MEDICATION APPROPRIATENESS INDEX: RELIABILITY AND RECOMMENDATIONS FOR FUTURE USE

To the Editor: The Medication Appropriateness Index (MAI) measures the appropriateness of prescribing for elderly patients, using 10 criteria for each medication prescribed. For each criterion, the evaluator rates whether the medication is appropriate, marginally appropriate, or inappropriate. Support is provided through explicit definitions and instructions.[1] The MAI has been used in observational and interventional studies.[2–6] Its feasibility, content validity, predictive validity, and reliability have been demonstrated in ambulatory settings.[1,7–10] Its limitations are that reliability was lower when assessed by researchers different from the authors[9,10] and that the original instrument does not address some areas (drug allergy, adverse drug reactions, compliance). We wanted to assess the reliability of the MAI for elderly patients hospitalized on a Belgian geriatric unit. Professionals with expertise in geriatrics but practicing on different sites were involved. Similar to previous research,[9] this study proceeded in two phases. First, the MAI was translated into French and piloted by a clinical pharmacist on 10 patients. Following discussions with another clinical pharmacist and a geriatrician, clarifications were introduced in the instructions. Second, interrater reliability between a clinical pharmacist (AS) and a geriatrician (CD) was checked, using 113 drugs prescribed to 16 patients at discharge (69% female, mean age 79.6, mean number of prescribed drugs on admission 6.2). The raters used an abstracted patient chart compounded by the clinical pharmacist (using data from the medical record and patient interview and from contact with the general practitioner or the community pharmacist if needed). Both raters performed the evaluations independently and then met to compare their ratings. Discrepancies were discussed, and raters were allowed to change their ratings to reach a consensus. Table 1 summarizes the results of agreement before and after discussion. Overall agreement was good and improved after discussion. Agreement on interactions was unsatisfactory before discussion between raters. Insufficient or unclear instructions in the MAI were found to be an important source of discrepancies. Based on this and on previous similar experience,[8–10] the following suggestions that might enhance the validity and reliability of the instrument are made.

General suggestions:

Add examples of appropriate, moderately appropriate, and inappropriate prescribing that are relevant to the geriatric population.

Define "moderately appropriate" for all criteria.

Consider how compliance could be accounted for, for example with regard to choice (e.g., is the choice appropriate in a patient unwilling to take his or her medicines) or to practical directions (e.g., evidence that the patient does not take the medication).

Suggestions specific to individual criteria:

- Indication:
  Add instruction that "global status" should be taken into account (e.g., vitamin D in a patient with previous fractures but in palliative care is not always a valid indication).
- Choice:
  Clarify how to cope with cases in which choice is inappropriate because of drug–drug or drug–disease interactions (e.g., use of alendronate in a patient with severe esophagitis; is it considered inappropriate in terms of choice and/or of drug–disease interaction?).
- Dosage:
  When a dose has been recently modified but consequences are not yet measurable, specify that clinical judgment should be used instead of the evaluation tool provided in the instrument.

Replace the 1997 Beers list with the 2003 updated list.

- Modalities correct
  The directions (regarding food and time of administration) provided for a limited number of drugs should be completed to include directions for additional drugs commonly prescribed in geriatrics.
- Modalities practical
  Take into account the information provided to the patient to ensure adequate intake of the medication; give inappropriate ratings when written instructions for a new medicine with specific modalities of administration (e.g., bisphosphonates) are not provided.
- Drug–drug and drug–disease interactions
  Further investigate interrater reliability, because low prevalence precluded a complete analysis in previous reports,[1,8,10] and prevalence was higher in the current study, but initial reliability was unsatisfactory.

Review the modifications proposed previously,[8,9] and agree on the definition to use in each setting.

Update the list of drug–disease interactions provided in the instrument. (Some may not be clinically relevant anymore.)

Include allergy as a drug–disease interaction.

- Duration
  Add specific instructions for drugs that are progressively withdrawn.

Table 1. Interrater Reliability Between a Clinical Pharmacist and a Geriatrician (n = 113 Drugs Prescribed to 16 Patients at Hospital Discharge)

Parameter	A	B	C	D	Positive Predictive Value	Negative Predictive Value	Kappa*
Before discussion between raters							
Indication	104	6	0	3	0.97	0.5	0.48
Effectiveness	93	6	2	12	0.96	0.75	0.71
Dosage	90	6	6	11	0.93	0.65	0.58
Correct directions	92	5	3	13	0.96	0.76	0.72
Practical directions	94	7	4	8	0.94	0.59	0.54
Drug–drug interaction	91	16	4	2	0.90	0.20	0.09
Drug–disease interaction	86	19	2	6	0.89	0.36	0.29
Duplication	106	0	0	7	1.00	1.00	1.00
Duration	94	5	1	13	0.97	0.81	0.78
Overall†	49	11	4	49	0.87	0.87	0.74
After discussion between raters							
Indication	106	1	0	6	1.00	0.92	0.92
Effectiveness	94	2	1	16	0.98	0.91	0.90
Dosage	92	1	3	17	0.98	0.89	0.87
Correct directions	95	0	2	16	0.99	0.94	0.93
Practical directions	97	4	1	11	0.97	0.81	0.79
Drug–drug interaction	95	10	0	8	0.95	0.62	0.57
Drug–disease interaction	92	8	0	13	0.96	0.76	0.73
Duplication	106	0	0	7	1.00	1.00	1.00
Duration	95	1	0	17	0.99	0.97	0.97
Overall†	50	7	2	54	0.92	0.92	0.84

Note: Cost (10th criterion) was not included in the analysis, because an explicit source for comparing the costs of drugs in Belgium was used instead.
*A kappa statistic of 0.40–0.75 denotes good interrater reliability, and a kappa value > 0.75 denotes excellent reproducibility.
†Drug's overall appropriateness (inappropriate if $\geq$ 1 of the 10 items were rated as inappropriate).
A = appropriate according to both raters; B = appropriate according to clinical pharmacist, inappropriate according to geriatrician; C = appropriate according to geriatrician, inappropriate according to clinical pharmacist; D = inappropriate according to both raters.

> Consider giving (moderately) inappropriate rating for short-term treatments for which no indication on the end of treatment has been provided in the letter or to the patient.

In conclusion, even though perfect interrater agreement is illusory, additional instructions and examples could improve the validity and reliability of the instrument. Researchers with previous experience with the MAI could discuss this.

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