Potentially inappropriate prescribing detected by STOPP–START criteria: are they really inappropriate?

Isabel Lozano-Montoya1, Manuel Vélez-Díaz-Pallarés2, Eva Delgado-Silveira2, Beatriz Montero-Errasquin1, Alfonso José Cruz Jentoft1

1Servicio de Geriatria, Hospital Universitario Ramón y Cajal, Madrid, Spain
2Servicio de Farmacia Hospitalaria, Hospital Universitario Ramón y Cajal, Madrid, Spain

Address correspondence to: I. Lozano-Montoya. Tel/Fax: (+34) 91 336 81 72. Email: ilozanom@salud.madrid.org

Abstract

Background: the STOPP–START criteria were developed to detect potentially inappropriate prescribing (PIP) in older people. The reasons why multidisciplinary geriatric teams decide not to follow STOPP–START criteria have not been studied.

Objective: to analyse compliance with the recommendations of the STOPP–START criteria in older inpatients.

Design: ambispective, non-randomised study.

Subjects setting: three hundred and eighty-eight consecutive patients aged 80 years or over admitted to the acute geriatric medicine unit of a University hospital.

Methods: STOPP–START criteria were systematically used by a pharmacist to assess pre-admission treatments, and the multidisciplinary geriatric team decided what drugs were recommended after discharge. Two researches independently assessed how many STOPP–START recommendations were accepted by the team, and if they were not accepted, why.

Results: two hundred and eighty-four PIPs were identified (0.8 per subject) according to STOPP criteria. Two hundred and forty-seven of these prescriptions (87.0%) were discontinued at discharge. STOPP recommendations were not accepted in 37 cases, mostly because the team considered other therapeutic priorities (lorazepam, n = 12; risperidone, n = 5; other, n = 18).

Three hundred and ninety-seven PIPs were identiﬁed according to START criteria (1.1 per subject). START recommendations were not followed at discharge in 264 cases (66.5%). The most frequent reasons were as follows: severe disability (n = 90), the use of other effective treatments for the condition (n = 38) and high risk of severe adverse effects (n = 32). Not following START criteria was signiﬁcantly associated with dependency for basic activities of daily living (ADLs) (odds ratio, OR: 0.66 for compliance with a recommendation; 0.49–0.89), dependency for instrumental ADLs (OR: 0.64; 0.48–0.85) or inability to walk (OR: 0.72; 0.54–0.98).

Conclusions: potentially inappropriate drugs are usually discontinued, but many older hospitalised patients do not receive potentially recommended medications. More research on the reasons and consequences of this fact is needed.

Keywords: potentially inappropriate prescribing, older people, STOPP/START

Introduction

Quality and safety of medication use in older people are an increasing problem in usual medical practice. Age-related changes in pharmacokinetics and pharmacodynamics, multiple medical co-morbidities, polypharmacy and inadequate nutritional status increase the risk for older patients to have adverse drug events (ADEs) [1, 2, 3].

Potentially inappropriate prescribing (PIP) encompasses (i) the use of medications in a situation in which the risk of an ADE outweighs the clinical benefit (particularly when safer or more effective medications are available) and (ii) the omission of clinically indicated medications in the absence of contraindication in patients with significant life expectancy [4]. Inappropriate prescribing (IP) is common in older patients [5, 6] and is associated with ADEs [7], hospitalisation and...
death [8, 9, 10], functional impairment [11] and wasteful util-
isation of resources [12].

Explicit criteria to detect PIP have been developed to iden-
tify and improve the use of medication in older people
[13, 14, 15, 16]. The concept of PIP implies that the final j udgment about the appropriateness of a drug in a patient is
made by the attending physician, considering all the factors
involved, including costs [17] and patient preferences and
experiences [18].

PIPs, according to the Screening Tool of Older People’s
Prescriptions (STOPP) criteria, are identified in 35–77% of
older inpatients [19–22, 23]. The Screening Tool to Alert to
Right Treatment (START) criteria detect potential prescribing
omissions (PPOs) in 44–65% of hospitalised older people
[24, 25].

Standard geriatric care uses comprehensive geriatric as-
se ssment, which includes medication review, but changes in
drug prescription in older hospitalised patients are reduced
by using comprehensive geriatric assessment [26]. Adding
pharmaceutical care to the multidisciplinary team of an acute
geriatric care unit may enable one to detect a great number
of PIPs and ADEs and to optimise patients’ medical treat-
ment, although evidence is still weak [27, 28]. However, com-
pliance with pharmacist recommendations is low. Recently,
a specially developed structured pharmacist review of med-
ication intervention supported by computerised decision
support systems was shown to improve both the appropriaten-
ness and accuracy of medication regimens of older hospital-
ised inpatients, but compliance with recommendations was
only 54.8% [29].

To the best of our knowledge, there are no studies that
analyse the rates and reasons why multidisciplinary geriatric
t eams with expertise in the use of drugs in older people
decide not to follow the recommendations from explicit
criteria. The objective of this study was to analyse the appropri-
ateness of the STOPP–START criteria in older inpatients
using a multidisciplinary comprehensive assessment as the
gold standard.

**Methods**

**Subjects and setting**

This was an ambispective, non-randomised study. Data were
collected from 388 consecutive patients aged 80 years or
over, admitted with acute illness to the acute geriatric medi-
cine unit of the Hospital Universitario Ramón y Cajal in
Madrid, Spain. This public hospital serves an urban catch-
ment area of around 650,000 persons. All patients were ad-
mitted via the Emergency Department, following referral by
their general practitioner (GP) or self-referral.

Patients were excluded if they were admitted to hospital in
the previous year or were cared as outpatients in the geriatric
clinic. Readmissions during the study period were also ex-
cluded. Patients who were transferred from other medical or
surgical wards for comprehensive geriatric assessment were
not considered.

**Use of explicit criteria**

On admission of each patient to the acute geriatric unit, a cli-
cical pharmacist who is an expert on the use of STOPP–START
criteria and in the interpretation of medical records obtains a
comprehensive drug history from the patient, caregiver and
other available sources (GP and both hospital and primary care
medical records) and reviews pre-admission treatments to
detect PIPs and PPOs using STOPP–START criteria. Results
are discussed within the multidisciplinary geriatric team, and
decisions on drug use or discontinuation are usually taken by
consensus within the team. At hospital discharge, the same
pharmacist informs patients and caregivers about the recom-
mended discharge treatment and gives them computer-
generated written information for all drugs prescribed [21].

For this study, and after patients had been discharged,
two researchers who were not part of the attending team (a
geriatrician and a clinical pharmacist trained in the use of
explicit criteria) independently collected STOPP–START cri-
criteria at admission for each patient, based on all the informa-
tion available in clinical records, and analysed whether the
recommendations of the explicit criteria had been followed
by the geriatric team. When recommendations on starting or
stopping drugs had not been followed by the geriatric team,
the reason of this decision was recorded. Possible reasons
for non-compliance were defined from the literature, and all
recommendations that were not followed were classified by
consensus between three geriatricians and two clinical phar-
macists. (Supplementary data, Appendix S1, available in Age
and Ageing online).

In the use of STOPP–START criteria, some minor issues
were considered:

- Acenocoumarol was included as anticoagulant treatment
  (warfarin is rarely used in Spain) and new oral anticoagulants
  with approved indications for these pathologies were consid-
ered in STOPPA9, STOPPA15, STOPPA16, STOPPA17,
  STOPPE5, STARTA1 and STARTA2.
- Triflusal was considered an antiplatelet therapy: STOPPA17,
  STARTA3.
- Any type of laxative prescription was considered as well as
  a fibre diet: START D2.
- Walter and Covinsky [30] approach was used to evaluate life
  expectancy: STARTA5.

Independent variables collected were age, gender and
number of prescribed medications prior to admission (those
prescribed before the hospital physician’s intervention for >3
months or with no ending date) and at hospital discharge. All
prescribed drugs with pharmacologically active ingredients
were included in the analysis. Oral nutritional supplements
and eye drops were excluded. Multivitamins in pills were con-
sidered as a single active drug.

Comprehensive geriatric assessment data were registered:
Cumulative Illness Rating Scale for Geriatrics (CIRS-G) [31],
Katz Index of Independence in Activities of Daily Living
(Katz), Lawton Instrumental Activities of Daily Living Scale
(Lawton), Mini Nutritional Assessment (MNA), Global
Deterioration Scale for dementia (GDS) and Functional Ambulation Category (FAC). Number of falls in the preceding 3 months, living in a nursing home and deaths during admission were also collected.

Descriptive statistics were used: frequencies for categorical measures and means and standard deviations for continuous measures. Contingency tables were created for discrete variables. A value of $P < 0.05$ was considered statistically significant.

## Results

Three hundred and eighty-eight patients were included (88.8 ± 6.0 years, 68.3% female); 42 of them died in hospital (data excluded from analysis as they were not discharged with a drug treatment). Twenty-five per cent of the subjects lived in an institutional setting prior to hospital admission. Most of the subjects were severely dependent for activities of daily living (ADLs) (47.9%) and suffered from malnutrition (42.6%). The mean number of medications prescribed per patient decreased from admission (8.1 ± 3.7) to discharge (7.0 ± 3.3). The main characteristics of the study population are presented in Table 1.

One hundred and seventy seven subjects out of 346 (49.1%) were using at least one PIP on admission according to STOPP criteria and 212 subjects (61.3%) had a PPO according to START criteria.

Two hundred and eighty-four PIPs were identified (0.8 per subject) according to STOPP criteria, of which 247 (87.0%) were discontinued at discharge. The most frequently encountered STOPP criteria were the use of benzodiazepines in those prone to falls (STOPP H1) ($n = 33$, 11.6%), duplicate drug classes (STOPP J) ($n = 28$, 9.9%) and loop diuretic as first-line monotherapy for hypertension (STOPP A3) ($n = 21$, 7.4%) (Table 2). The suggestion to stop a drug was not accepted in 37 cases (13.0%) because of other therapeutic priorities.

### Table 1. Characteristics of the study population ($n = 346$)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>$N$</th>
<th>Mean ± SD or proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>346</td>
<td>88.5 ± 6.0</td>
</tr>
<tr>
<td>Sex (women)</td>
<td>241</td>
<td>69.7%</td>
</tr>
<tr>
<td>Living in nursing home</td>
<td>86</td>
<td>24.9%</td>
</tr>
<tr>
<td>Faller (one or more falls in the 3 months prior to assessment)</td>
<td>80</td>
<td>23.1%</td>
</tr>
<tr>
<td>Died in hospital</td>
<td>42</td>
<td>10.8%</td>
</tr>
<tr>
<td>Cumulative Illness Rating Scale for Geriatrics (CIRS-G)</td>
<td>345</td>
<td>2.5 ± 0.4</td>
</tr>
<tr>
<td>ADL (Katz)</td>
<td>330</td>
<td>2.6 ± 2.3</td>
</tr>
<tr>
<td>Severe ADL disability (Katz: F-G)</td>
<td>158</td>
<td>47.9%</td>
</tr>
<tr>
<td>IADL (Lawton)</td>
<td>312</td>
<td>1.5 ± 2.4</td>
</tr>
<tr>
<td>Severe IADL disability (Lawton: 0–2)</td>
<td>215</td>
<td>68.9%</td>
</tr>
<tr>
<td>Cognitive status (Global Deterioration Scale, GDS)</td>
<td>290</td>
<td>3.9 ± 2.1</td>
</tr>
<tr>
<td>Severe dementia (GDS: 6–7)</td>
<td>94</td>
<td>32.4%</td>
</tr>
<tr>
<td>FAC index</td>
<td>318</td>
<td>2.4 ± 2.0</td>
</tr>
<tr>
<td>Walking disability (FAC: 0–1)</td>
<td>137</td>
<td>43.1%</td>
</tr>
<tr>
<td>Nutritional assessment (MNA)</td>
<td>209</td>
<td>8.0 ± 3.4</td>
</tr>
<tr>
<td>At risk of malnutrition (MNA: 8–11)</td>
<td>87</td>
<td>41.6%</td>
</tr>
<tr>
<td>Malnourished (MNA: 0–7)</td>
<td>89</td>
<td>42.6%</td>
</tr>
</tbody>
</table>

### Table 2. Compliance with the most prevalent STOPP–START criteria

<table>
<thead>
<tr>
<th>STOPP</th>
<th>$n$</th>
<th>Compliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzosiazepines in those prone to falls (H1)</td>
<td>33</td>
<td>52</td>
</tr>
<tr>
<td>Duplicate drug classes (J)</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>Loop diuretic as first-line monotherapy for hypertension (A3)</td>
<td>21</td>
<td>81</td>
</tr>
<tr>
<td>Calcium channel blockers with chronic constipation (A8)</td>
<td>19</td>
<td>79</td>
</tr>
<tr>
<td>Aspirin at dose &gt;150 mg per day (A12)</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>Long-term (i.e. &gt;1 month) loop diuretic as first-line monotherapy for hypertension (STOPP A3)</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>Calcium channel blockers with chronic constipation (A8)</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Neuroleptic drugs (H2)</td>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td>Aspirin with no history of coronary, cerebral or peripheral arterial symptoms (A13)</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>Long-term (i.e. &gt;1 month) neuroleptics as long-term hypnotics (B8)</td>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 3. Compliance with the most prevalent STOPP–START criteria

<table>
<thead>
<tr>
<th>START</th>
<th>$n$</th>
<th>Compliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium and vitamin D supplement in patients with known osteoporosis (E3)</td>
<td>88</td>
<td>38</td>
</tr>
<tr>
<td>ACE inhibitor with chronic heart failure (A6)</td>
<td>57</td>
<td>44</td>
</tr>
<tr>
<td>Statin therapy in diabetes mellitus if there are coexisting major cardiovascular risk factors present (F4)</td>
<td>49</td>
<td>14</td>
</tr>
<tr>
<td>Antiplatelet therapy in diabetes mellitus with coexisting major cardiovascular risk factors (F3)</td>
<td>39</td>
<td>23</td>
</tr>
<tr>
<td>Metformin with type 2 diabetes ± metabolic syndrome (F1)</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>ACE inhibitor following acute myocardial infarction (A7)</td>
<td>21</td>
<td>52</td>
</tr>
<tr>
<td>Warfarin in the presence of chronic atrial fibrillation (A1)</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Aspirin/clopidogrel with a history of atherosclerotic vascular disease in patients with sinus rhythm (A3)</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>ACE inhibitor or angiotensin receptor blocker in diabetes with nephropathy (F2)</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Antihypertensive therapy where systolic blood pressure is consistently &gt;160 mmHg (A4)</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Statin therapy with vascular disease and life expectancy &gt;5 years (A5)</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Regular inhaled corticosteroid for moderate/severe asthma or COPD (B2)</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Regular inhaled 2-agonist or anticholinergic agent for mild-to-moderate asthma or COPD (B1)</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Fibre supplement for chronic, symptomatic diverticular disease with constipation (D2)</td>
<td>6</td>
<td>67</td>
</tr>
</tbody>
</table>
Our prevalence results are consistent with previous studies of inappropriate prescribing using STOPP and START criteria that report prevalence rates of 35–77% for PIPs [19] and 58–65% for POs [24, 25]. The most frequently encountered STOPP criteria at hospital admission were the use of benzodiazepines in those at risk of recurrent falls (STOPP H1) and duplicate drug-class prescriptions (STOPP J). These results are consistent with previous studies [19].

Some contextual aspects may influence prescription. For instance, benzodiazepine use is higher in Spain than in most European countries [33]. Lorazepam was the most frequent drug used in our patients that was not discontinued. However, its use was mostly limited to specific clinical conditions, mainly to treat insomnia for short periods of time at low doses (0.5 mg/day).

The second drug that was usually not discontinued in those at risk of recurrent falls was risperidone. It was maintained at the lowest effective dose in patients to treat behavioural and psychological symptoms of dementia. A previous meta-analysis has shown a small but significant benefit with aripiprazole, olanzapine and risperidone in treating this syndrome [34]. Risperidone is approved for this indication in most European countries. For most other drugs, recommendations based on STOPP criteria were followed by the medical team, with a low rate of non-compliance.

The most frequent POs at admission included calcium/vitamin D supplementation in patients with osteoporosis (START A6), ACE inhibitors with chronic heart failure (START A6) and statin therapy with diabetes mellitus and coexisting cardiovascular risk factor (START F4). These results are similar to previous studies [19]. Two hundred and sixty-four POs remained at discharge.

In some instances, not starting a potentially useful drug detected by the START criteria may be caused by the publication of new evidence after the explicit criteria were released. For instance, a recent meta-analysis has suggested a lack of benefit of calcium supplements in preventing fractures in community-dwelling individuals [35]. These results as well as their possible side effects such as cardiovascular events [36], kidney stones [37], constipation and gastrointestinal distress had led some authors to recommend against their use [38]. An open debate on the benefits of vitamin D exists [39]. This may lead many physicians not to start supplements of calcium/vitamin D, even if the reason is not specifically stated in the records.

Compliance with recommendations based on START criteria was highly variable and overall low (Table 2, from 14 to 67% for different recommendations). Reasons for this variability are unclear. In some cases (i.e., statin therapy, F4), the reason may be low or conflicting evidence in old, complex patients [40, 41] or considering that preventive drugs do not have a role in such a population. This may also explain underuse of antithrombotic agents or anticoagulants. In other cases, perceived risks (metformin, warfarin and ACE inhibitors) of a general thrive to avoid extreme polypharmacy may be present. However, in most instances, the reason seems to be that the population treated in an acute care geriatric unit

### Table 3. Reasons for not following STOPP–START recommendations

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Followed recommendation</th>
<th>Cause</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOPP (317)</td>
<td>Died in hospital</td>
<td>Therapeutic prioritisation</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe mental or physical</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disability</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palliative care</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total No</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Total Yes</td>
<td></td>
<td>247</td>
</tr>
<tr>
<td>START (441)</td>
<td>Died in hospital</td>
<td>Severe mental or physical</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disability</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other treatment used for the</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High risk of adverse events</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contraindicated drug or allergy</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palliative care</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conflicting drugs</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unjustified cause</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Therapeutic prioritisation</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient refusal/no compliance</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Total No</td>
<td></td>
<td>264</td>
</tr>
<tr>
<td></td>
<td>Total Yes</td>
<td></td>
<td>133</td>
</tr>
<tr>
<td>Total (general)</td>
<td></td>
<td></td>
<td>758</td>
</tr>
</tbody>
</table>

(66.5%). The most frequent reasons identified for not following recommendations to start drugs were advanced physical disability (n = 90), use of other effective treatment (n = 38) and high risk of severe adverse effects (n = 32) (Table 3). The rates of compliance with START criteria were highly variable for different criteria (Table 2).

Neither physical nor mental disabilities were associated with the degree of compliance of STOPP recommendations. Not following START criteria was significantly associated with being dependent for basic ADLs (OR: 0.66 for compliance with the recommendation; 0.49–0.89), dependent for instrumental ADLs (OR: 0.64; 0.48–0.85) or unable to walk (OR: 0.72; 0.54–0.98).

### Discussion

Explicit instruments to detect PIPs are widely used and recommended by scientific societies [13, 32]. Physicians usually decide to stop or start drugs that are potentially inappropriate medication (PIM) or PPO considering all circumstances in individual patients, including patient preferences. However, we have found no studies that address the reasons for not following STOPP/START criteria.

In this study, performed in geriatric inpatients, we have shown that explicit recommendations to discontinue PIPs are usually followed at discharge. However, two-thirds of the recommendations to start potentially appropriate treatments are not followed in this population due to different clinical reasons.
includes many patients with severe disability, in which a more conservative end-of-life approach may be chosen by patients and caregivers.

More research is needed to understand whether this reflects a problem in the concept of using explicit criteria in complex populations, or a practice that may be improved with education or other intervention. The impact of non-compliance with recommendations on clinical outcomes is unknown.

**Limitations**

This study has some limitations. First, it was performed in older inpatients admitted to a specialised geriatric unit; therefore, results cannot be generalised to the entire older population in other settings. It was conducted in a single centre, and analysed decisions made by a multidisciplinary geriatric team specialised in the use of drugs in older people; so findings may be different for teams with lower expertise in this topic. Similar studies in different settings are needed to assess the differences in prescribing practices. Finally, we found no consensus lists of reasons for non-compliance of recommendations from explicit criteria. Many expected reasons (i.e. cost, therapeutic inertia and psychological reactance) were not found in our sample or may not have been properly documented in records, a limitation due to the retrospective nature of our study. Prospective studies are needed to better define and understand such reasons.

**Conclusions**

To the best of our knowledge, this is the first clinical study to look at the most frequent reasons for not following STOPP/START criteria in usual clinical practice. Potentially inappropriate drugs are usually discontinued, but many patients do not receive potentially recommended medications. More research on the reasons and consequences of this fact is needed.

**Key points**

- This is the first clinical study to look at the most frequent reasons for not following STOPP/START criteria.
- PIPs are usually discontinued.
- Two-thirds of the patients do not receive potentially recommended medications due to clinical reasons such as disability.

**Acknowledgements**

All of the authors listed have had a significant role in the project, its execution and analysis, and the writing of the paper. This included the conception and design, analysis, and interpretation of data.

**Conflicts of interest**

None declared.

**Supplementary data**

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

**References**

Following the journal publication rules, only the 30 references are listed here, marked in bold type. The full list of references is given in Supplementary data, Appendix S2, available in *Age and Ageing* online.


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