

## COMMENTARY

# Inappropriate prescribing in the older population: need for new criteria

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## Abstract

Inappropriate prescribing (IP) is a common and serious global healthcare problem in elderly people, leading to increased risk of adverse drug reactions (ADRs), polypharmacy being the main risk factor for both IP and ADRs. IP in older people is highly prevalent but preventable; hence screening tools for IP have been devised, principally Beers' Criteria and the Inappropriate Prescribing in the Elderly Tool (IPET). Although Beers' Criteria have become the most widely cited IP criteria in the literature, nevertheless, they have serious deficiencies, including several drugs that are rarely prescribed nowadays, a lack of structure in the presentation of the criteria and omission of several important and common IP instances. New, more up-to-date, systems-based and easily applicable criteria are needed that can be applied in the routine clinical setting.

**Keywords:** *inappropriate prescribing, drugs, elderly, screening*

## Background

In older people, medicines are considered appropriate when they have a clear evidence-based indication, are well tolerated in the majority and are cost-effective. Appropriate prescribing in older people also entails an individual patient's life expectancy, avoiding preventive therapies in those with a poor survival prognosis and promoting drugs with favourable risk:benefit ratios. Medicines that are potentially inappropriate in older people, by contrast, either have no clear evidence-based indication, carry a substantially higher risk of adverse side-effects compared to younger people or are not cost-effective. Inappropriate prescribing (IP) in the elderly population is now considered a major public health issue, given its direct linkage to substantial morbidity, mortality and wastage of health resources [1] that result from adverse drug reactions (ADRs) [2, 3], particularly in very old people [4]. People with the greatest burden of adverse medication and polypharmacy are generally aged over 80 years, with multiple co-morbid conditions and a life expectancy of 3 years or less. In these patients, the risk of ADRs increases in proportion to the number of simultaneous prescription drugs [5]. Poor choice of medication by the patient's physician is undoubtedly a major cause of ADRs in older people [6]. Despite the scale and severity of the problem globally, there is little agreement about how best

to prevent IP in older people. Regular review of medicines of older patients seems a logical way of minimising IP and associated ADRs. However, there is a need for this task to be carried out in an orderly, systematic way.

## Screening tools for inappropriate prescribing

The case for screening for IP appears compelling. IP is a major, common public health problem in older people [1, 7] most often resulting from defective choice of medication by the prescriber. An inexpensive, user-friendly screening tool aimed at assisting clinical judgement in drug selection should, in theory, reduce IP in older people. At present, there are only two well-described and validated screening tools for IP in old age in literature aimed at regular clinical use: Beers' Criteria [8] and Inappropriate Prescribing in the Elderly Tool (IPET) [9]. Another prescribing quality assessment tool, the Medication Appropriateness Index [10], measures overall prescribing quality in 10 separate but inter-related domains, but does not give specific guidance in relation to any medicines in particular and is not an IP screening tool *per se*. Between Beers' Criteria and IPET, Beers' Criteria dominate the international literature since they were first described in 1991. Originally, Beers' Criteria were in essence, a list of 30 drugs to be avoided in the elderly

nursing home population, regardless of diagnosis. Beers' Criteria have been subsequently modified to facilitate use in community-dwelling elderly and have been updated in 1997 and most recently, in 2003 [11].

Using Beers' Criteria, rates of IP range from 14.0% in a community-dwelling population to 40.3% among residents of 'skilled nursing homes' [2]. The most commonly cited inappropriate drugs in these studies were long-acting benzodiazepines, dipyridamole, propoxyphene and amitriptyline. The great majority of patients on inappropriate medicines in these studies were taking one inappropriate drug only. However, in Beers' original study of nursing home residents, 10.4% of nursing home residents were taking two or more inappropriate drugs [8]. Multi-variate analyses consistently show that a higher number of concurrent medicines is the only significant predictor of inappropriate medicines [2], i.e. IP in old age is most often a by-product of polypharmacy [12].

Sometimes referred to as the 'Canadian Criteria' [9], IPET consists of a list of the 14 most prevalent prescription errors identified from a long list of inappropriate prescription instances drawn up by an expert Canadian consensus panel in 1997. IPET was validated in a prospective study of acutely hospitalised elderly patients that found IP in 12.5% of patients by these criteria [9]. IPET has been used very little outside Canada, although one recent Irish study found that 22% of acutely hospitalised elderly were taking at least one inappropriate prescription medicine at the point of admission using IPET criteria [13].

### Problems with Beers' Criteria and Ipet as Screening Tools

Convincing evidence to show that Beers' Criteria or IPET consistently reduces ADR incidence, excessive health resource utilisation or mortality is lacking [1]. Lack of evidence for consistent efficacy may relate to inadequate design and content of Beers' Criteria and IPET. Despite recent updating of Beers' Criteria [11], a number of significant intrinsic problems militate against their use in routine clinical practice. Several of the drugs included in Beers' Criteria are not, in fact, absolutely contraindicated in older people, e.g. oxybutinin, amitriptyline, diazepam, amiodarone, nitrofurantoin, doxazosin, and naproxen, according to the latest version of the British National Formulary. Another problem with Beers' Criteria is the random order of both the 'Independent of Diagnoses or Conditions' criteria and the 'Considering Diagnoses or Conditions' criteria. The criteria are not presented in any recognisable order or according to physiological systems, as is conventional in most formularies. Beers' Criteria include many out-dated drugs that are unavailable or very seldom used in Europe such as trimethobenzamide, metaxalone, cyclandelate, guanedrel, cyclobenzaprine, reserpine, clonidine, meprobamate and chlorpropamide to name some. The criteria also lack comprehensiveness. There are several instances of IP not mentioned in Beers' Criteria, some of which are shown in Table 1. Beers' Criteria only consider

the drugs which are to be avoided, making no reference to inappropriate under-utilisation of drugs. Similarly, Beers' Criteria do not include drug–drug interactions and make no reference to duplicate drug classes.

The IPET criteria while being succinct, also have serious deficiencies. IPET cites only 14 instances of IP of which 3 relate to tricyclic anti-depressants which are infrequently used nowadays, given the greater tolerability of selective serotonin re-uptake inhibitors and other newer anti-depressants. IPET contains a caution to avoid beta-blockers in congestive heart failure, contrary to current evidence. Also, the criteria are not arranged in any particular order or structure.

Despite the lack of convincing evidence to show that either Beers' Criteria or IPET is able to reduce adverse drug-related morbidity, health resource utilisation or mortality, this does not mean that a better-designed, more applicable screening tool might not have consistent benefit in routine clinical practice.

### Screening Tools for Indicated (But Unprescribed) Drugs in Old Age

The published literature is lacking an internationally recognised screening tool that deals with inappropriate under-utilisation of clearly indicated, evidence-based medicines. Jackson and colleagues [14, 15] have described working algorithms for the appropriate use of drugs such as aspirin, warfarin and benzodiazepines in older people. While these criteria are useful in guiding the prescriber in the appropriate use of these particular drugs in older patients, their design is not comprehensive.

### Need for a New Tool for Inappropriate Prescribing in Old Age

Given the deficiencies of Beers' Criteria and IPET, there is a need to develop and validate new criteria to detect IP in older people. Conversely, with the multiplicity of drugs that offer potentially major health gains for older patients, there is also a need to develop evidence-based, user-friendly criteria to highlight more common instances of potentially inappropriate omission of indicated medicines to the prescriber. Ideally, these sets of criteria should be used in tandem, eupharmacy being the aim. Such criteria should be easy to use by the busy physician or pharmacist and should complement rather than replace clinical judgement. In our opinion, the criteria should be as follows.

- (i) Organised on the basis of physiological systems and be applicable quickly, i.e. within 5 min.
- (ii) Encompass the more common errors of commission and omission in prescribing for older people.
- (iii) Generalisable for the global community of doctors and pharmacists.
- (iv) Easily interfaced with computer records of current illnesses of patients and lists of medicines.

**Table 1.** Some prescriptions to be avoided in elderly patients that are not mentioned in Beers' criteria [7]:

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- (i) Loop diuretic for dependent ankle oedema only, i.e. no clinical signs of heart failure (no evidence of efficacy, compression hosiery usually more appropriate).
  - (ii) Thiazide diuretic with a history of gout (may exacerbate gout).
  - (iii) Aspirin to treat dizziness not clearly attributable to cerebrovascular disease (not indicated).
  - (iv) Tricyclic anti-depressants with glaucoma (*likely to exacerbate glaucoma*).
  - (v) Long-term (i.e. > 1 month) neuroleptics as long-term hypnotics (risk of confusion, hypotension, extra-pyramidal side-effects, falls).
  - (vi) Anti-cholinergics to treat extra-pyramidal side-effects of neuroleptic medications (risk of anti-cholinergic toxicity).
  - (vii) Prochlorperazine (Stemetil) with Parkinsonism (risk of exacerbating Parkinsonism).
  - (viii) Proton pump inhibitor for peptic ulcer disease at full therapeutic dosage for >8 weeks (dose reduction or earlier discontinuation indicated).
  - (ix) Theophylline as monotherapy for COPD (safer, more effective alternative; risk of adverse effects due to narrow therapeutic index).
  - (x) Non-steroidal anti-inflammatory drugs (NSAIDs) with moderate to severe hypertension (risk of exacerbation of hypertension).
  - (xi) NSAID with heart failure (risk of exacerbation of heart failure).
  - (xii) NSAID with chronic renal failure<sup>a</sup> (risk of deterioration in renal function).
  - (xiii) Alpha-blockers in males with frequent urinary incontinence, i.e. one or more episodes of incontinence daily (risk of urinary frequency and worsening of incontinence).
  - (xiv) Beta-blockers in those with diabetes mellitus and frequent hypoglycaemic episodes, i.e.  $\geq 1$  episode per month (risk of masking hypoglycaemic symptoms).
  - (xv) Oestrogens with a history of venous thromboembolism (increased risk of recurrence).
  - (xvi) Neuroleptics and recurrent falls (may cause gait dyspraxia and Parkinsonism, leading to further falls).
  - (xvii) Vasodilator drugs with persistent postural hypotension, i.e. recurrent >20 mmHg drop in systolic blood pressure (risk of syncope, falls).
  - (xviii) Long-term opiates, i.e. >3 months in those with chronic constipation without concurrent use of laxatives (risk of severe constipation).
  - (xix) Any duplicate drug class prescription, e.g. two concurrent opiates, NSAIDs, loop diuretics, ACE inhibitors (optimisation of monotherapy within a single drug class should be observed prior to considering a new agent).
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<sup>a</sup> Serum creatinine concentration >150  $\mu\text{mol/l}$  or estimated glomerular filtration rate <50 ml/h.

- (v) Tested for their ability to significantly reduce the prevalence of IP in a variety of elderly populations, in a variety of settings.
- (vi) Help to reduce ADR incidence rates and their effects, i.e. hospitalisation and composite health resource use.

Given the global phenomenon of ageing populations and the simultaneous risk of polypharmacy and IP, the need for comprehensive, evidence-based, easily applicable IP criteria has never been greater. The challenge presented to researchers is to develop and validate new, user-friendly IP screening tools to meet the specifications described above.

### Key points

- Inappropriate prescribing (IP) is a major public health problem in old age.
  - Screening for IP is highly desirable, since detection and correction are simple and worthwhile.
  - Beers' Criteria for IP dominate the international literature, but are not comprehensive or easy to use.
  - New IP criteria are required which will be comprehensive, user-friendly and evidence-based.
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### Conflicts of interest

No conflict of interest in relation to publication of this manuscript.

### References

1. Spinewine A, Schmader KE, Barber N *et al.* Appropriate prescribing in elderly people: how well can it be measured and optimised? *Lancet* 2007; 370: 173–84.
2. Aparasu RR, Mort JR. Inappropriate prescribing for the elderly: Beers criteria-based review. *Ann Pharmacother* 2000; 34: 338–46.
3. Lindley CM, Tully MP, Paramsothy V *et al.* Inappropriate medication is a major cause of adverse drug reactions in elderly patients. *Age Ageing* 1992; 21: 294–300.
4. Klarin I, Wimo A, Fastbom J. The association of inappropriate drug use with hospitalisation and mortality: a population based study of the very old. *Drugs Aging* 2005; 22: 69–82.
5. Lazarou J, Pomeranz BH, Corey PN. Incidence of adverse drug reactions in hospitalised patients: a meta-analysis of prospective studies. *JAMA* 1998; 279: 1200–5.
6. Montamat SC, Cusack BJ, Vestal RL. Management of drug therapy in the elderly. *N Engl J Med* 1989; 321: 303–9.
7. Bates DW. Frequency, consequences and prevention of adverse drug events. *J Qual Clin Pract* 1999; 19: 13–7.

8. Beers MH, Ouslander JG, Rollinger I *et al.* Explicit criteria for determining inappropriate medication use in nursing home residents. *Arch Intern Med* 1991; 151: 1825–32.
9. Naugler CT, Brymer C, Stolee P *et al.* Development and validation of an improving prescribing in the elderly tool. *Can J Clin Pharmacol* 2000; 7: 103–7.
10. Hanlon JT, Schmader KE, Samsa GP *et al.* A method for assessing drug therapy appropriateness. *J Clin Epidemiol* 1992; 45: 1045–51.
11. Fick DM, Cooper JW, Wade WE *et al.* Updating the Beers criteria for potentially inappropriate medication use in older adults. *Arch Intern Med* 2003; 163: 2716–24.
12. Gallagher P, Barry P, O'Mahony D. Inappropriate prescribing in the elderly. *J Clin Pharm Ther* 2007; 32: 113–21.
13. Barry PJ, O'Keefe N, O'Connor KA *et al.* Inappropriate prescribing in the elderly: a comparison of the Beers criteria and the improved prescribing in the elderly tool (IPET) in acutely ill elderly hospitalised patients. *J Clin Pharm Ther* 2006; 31: 617–26.
14. Osborne CA, Hooper R, Swift CG *et al.* Explicit, evidence-based criteria to assess the quality of prescribing to elderly nursing home residents. *Age Ageing* 2003; 32: 102–8.
15. Batty GM, Grant RL, Aggarwal R *et al.* Using prescribing indicators to measure the quality of prescribing to elderly medical in-patients. *Age Ageing* 2003; 32: 292–8.

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