Inappropriate drug prescribing in older adults

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Structure

- What does appropriate prescribing mean?

- How should we identify subjects at risk of drug related problems (DRPs) and adverse drug reactions (ADRs)?

- How should we review prescribing for an older patient?

- Which tools and strategies can help us to reduce inappropriate prescribing?
What is appropriate prescribing?

- A prescription that maximises **efficacy** and **safety**, minimises **costs**, and respects patient’s **choices**

  *Barber N. Pharm J 1996;257:289-91*

- « **Pharmacological appropriateness** »
  - Only 1 dimension

- **Other dimensions**
  - What the patient wants
  - The « **general good** »
Categories of inappropriate prescribing

- Prescribing more drugs than are clinically indicated
- Inappropriate with regard to:
  - Choice of drugs
  - Dosage
  - Duration
  - Modalities of administration
  - Drug interactions (/drug or /disease)
  - Cost
- Failure to prescribe drugs that are needed
Is inappropriate prescribing frequent?

Inappropriate prescribing

- 186 patients admitted to an acute geriatric unit
  - Almost 60% of prescriptions: 1 inappropriate rating
  - 30% of patients were taking 1 drug-to-avoid
  - Under-prescribing in 50% of patients

Over- and mis-prescribing

Under-prescribing

Table 3. Percentage of Drugs with Inappropriate Ratings on Admission and at Discharge Using the Medication Appropriateness Index (MAI)

<table>
<thead>
<tr>
<th>MAI Criterion</th>
<th>Control</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (n = 633)</td>
<td>Discharge (n = 654)</td>
</tr>
<tr>
<td>Indication</td>
<td>9.8</td>
<td>26.1</td>
</tr>
<tr>
<td>Choice</td>
<td>23.2</td>
<td>18.5</td>
</tr>
<tr>
<td>Dosage</td>
<td>28.0</td>
<td>25.1</td>
</tr>
<tr>
<td>Modalities correct</td>
<td>19.3</td>
<td>17.9</td>
</tr>
<tr>
<td>Modalities practical</td>
<td>15.0</td>
<td>16.8</td>
</tr>
<tr>
<td>Drug-drug interactions</td>
<td>7.4</td>
<td>6.7</td>
</tr>
<tr>
<td>Drug-disease interactions</td>
<td>18.8</td>
<td>15.4</td>
</tr>
<tr>
<td>Duplication</td>
<td>3.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Duration</td>
<td>16.7</td>
<td>20.5</td>
</tr>
<tr>
<td>Cost</td>
<td>23.2</td>
<td>23.1</td>
</tr>
<tr>
<td>Overall*</td>
<td>59.9</td>
<td>59.8</td>
</tr>
</tbody>
</table>

* Inappropriate rating in at least 1 of the 10 criteria.

Condition

Osteoporosis
AF
IHD
HF
Myocardial infarction

% patients undertreated
72%
40%: anticoag/aspirin
42%: aspirin
42%: ACEI
61%: β-blocker

...
Consequences of inappropriate prescribing

- Drug related problems (DRPs) and Adverse drug reactions (ADRs)
- Drug interactions
- Duplication of drug therapy
- Decreased quality of life
- Medication non-adherence
- Unnecessary cost
Consequences of inappropriate prescribing

- Drug related problems (DRPs) and adverse drug reactions (ADR) represent a major burden on health care

- In Western countries ADRs cause 10-20% of all hospital admissions, and are responsible for about 5-10% of in-hospital costs

Increased vulnerability to ADRs in older people

Older people are 2-3 times more at risk for adverse drug reactions due to:

- altered pharmacokinetics
- altered pharmacodynamics
- cumulative insults to the body (e.g., co-morbidity, polypharmacy)

Pirmohamed M. BMJ 2004; 329:15-19

- non-compliance
- lack of available data
- medical errors

Barat I. Br J Clin Pharm 2001;51:615-622
Tools and strategies to screen for and prevent DRPs/ADRs

- Medication review
- Avoiding use of potentially inappropriate medications (PIM)
- Computer-based prescribing systems
- Comprehensive geriatric assessment (CGA)

Screening - identification of subjects at risk of ADR

- Few data exist that allow stratification of patients according to likelihood of an ADR
  - An attempt to develop a risk stratification model: *not enough statistical power to develop a risk score*
    
  
  - An attempt to identify specific patient’s characteristics associated with an increased risk: *restrospective study, relied on voluntarily reported ADRs, under reporting*
    
Development and Validation of a Score to Assess Risk of Adverse Drug Reactions Among In-Hospital Patients 65 Years or Older: the GerontoNet ADR risk score

Arch Intern Med 2010, 170: 1142-1148
### Variables of the GerontoNet ADR risk score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 4 co-morbid conditions</td>
<td>1.31</td>
<td>1.04 - 1.64</td>
<td>1</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1.79</td>
<td>1.39 - 2.30</td>
<td>1</td>
</tr>
<tr>
<td>Liver disease*</td>
<td>1.36</td>
<td>1.06 - 1.74</td>
<td>1</td>
</tr>
<tr>
<td>No of drugs,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>5-7</td>
<td>1.90</td>
<td>1.35 - 2.68</td>
<td>1</td>
</tr>
<tr>
<td>≥ 8</td>
<td>4.07</td>
<td>2.93 - 5.65</td>
<td>4</td>
</tr>
<tr>
<td>Previous ADR</td>
<td>2.41</td>
<td>1.79 - 3.23</td>
<td>2</td>
</tr>
<tr>
<td>Renal failure**</td>
<td>1.21</td>
<td>0.96 - 1.51</td>
<td>1</td>
</tr>
</tbody>
</table>

*transaminases > 2 x upper normal limit; ** GFR < 60 ml/min
Screening- identification of subjects at risk of ADR: evidence

- The GerontoNET ADR risk score represents the *only tool available so far* to identify patients at risk of ADR, which may be target of interventions aimed at reducing their risk of ADR

- However...
  - *it still should be validated in different settings and studies*
  - *the need for identification of new risk factors to be added to the score*

Medication review

- An individualized assessment provided by a clinical pharmacist: during which the medication list is analyzed in a structured manner, with full access to the medical file, in order to identify drug related problems.

- **First step**: identification of all the medications that the patient is taking.

- **Second step**: the medication list is screened for drug related problems i.e. any misuse, underuse or overuse of drugs.

- **Third step**: possible solutions to the drug related problems (DRPs) are then discussed with the treating physician and, if possible, with the patient.
Medication review

Level 0
AD-HOC
Unstructured, opportunistic

Level 1
PRESCRIPTION REVIEW
Technical review of list of patient’s medicines

Level 2
TREATMENT REVIEW
Review of medicines with full patient’s notes

Level 3
CLINICAL MEDICATION REVIEW
Face-to-face review of medicines and condition
Reporting adverse drug reactions on a geriatric ward: *spontaneous reporting vs. patient interview (by pharmacists)*

<table>
<thead>
<tr>
<th></th>
<th>Patients</th>
<th>Patients with ADRs</th>
<th>Number of ADRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>spontaneous reporting</td>
<td>168</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>patient interview</td>
<td>56</td>
<td>23</td>
<td>32</td>
</tr>
</tbody>
</table>

**Interviewed patients (n = 56)**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>80.1</td>
<td>80.0</td>
<td>62 – 94</td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td>18.6</td>
<td>14.0</td>
<td>4 – 61</td>
</tr>
<tr>
<td>Number of drugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>patients with ADR (n=23)</td>
<td>9.3</td>
<td>8.0</td>
<td>6 – 16</td>
</tr>
<tr>
<td>patients without ADR (n=33)</td>
<td>8.3</td>
<td>9.0</td>
<td>3 – 14</td>
</tr>
</tbody>
</table>

*Somers A et al. Eur Clin Pharmacol 2003;58:707-14*
Reporting adverse drug reactions on a geriatric ward: *spontaneous reporting vs. patient interview (by pharmacists)*

## Results of the patient interview

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>(43%)</td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>(57%)</td>
</tr>
<tr>
<td><strong>Causality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td>23</td>
<td>(72%)</td>
</tr>
<tr>
<td>Possible</td>
<td>9</td>
<td>(28%)</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = no change</td>
<td>13</td>
<td>(41%)</td>
</tr>
<tr>
<td>2 = stopped / dose changed</td>
<td>12</td>
<td>(37%)</td>
</tr>
<tr>
<td>3 = stopped + additional therapy</td>
<td>7</td>
<td>(22%)</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious ADR</td>
<td>12</td>
<td>(38%)</td>
</tr>
<tr>
<td>Non-serious ADR</td>
<td>20</td>
<td>(62%)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>32</td>
<td>(100%)</td>
</tr>
<tr>
<td>Type B</td>
<td>0</td>
<td>(0%)</td>
</tr>
</tbody>
</table>

*Somers A et al. Eur Clin Pharmacol 2003;58:707-14*
# Impact on appropriateness of prescribing

<table>
<thead>
<tr>
<th>Geriatric medicine services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coleman et al.</strong>&lt;sup&gt;104&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Schmader et al.</strong>&lt;sup&gt;105&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Saltvedt et al.</strong>&lt;sup&gt;106&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Crotty et al.</strong>&lt;sup&gt;107&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Strandberg et al.</strong>&lt;sup&gt;108&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Impact on appropriateness of prescribing

RCT, 203 patients, one acute geriatric unit, Belgium
Pharmaceutical care from admission to discharge
- ↑ appropriateness of prescribing (MAI, ACOVE)
- 90% acceptance rate
- Trend toward ↓ mortality and ED visits

RCT, 400 patients ≥80y, 2 internal medicine wards, Sweden
Pharmaceutical care from admission to discharge(+ after)
- 16% ↓ hospital visits
- 46% ↓ ED visits
- 80% ↓ drug-related readmissions

Medication review: evidence

- **Good evidence** that collaboration with pharmacists can decrease the risk of drug-related problems

- **Mixed / lacking evidence** for effect on:
  - Health outcomes
  - HRQoL
  - Cost-effectiveness of care

Chisholm-Burns Med Care. 2010;48:923-933
Avoiding use of potentially inappropriate medications (PIM)

Medication Assessment Tools

1) **Explicit (criteria based): drugs to avoid**
   - McLeod (1997)
   - ACOVE: Assessing Care of Vulnerable Elders (2001)

2) **Implicit (judgement based):**
   - MAI: Medication Appropriateness Index (1992)
   - GMA: Geriatric Medication Algorithm (1994)
   - Lipton’s criteria (1993)
Avoiding use of potentially inappropriate medications (PIM)

- **Explicit**
  - criterion-based
  - reviews, consensus, experts
  - focus on drugs/diseases

- **Process**
  - prescription accords with accepted standards
  - should have causal links to important outcomes

- **Implicit**
  - judgement-based
  - focus on the patient

- **Outcome**
  - indicators of adverse outcomes
## Avoiding use of potentially inappropriate medications (PIM)

<table>
<thead>
<tr>
<th>Explicit</th>
<th>Process</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- LA-BZD</td>
<td>Admission to hospital for fall and patient taking a LA-BZD</td>
</tr>
<tr>
<td></td>
<td>- LA-BZD in patients with fall</td>
<td></td>
</tr>
<tr>
<td>Implicit</td>
<td>Patient with LA-BZD for insomnia for 5 years, other risk factors for fall, patient open to attempt progressive discontinuation</td>
<td></td>
</tr>
</tbody>
</table>
Beers criteria


- Drugs with risk > benefit in older patients

- 2 parts:
  - non-recommended drugs in older people
  - conditionally non-recommended drugs

- O/M

### Examples of non-recommended drugs in older people

<table>
<thead>
<tr>
<th><strong>Generic name</strong></th>
<th><strong>Generic name</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Propoxyphene</td>
<td>Triazolam &gt; 0,25 mg daily</td>
</tr>
<tr>
<td>Indometacine</td>
<td>Diazepam</td>
</tr>
<tr>
<td>Phenylbutazone</td>
<td>Digoxine &gt; 0,125 mg daily</td>
</tr>
<tr>
<td>Pentazocine</td>
<td>Dipyridamole</td>
</tr>
<tr>
<td>Oxybutynin</td>
<td>Methylidopa</td>
</tr>
<tr>
<td>Flurazepam</td>
<td>Chlorpropamide</td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>Belladonna alkaloids</td>
</tr>
<tr>
<td>Perphenazine-amitriptyline</td>
<td>Chlorpheniramine</td>
</tr>
<tr>
<td>Doxepine</td>
<td>Diphenhydramine</td>
</tr>
<tr>
<td>Meprobamate</td>
<td>Hydroxyzine</td>
</tr>
<tr>
<td>Lorazepam &gt; 3 mg daily</td>
<td>Cyproheptadine</td>
</tr>
<tr>
<td>Oxazepam &gt; 60 mg daily</td>
<td>Promethazine</td>
</tr>
<tr>
<td>Alprazolam &gt; 2 mg daily</td>
<td>Dexchlorpheniramine</td>
</tr>
<tr>
<td>Temazepam &gt; 15 mg daily</td>
<td>Ergot mesyloids</td>
</tr>
<tr>
<td>Zolpidem &gt; 5 mg daily</td>
<td>Iron supplelements &gt; 325 mg daily</td>
</tr>
<tr>
<td></td>
<td>Ticlopidine</td>
</tr>
</tbody>
</table>
Conditionally non-recommended drugs in older people

<table>
<thead>
<tr>
<th>Pathology</th>
<th>treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>sodium containing drugs (sodium carbonate: effervescent tablets)</td>
</tr>
<tr>
<td>Gastric ulcer</td>
<td>NSAIDs, aspirin</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>Tricyclic antidepressants</td>
</tr>
<tr>
<td>Depression</td>
<td>methyldopa</td>
</tr>
<tr>
<td>Obesity</td>
<td>Olanzapine</td>
</tr>
</tbody>
</table>
Beers criteria

- Somme drugs controversial
- Many drugs not available in Europe
  - Better situation with the 2012 version
- Only 2 aspects of inappropriate prescribing
- Easy and rapid to use

# Table 1. Applicability of the 2003 and 2012 Beers Criteria to Belgium

<table>
<thead>
<tr>
<th>Level of Analysis</th>
<th>2003</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications or medication classes&lt;sup&gt;a&lt;/sup&gt;</td>
<td>38/48 (79.2)</td>
<td>49/53 (92.5)</td>
</tr>
<tr>
<td>Molecules listed&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60/100 (60.0)</td>
<td>100/177 (56.5)</td>
</tr>
<tr>
<td>Individual criteria&lt;sup&gt;c&lt;/sup&gt;</td>
<td>47/66 (71.2)</td>
<td>84/99 (84.8)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Adapted from Belyea et al. JAGS 2003;51:79-97

<sup>b</sup> Adapted from Beers Criteria Panel. JAGS 2012;60:2188-2189

<sup>c</sup> Adapted from Beers Criteria Panel. JAGS 2012;60:2188-2189
ACOVE criteria

- Assessing Care Of the Vulnerable Elders
  - Literature study + expert opinion
  - 22 pathologies, syndromes, clinical situations
  - 236 indicators (prevention, diagnosis, therapy, monitoring)
    - 68 medication-related indicators
    - If… then… (unless…)

- O/U/M

ACOVE criteria

Domains of care taken into consideration

- Continuity of care
- Dementia
- Depression
- Diabetes mellitus
- End-of-life care
- Falls and mobility disorders
- Hearing impairment
- Heart failure
- Hospital care
- Hypertension
- Ischaemic heart disease
- Malnutrition
- Medication management
- Osteoarthritis
- Osteoporosis
- Pain management
- Pneumonia and influenza
- Pressure ulcers
- Screening and prevention
- Stroke and atrial fibrillation
- Urinary incontinence
- Vision impairment

### Criteria concerning therapy

<table>
<thead>
<tr>
<th>Indication</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>low dose aspirine</td>
</tr>
<tr>
<td>Diabetes with proteinuria</td>
<td>ACE inhibitor</td>
</tr>
<tr>
<td>Diabetes, TC &gt; 240 g/dl</td>
<td>lipid lowering agent</td>
</tr>
<tr>
<td>Heart failure with LVEF &lt; 40%</td>
<td>ACE inhibitor</td>
</tr>
</tbody>
</table>

### Criteria concerning monitoring

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digoxine, with symptoms of intoxication</td>
<td>determine plasma level within 24 hours</td>
</tr>
<tr>
<td>Anticoagulans</td>
<td>determine INR 3 days after initiation</td>
</tr>
<tr>
<td>Anticoagulans (chronic use)</td>
<td>determine INR monthly</td>
</tr>
</tbody>
</table>

### Criteria concerning prevention

<table>
<thead>
<tr>
<th>Therapy 1</th>
<th>Therapy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corticoids during &gt; 1 month</td>
<td>Start Calcium + Vitamine D</td>
</tr>
<tr>
<td>NSAID and history of peptic ulcer</td>
<td>PPI or misoprostol</td>
</tr>
</tbody>
</table>
ACOVE criteria

- Operationalisability
- No recent update

- Geriatric conditions included
- Encompass Tx, prevention, monitoring, education and documentation
- Applicable to patients with dementia and poor prognosis

STO\(PP\) / \(START\) criteria

- Screening tool of older persons’ potentially inappropriate prescriptions (\(STO\)PP)
  - 80 criteria, O/M

- Screening tool to alert doctors to the right treatment (\(STA\)RT)
  - 34 criteria, U

STOPP/START criteria

**STOPP**
- Aspirin $> 150\, \text{mg/d}$
- SSRI in case of clinically significant hyponatremia
- PPI for an ulcer in full therapeutic dose $> 8\, \text{w}$

**START**
- Antidepressant in case of major depressive symptoms during at least 3 months
Avoiding use of PIM: evidence

- Use of STOPP/START criteria leads to significant and sustained improvements in the appropriateness of prescribing at discharge and for up to 6 months after discharge
  

- STOPP criteria seem significantly associated with avoidable adverse drug events that cause or contribute to urgent hospitalization

Beers vs STOPP START

**Similarities**
- Criteria: BZD & falls; CCB & constipation; long-acting sulfonylurea;...

**Differences**
- ~ 75% of Beers criteria do NOT overlap with STOPP
- ~ 55% of the STOPP criteria are not part of Beers
- Beers: more focus on anticholinergics; delirium; dementia
- STOPP: more focus on anticoagulants; opiates; PPIs

*Dalleur O et al. JAGS 2012;60:2188-2189*
In conclusion, we believe that the 2012 Beers criteria have greater relevance for European countries. Because the majority of criteria for inappropriate prescribing do not overlap in Beers and STOPP, both lists will continue to coexist. Furthermore, the addition to Beers of criteria...
Explicit instruments

- **Pros** of using explicit criteria in your daily practice
  - Relatively easy to remember and to detect
  - Provides support to identify inappropriate prescribing in the elderly

HOWEVER…
Explicit instruments

- **Cons** of using explicit criteria in daily practice

  - This is just one part of the story…
  - The patient’s perspective is often not taken into consideration

→ We should not limit our evaluation to the application of such criteria
Medication Appropriateness Index (MAI)

- 10 questions per drug

1. Valid indication?
2. Appropriate choice?
3. Correct dose?
4. Modalities of treatment correct?
5. Modalities of treatment practical?
6. Clin. significant drug-drug interactions?
7. Clin. significant drug-disease interactions?
8. Duplication?
9. Appropriate duration?
10. Cost?

MAI

- Time consuming
- Knowledge-dependent

- Comprehensive and systematic
  - Includes operational definitions, explicit instructions, and examples
  - Excellent as an educational « tool » for students!

Computer-based prescribing systems

- Clinical Decisions Support Systems (CDSS) and Computerized Prescription Support System (CPSS) are interactive softwares, designed
  - As potentially powerful tools to prevent ADRs
  - To support at the time of prescribing
  - All categories of inappropriate prescribing can be addressed, if prescription data are linked to clinical data

- Computerized Provider Order Entry Systems (CPOE), which are based on these softwares, enable providers to enter medical orders into a computer system that is located within an inpatient or ambulatory setting.

Translating Quality Measures into Clinical Decision Support

Complexity

Validity

Drug Data

Drugs, Dx’s, Labs & Clinical Info

Drugs, Dx’s & Labs

Drugs & Dx’s

Drug Data
Computer-based prescribing systems

- **Disadvantages**
  - Very few studies demonstrated an improvement in patient outcomes
  - Challenging to implement
  - Existing systems are not geriatric specific
  - High volume of alerts: risk of unimportant warnings
  - Some prescribers are reluctant to use

Strom B et al; Arch Intern Med. 2010;170:1578-1583.
Comprehensive geriatric assessment (CGA)

- Medical complexity plays an important role in the onset of ADR and should always be considered before prescribing a pharmacological treatment in older people.

- Drugs that have proven in clinical trials clear beneficial effects to treat a chronic conditions and which use is indicated in clinical guidelines should be used carefully in complex older adults
  - since they may interact with co-existing diseases or geriatric syndromes, may not be assumed correctly because of presence of cognitive deficits, disability or social problems or may be useless because the health expectancy of the patient is too short to determine a beneficial effect of the drug.

Comprehensive geriatric assessment (CGA): evidence

- CGA in association with a multidisciplinary team (assessing and managing the health care problems identified by the CGA, and developing individualized care plans) results in more detailed evaluation, improved care planning, and overall better quality of care.

  *Ellis G et al. BMJ. 2011;343:d6553.*

- Limitation: heterogeneity in terms of structural components and care processes.
Comprehensive geriatric assessment (CGA): evidence

- CGA allows a complete and global assessment and management of the health care problems, including evaluation of drugs with the goal of recognizing and preventing potential drug-related problems and improve quality of prescribing.
  

- CGA associated with a multidisciplinary team approach, as compared with usual care in frail older adults shows a 35% reduction in the risk of a serious ADRs and a substantial reduction in unnecessary and inappropriate drug use.
  
Systematic approach for drug cessation in complex older adults

Discuss the following with the patient/guardian:

- An evidence-based consensus exists for using the drug for the indication given in its current dosing rate in this patient’s age group and disability level, and the benefit outweighs all possible known adverse effects.
  - No/Not sure

  - Indication seems valid and relevant in this patient’s age group and disability level.
    - No
    - Yes

  - Do the known possible adverse reactions of the drug outweigh possible benefit in old, disabled patients?
    - Yes
    - No

  - Any adverse symptoms or signs that may be related to the drug?
    - Yes
    - No

  - Is there another drug that may be superior to the one in question?
    - Yes
    - No

  - Can the dosing rate be reduced with no significant risk?
    - Yes
    - No

Continue with the same dosing rate
Reduce dose

COLLABORATIVE CARE

- Multidisciplinary teams
  - Geriatric medicine services/CGA
- Collaboration with
  - Clinical pharmacists
  - Nurses
- Collaboration with the patient
  - Computerized support
  - Educational approaches
None of the existing approaches shows a clear beneficial effect on patients’ health outcomes: available evidence on the impact of medication review, avoidance of PIM, computer-based prescribing systems and CGA is mixed and controversial.

A main limitation of all the described approaches is the lack of standardization.

- Large differences are described in the delivery of the pharmacist-led medication review.
- Criteria to assess quality of prescribing vary across countries and no widely accepted gold standard exists, yet.
- Computer-based prescribing systems are often home-grown and they implement different types of information, tools and algorithms.
- Geriatric assessment and management programs are heterogeneous in terms of structural components and care processes.
Most of the available research is focused on a single intervention targeting either clinical or pharmacological factors causing ADR.

When these approaches were combined—such as for studies assessing the efficacy of an intervention based on experienced pharmacists performing medication review in the context of a multidisciplinary team—positive effects on patients’ health outcomes were shown.

Safe drug use goes along with global assessment of patients' clinical and functional parameters and that integration of skills from different health care professionals is needed to address medical complexity of older adults.

The challenge for future research is to integrate valuable information obtained by existing instruments and methodologies in a complete and global approach targeting all potential factors involved in the onset of ADR.
Development and clinical trials of a new Software ENgine for the Assessment & Optimization of drug and non-drug Therapy in Older peRsons

http://www.senator-project.eu

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<th>No</th>
<th>Partner Organization</th>
<th>Scientist</th>
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IGRIMUP
Invitation to join

- IGRIMUP (International Group for Reducing Inappropriate Medication Use & Polypharmacy), founded during IAGG 2013 in Seoul, Korea is an open group focused on preventing negative effects of drugs by avoiding polypharmacy and Inappropriate Medication Use (IMU).

- Researchers capable of promoting this goal in their country and/or internationally are welcome. Please feel free to forward us names of other leading figures, regardless of country or profession, that are interested in and willing to join the group.

- We hope that you will share your thoughts about the issues prevalent in your country’s health care system on reducing inappropriate medication use, and ideas for change.

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