three criteria indication, effectiveness, and duplication can be used to detect unnecessary polypharmacy and potentially inappropriate medications (PIM) prescribing. Each criterion has operational definitions that instruct the evaluator to rate a medication as “appropriate,” “marginally appropriate,” or “inappropriate.” The measure of inappropriateness for each medication, ranges from 0 to 18 that is, a medication that fulfills all 10 criteria of inappropriateness receives the maximum score of 18. A total score for each patient is obtained by combining the weighted MAI scores across all medications.

The major advantages of MAI as a tool to evaluate PIM prescribing are: i) been tested in both the inpatient and ambulatory settings, ii) exhibits excellent intra-rater and inter-rater reliability, and iii) has face and content validity. It addresses multiple components of prescribing appropriateness, and can be applied to every medication in the context of patient-specific characteristics. However, the tool is more time-consuming to complete (~10 minutes per drug assessed) and does not assess under-prescribing (untreated indications). Most studies using the MAI have been performed in a single setting. Clinical expertise is required to apply some of

the criteria, resulting in variable inter-rater reliability.

II] Assessment of Underutilization (AOU)^{17:}

Under prescribing can be detected with the Assessment of Underutilization of Medication. The assessment needs a health professional to match a list of chronic medical disorders to the prescribed medications to establish whether there is an omission of a needed drug. The evaluator requires a list of established medical conditions and concurrent medications to apply one of three ratings for each condition: A = no omission, B = marginal omission (patient preference, changing therapeutic goals, discontinuation of medications to focus on palliation, or other documented relative contraindication), and C = omission of an indicated medication without absolute or relative contraindication. The outcome measure is the proportion of patients with at least one medication omission detected by the AOU.

III] Assessing Care Of the Vulnerable Elder (ACOVE) project :

This quality indicator (QI) set was developed in the year 2000 by Rand Healthcare and the UCLA as a comprehensive method for assessing the quality of care of vulnerable elderly patients.¹⁸ Iterative expert panel meetings with review of the relevant evidence were used to generate a set of indicators to assess the quality of the process of care, rather than outcomes. It consists of 68 (29%) indicators refer to medication.¹⁹ The ACOVE indicators have several merits: i) geriatric conditions (eg, dementia, falls) are included, ii) indicators pertain to treatment, prevention, monitoring, education, and documentation, and they encompass overprescribing, misprescribing, and under prescribing and iii) most indicators are applicable to people with advanced dementia and poor prognosis.²⁰

IV] IPET (Improved Prescribing in the Elderly Tool) –

Referred to as the “Canadian Criteria”, the IPET consists of a list of the 14 most prevalent prescription errors identified from a long list of inappropriate prescription instances drawn up by a panel in 1997 (list by McLeod et

al).²¹ Few of the drawbacks of this criteria are: i) it only cites 14 instances of inappropriate prescribing, three of which relate solely to tricyclic antidepressants (TCAs), which are infrequently used in today's medical practice, ii) it can be said as outdated because it recommends against the use of beta-blockers in heart failure contrary to current guidelines and published evidence and iii) it mainly considers cardiovascular drug use, psychotropic drug use and Nonsteroidal anti-inflammatory drugs (NSAID) use and is not organized in any particular order or structure.²² It has not been as widely used in published research studies. But IPET was easier to apply as it had fewer criteria and hence user friendly.

V] Beers' criteria- The best known screening tool is a Beers' criteria which are American based. Beers' criteria were originally developed in 1991 and contained an explicit list of 30 medicines that should not be used in elderly patients regardless of diagnosis. This set of criteria was originally compiled primarily with nursing home patients in mind.²³

The 1991 criteria were updated and expanded in 1997 to make the criteria more applicable to the general elderly population and to determine the severity of an adverse event due to potential inappropriate prescribing. The guidelines consisted of two different explicit lists – one considering diagnosis (CD) and one independent of diagnosis (ID) that define potentially inappropriate prescribing in the elderly. Doses or frequencies of administrations that should not be exceeded were also listed.

The 1997 criteria were revised and updated again in 2003²⁴ and recently in 2012²⁵. The new criteria lists 48 medicines ID and 20 medicines CD, total 68 medicines that should be avoided. The 2003 criteria included new conditions that were not listed in the previous versions e.g. depression, anorexia and obesity. Each of these versions of Beers criteria has been used in several studies to identify rates of inappropriate prescribing in the elderly population

Updated 2012 AGS Beers Criteria- The previous Beers Criteria was updated recently through the support of the American Geriatrics Society (AGS) and the work of an interdisciplinary panel of 11 experts in geriatric care and pharmacotherapy using a comprehensive, systematic review and grading of the evidence on drug-related problems and adverse drug events (ADEs) in older adults.²⁵ The 2012 AGS Beers Criteria are intended for use in all ambulatory and institutional settings of care for populations aged 65 and older in the United States..

These updated criteria are supported by Quality of evidence (High, Moderate, Low) and Strength of recommendation (Strong, weak and insufficient). The final updated criteria consist of 53 medications, which are divided into three categories:

a) PIMs and classes to avoid in older adults (Independent of diagnosis)- includes 34 potentially inappropriate medications.

b) PIMs and classes to avoid in older adults with certain diseases and syndromes that the drugs listed can exacerbate (considering diagnosis)- includes 19 drugs.

c) Medications to be used with caution in older adults- consists of 14 medications.

Beers criteria have some limitations: i) even being the largest consumers of medication, older adults are often underrepresented in drug trials.²⁵

ii) it does not address other types of potential PIMs that are not unique to aging (e.g., dosing of primarily renally cleared medications, drug-drug interactions, therapeutic duplication) and iii) it does not comprehensively address the needs of individuals receiving palliative and hospice care, in whom symptom control is often more important than avoiding the use of PIMs.

VI] Zhan criteria²⁶ The Zhan criteria focus only on drugs that should generally be avoided in elders, without consideration of drug dosages, drug-disease interactions, or drug-drug combinations. The Zhan criteria categorize drugs into one of three categories: i) drugs that should

always be avoided (e.g., meperidine), ii) drugs that are rarely appropriate (e.g., diazepam), and iii) drugs that are sometimes appropriate but often misused (e.g., amitriptyline). Zhan created a modified Beers criteria for a study of potentially inappropriate medication use in community-dwelling elderly and reported the results.

VII] STOPP and START^{27,28} As a result of the shortfalls with all the above tools and the importance of prescribing appropriately, a more organized, up-to-date tool that also considers the acts of prescribing omissions has been developed. This has been given the acronym STOPP / START (screening tool of older people's prescriptions [STOPP] and screening tool to alert doctors to the right treatment [START]).

STOPP comprises 65 indicators that pertain primarily to important drug–drug and drug–disease interactions (potentially leading to side effects such as cognitive decline and falls) and therapeutic duplication. These criteria are arranged according to relevant physiological systems for ease of use, as is the case in most drug formularies. Each criterion is accompanied by a concise explanation as to why the prescription is potentially inappropriate.

START incorporates 22 evidence-based indicators of common prescribing omissions.

VIII] Phadke's criteria^{29,30}: Phadke's criteria is a method to assess a prescription for rationality as a whole and assign the status as rational, semirational or irrational to it. It is based on a 30-point scale comprising of 20 points for main drug/s and 10 points for complementary drug/s. Half of the points (10 and 5 respectively) for each of these two categories are allotted to the drug chosen for the condition and remaining half for the correctness of the dose given, including route and frequency of administration and the duration of therapy. If more than two drugs are needed to be given in a condition, the points allocated are subdivided accordingly. For deciding the correctness of the selection of a

drug, its dose, route, frequency of administration and duration of therapy, the evidence base is searched and applied. In computing the final score (out of 30), when necessary, negative points are assigned as under³⁰

- a. Irrational drug or irrational drug combination: 5 for each drug/formulation.
- b. Unnecessary drug or injection: 5 for each drug/formulation
- c. Hazardous drugs: 10 for each drug/formulation.
- d. Unnecessary injection: 5 for each injection.

CONCLUSION

A screening tool by definition must be shown to improve outcome. Randomized control trials are needed to test the true benefit of these tools to patients in terms of morbidity and mortality, and also in terms of health resource utilization. Timely inputs from geriatrician and review by pharmacists can improve drug appropriateness in older people but it is not feasible, in most health services, for a geriatrician to assess all older patients. Hence such screening tools can be used in a time-efficient manner by all disciplines involved in the care of older patients. For the success of these drug utilization screening tools, proper training of medical students, doctors, pharmacists and nursing staff in appropriate pharmacotherapy for the elderly is very important.

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