Explicit, evidence-based criteria to assess the quality of prescribing to elderly nursing home residents

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Abstract

Background: prescribing in nursing homes is frequently suboptimal. Indicators to measure prescribing quality, including appropriateness of prescribing certain drugs or combinations of drugs, to hospital inpatients have been developed previously.

Objective: to modify prescribing indicators, including appropriateness of prescribing algorithms developed in the hospital setting, for use in nursing homes.

Design: an audit of prescribing to patients resident in a random sample of nursing homes on a single day.

Setting, subjects: 22 nursing homes in the former South Thames Region selected from lists of nursing homes with more than 35 residents. All residents aged 65 years or over were eligible.

Methods: prescribing indicators, including evidence-based indicators of appropriateness of prescribing benzodiazepines, steroids with β2 agonists, antithrombotics with digoxin and aspirin with nitrates were adapted: to reflect where prophylaxis was not justified in terms of quality of life; and for use with primary care clinical records. Indicators were used to evaluate drugs prescribed to each resident to determine whether prescribing was appropriate.

Results: 13 indicators were successfully modified and applied. The 934 residents included were prescribed a mean of 5.1 regular items. Only 496/934 (55%) drug sensitivity statements were completed. Although 24% residents received benzodiazepines, clinical data indicated that only 7% received benzodiazepines appropriately. Over three-quarters of residents with ischaemic heart disease received appropriate aspirin therapy, but fewer than half residents with atrial fibrillation received appropriate antithrombotic therapy. It was not possible to derive reference ranges of observed prescribing that included homes demonstrating appropriate prescribing whilst excluding those with inappropriate prescribing. Intra-cluster correlations ranged from 0.027 to 0.335.

Conclusion: quality of prescribing indicators were successfully modified for the nursing home setting. Application identified suboptimal prescribing to nursing home residents.

Keywords: nursing home, drug therapy, health care quality, hypnotic agent, heart atrium fibrillation

Introduction

The UK elderly population is increasing rapidly, particularly the population aged 85 years and over [1]. Five percent of people aged 75–84 live in a long-stay care setting, increasing to 22% in those over 84 years [2]. Elderly people receive three times more drugs than young people [3]. The risks associated with medication are also higher in older people and frail institutionalised elderly patients may be at the greatest risk of drug-induced morbidity and mortality [4, 5]. North American data indicate 40% of nursing home residents receive inappropriate prescriptions and 10% receive two or more inappropriate prescriptions [6]. However, these studies used consensus rather than evidence-based criteria and included drugs now rarely prescribed in the UK. Little is known about the appropriateness of prescribing in UK nursing homes, as the few UK surveys have included non-evidenced-based criteria or implicit criteria, which may be subjective or difficult to
apply [7–9]. Others have focused on cost minimisation, but optimal prescribing for elderly people may actually increase prescribing costs [10, 11].

We have previously described evidence-based measures of prescribing quality, including appropriateness of prescribing certain drugs or drugs combinations, for elderly hospital inpatients [12, 13]. These indicators start at the drug chart and use index drugs to identify patients with specific diseases. Clinical data are therefore only collected where necessary to assess prescribing appropriateness against algorithms. Indicators are objective, repeatable and use readily obtainable clinical data; thus they are simple to apply.

**Aim**

The aim of this work was to modify prescribing indicators and algorithms developed in the hospital setting for use in elderly nursing home residents, and to apply the modified indicators in the nursing home setting.

**Methods**

Prescribing indicators were of three types: i) purely descriptive, with no attempt to define optimal values; ii) assessing unnecessary or potentially harmful prescribing; and iii) assessing appropriateness of prescribing specific drugs or combinations based on published data [12, 13]. Cost of prescribing was not considered.

**Pilot study**

Prescribing indicators were piloted in five nursing homes. Modifications to accommodate differences in nursing home documentation were: i) collection of drug sensitivity data from the relevant section of residents’ nursing notes (not all medication administration records in use contained an allergy section); ii) screening both nursing and medical records for clinical data; iii) comments indicative of reversibility of airways obstruction were sufficient evidence on which to base steroid prescribing (spirometry results were seldom recorded in GP-held notes). Minor modifications to indicators were: i) amiodarone was added as an index drug for atrial fibrillation; ii) any nitrates were used as index drugs for cardiac ischaemia (documentation of glyceryl trinitrate (GTN) prescriptions was unreliable); iii) additional criteria were included in indicators assessing under-prescribing of antithrombotics, to reflect where prophylaxis was not justified in terms of quality of life. In recognition that this decision may be incompletely documented, if prescribing appropriateness was still unclear after notes scrutiny, the GP was asked whether the resident was for active intervention.

**Recruitment of nursing homes**

All nursing homes in the former South Thames Region with 35 beds or more were eligible for inclusion. To help ensure coverage of the full range of homes in the Region, one home from each of the 12 Health Authorities was selected at random. To increase the amount of data collected this sample was augmented with a random sample of 17 homes from a pooled list covering all Health Authorities.

Nursing home managers were approached by telephone then sent a standard letter describing the study. Attending general practices were approached in a similar manner.

**Data collection**

Data were collected from each home on a single day by a research pharmacist and/or a specialist registrar in geriatric and general internal medicine. Residents aged 65 years or over were eligible. All current prescriptions were recorded from medication administration records, with the exception of dressings available without prescription.

Allergy statement completion and clinical data to assess prescribing appropriateness were collected from homes’ nursing notes and from GPs’ medical notes. All sections were screened including notes on admission, medical history, correspondence, laboratory results, nursing care plans and daily care notes. Computerised medical records used in three surgeries were also scrutinised. Appropriateness was assessed by comparing clinical data to algorithms of appropriate prescribing (Figures 1–4).

**Generic or appropriate brand prescribing and black triangle drugs**

A consensus list of medicines for which proprietary prescribing was acceptable was derived [14, 15] and included compound products with no approved name and formulations with significant bioavailability differences. Appropriate proprietary prescribing was reported together with generic prescribing. Black triangle drugs were drugs under intensive surveillance by the UK Committee for Safety of Medicines (CSM) at the time of the study.

**Intra-cluster correlations**

Intra-cluster correlations summarise the degree to which the outcomes of two patients from the same unit or centre are correlated with each other and are a consideration when planning trials where subjects are randomised in clusters. They were calculated for all prescribing indicators, using nursing homes as clusters, except where observed prescribing was too infrequent for an indicator to be a useful outcome measure.
Figure 1. Algorithm of appropriate benzodiazepine prescribing.

Acceptable indications for benzodiazepine
(the regimen must be appropriate for indication)
- Fits
- Alcohol withdrawal
- Muscle relaxant
- Documented evidence that withdrawal has been considered but decided against

Benzodiazepine contraindications
- Falls
- CNS depression

Figure 2. Algorithm of appropriate aspirin prescribing in ischaemic heart disease.

Patient prescribed a benzodiazepine
Acceptable indication for benzodiazepine?
○ No
- Prescription initiated prior to nursing home admission?
  - No
  - Contraindication to benzodiazepine?
    - Yes
      - Dose reduction/withdrawal attempted?
        - No
          - Inappropriate prescribing
        - Yes
          - Appropriate prescribing
    - Yes
      - Inappropriate prescribing
  - Yes
    - Inappropriate prescribing

Figure 3. Algorithm of appropriateness of prescribing antithrombotics to patients with atrial fibrillation.

Contra indications to warfarin and aspirin
- Previous / potential GI bleed*
- Previous intracranial haemorrhage*
- Repeated fits/falls/head injury
- Chronic alcoholism
- Haemorrhage with anticoagulant
- Clotting disorder*
- On heparin (any type)*
  - *applies to aspirin

Figure 4. Algorithm of appropriate steroid prescribing in stable airways obstruction.

Contra indications to aspirin
- Previous GI* GIU/metropontoneal bleed
- Previous intracranial haemorrhage
- Haemorrhage with previous aspirin
- Aspirin allergy (including NSAID-induced asthma)
- Clotting disorder
- Death of patient imminent
- Gout

*If prescribed ulcer-healing drugs, both use and non-use of aspirin was deemed appropriate as it is a clinical decision

Criteria for diagnosis of reversible airways obstruction
- Acute exacerbation?
  - Yes
    - Exclude
  - No
    - Criteria for diagnosis of reversibility
      - History of recurrent episodes of wheezy chest, shortness of breath or cough, objectively responding to steroids
      - PEFR chart showing 15% or more improvement in pre and post dose PEFR
      - Spirometry report showing improvement in FEVI of 15% with or without treatment, or comments to this effect in notes (if report not seen)
      - Past history or family history of atopy

Criteria for diagnosis of reversibility
- Other indication for steroid use?
  - Yes
    - Currently on steroid
      - Responsiveness trial, with PEFR or spirometry monitoring?
        - Yes
          - Inappropriate prescribing
        - No
          - Appropriate prescribing
  - No
    - Prescribed steroid?
      - Yes
        - Prescribed steroid?
          - Yes
            - Inappropriate prescribing
          - No
            - Appropriate prescribing
      - No
        - Other indication for steroid use?
          - Yes
            - Inappropriate prescribing
          - No
            - Appropriate prescribing
Results

Nursing homes and their associated GPs

Of the 29 homes approached, seven homes or their attending general practitioners declined to participate. Five (71%) refusing homes were in suburban areas and two a rural location. Capacity of non-recruited homes was not different from recruited homes (48 vs 46 beds Mann-Whitney, \( p = 0.44 \), NS).

Recruited homes varied from 40–120 beds. Two-thirds (15/22) were suburban, five (23%) rural and two (9%) in inner city areas. Thirteen (59%) were part of corporate groups comprising over two homes, two (9%) were run by charities and seven (32%) were privately owned. Sixteen (73%) were attended by a group general practice.

Resident demographics

A total of 934 residents aged 65 years or over were seen, median 41 elderly residents (range between homes 27–87). Residents’ median age was 85.9 years (82.8–89.5). Residents had lived in the nursing home for a median of 1.2 years (0.3–4.4). The majority (712/934, 76%) of residents were female (59–90%). Altogether, 4,743 items were prescribed.

Prescribing indicators suitable for use in the nursing home setting

Thirteen prescribing indicators were found to be applicable in the nursing home setting. Intra-class correlation coefficients ranged from 0.031–0.198 (Tables 1 and 2).

Table 1. Descriptive prescribing indicators and indicators assessing unnecessary or potentially harmful prescribing (Group a. and b. indicators)

<table>
<thead>
<tr>
<th></th>
<th>Mean observed prescribing (Range of means)</th>
<th>Intra-cluster correlation coefficient</th>
<th>Optimal prescribing</th>
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</thead>
<tbody>
<tr>
<td>Group a) Descriptive prescribing indicators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean number of regular items prescribed per resident</td>
<td>4.1 (2.8–5.3)</td>
<td>0.036</td>
<td>–</td>
</tr>
<tr>
<td>Percent of residents prescribed black triangle drugs</td>
<td>4% (0%–21%)</td>
<td>0.051</td>
<td>–</td>
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<tr>
<td>Group b) Indicators assessing unnecessary or potentially harmful prescribing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of generic drug name*</td>
<td>90% (74–99%)</td>
<td>0.031</td>
<td>100%</td>
</tr>
<tr>
<td>Documentation of drug sensitivity status in relevant section of notes</td>
<td>55% (0–100%)</td>
<td>0.335</td>
<td>100%</td>
</tr>
<tr>
<td>Documentation of maximum frequency of administration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residents prescribed long acting sulphonylurera (( n = 40 ))</td>
<td>65% (0–93%)</td>
<td>0.153</td>
<td>100%</td>
</tr>
<tr>
<td>Residents prescribed paracetamol allowing doses &gt; 4g/24 hoursb (( n = 399 ))</td>
<td>15% (0–50%)</td>
<td>0.198</td>
<td>0%</td>
</tr>
<tr>
<td>Residents prescribed ulcer-healing drug duplicationd</td>
<td>19% (0–74%)</td>
<td>0.145</td>
<td>0%</td>
</tr>
<tr>
<td>Inhaled short acting ( \beta_2 ) agonist duplication (excluding regular with prn)d</td>
<td>2% (0–25%)</td>
<td>NC</td>
<td>0%</td>
</tr>
</tbody>
</table>

|                              |                                            |                                      |                     |

*Or appropriate use of brand name (e.g. modified release formulations, compound products).

bResult reported as a proportion of all residents prescribed sulphonylurea.

_result reported as a proportion of all residents prescribed paracetamol preparations.

dResult reported as a proportion of all residents prescribed an ulcer-healing drug.

NC - not calculated, insufficient data.

Nursing home prescribing indicators

Group a): Purely descriptive indicator results

Only 14 (1.5%) residents received no medication. The mean number of prescriptions per resident was 5.1, of which 4.1 were for regular use (Table 1). Black triangle drugs were rarely prescribed.

Group b): Unnecessary or potentially harmful prescribing

Prescription documentation. Most prescriptions (4,247/4,743, 90%) were written using generic or acceptable brand names. Only 55% of drug sensitivity statements contained comment(s) on allergies (Table 1). In five (23%) homes, fewer than 25% of drug sensitivity sections were complete and only one home achieved 100% completion. Of 750 prescriptions for prescription drugs, 551 (73%) had a maximum frequency of administration documented (Table 1), but 13/51 (25%) neuroleptic prescriptions had no maximum frequency.

Duplication. One-fifth (75/397) of residents prescribed paracetamol had an unsafe prescription (Table 1). One of 57 residents prescribed short-acting \( \beta_2 \) agonists received duplicate prescriptions (prescription salbutamol ordered twice). Three of 176 (2%) residents on ulcer-healing drugs received a therapeutic duplicate. Duplication of inhaled antimuscarinics was not seen.

Forty residents were prescribed sulphonylureas, of whom six (15%) received glibenclamide. Chlorpropamide was not prescribed.

Group c): Appropriateness of prescribing specific drugs/combinations

Appropriate benzodiazepine prescribing. A total of 250 benzodiazepines were prescribed to 226 (226/934,
24% residents. Temazepam accounted for 90 (36%) and diazepam 61 (24%) prescriptions. Three quarters (189/250, 76%) were to be given every day. Observed benzodiazepine prescribing varied widely (Table 2).

Clinical data were obtained for 223/226 (99%) residents on benzodiazepines. Only 17 (17/223, 8%) attempts at withdrawal or dose reduction were noted, yet 168 (75%) residents receiving benzodiazepines had contraindications documented: 126 (56%) had a history of falls and 129 (58%) CNS depression. Ninety-one (41%) residents had no documented history of benzodiazepine use prior to admission, suggesting initiation in the nursing home. An even higher proportion (77/91, 85%) of new benzodiazepine users had contraindications documented than established users (91/123, 69%, chi-square *p*=0.007).

Overall, 154/934 (16%) residents were inappropriately prescribed benzodiazepines and only 67/934 (7%) residents appropriately received these drugs (Table 2).

**Appropriate aspirin prescription in cardiac ischaemia.** The medical notes of 54/58 (93%) residents receiving nitrates were seen. Cardiac ischaemia was confirmed in 52 individuals. No aspirin contraindications were documented for 36/52 (69%) residents. Aspirin was prescribed to 27 (27/52, 52%) of these (Table 2) and was inappropriately omitted in nine (17%). Contraindications to antiplatelet drugs were documented for 16 (31%) residents. Worryingly, two (4%) of these were receiving aspirin yet had current, active bleeding documented. In all, 41/52 (79%) residents on nitrates for cardiac ischaemia received appropriate antithrombotic therapy (Table 2).

**Appropriate steroid prescription in airways obstruction.** The clinical notes of all 57 residents prescribed β2 agonists were reviewed. Steroids were indicated in 8/57 (14%), and all these individuals received steroids. A further 16 (16/57, 28%) residents were prescribed inhaled or systemic steroids, or both, inappropriately (Table 2).

Of the 33/57 (58%) residents not prescribed steroids, 25 (44%) were felt to be appropriately not on steroids but steroids had been inappropriately omitted in seven (7/57, 12%) with reversible obstruction. In total, 33/57 (58%) residents received appropriate steroid prescriptions (Table 2). Insufficient data were available to assess prescribing for three residents (two on steroids, one not).

**Appropriate anticoagulant/aspirin 300 mg prescription in atrial fibrillation.** The clinical notes of 106/114 (93%) residents receiving digoxin or amiodarone were available for scrutiny. Atrial fibrillation (AF) was confirmed in 99/106 (93%). Antithrombotics were indicated in 74/99 (75%) residents, but only 16/99 (16%) received antithrombotics (ten warfarin, six aspirin 300 mg). Aspirin in doses of unproven benefit in AF (<300 mg) were prescribed to 32 (32/99, 32%) residents who should have received an effective antithrombotic. Contraindications to both warfarin and aspirin were documented for the remaining 25/99 (25%) residents; thus they were felt to be appropriately managed. In total, only 41/99 (41%) residents with atrial fibrillation received appropriate stroke prophylaxis.

**Interrater agreement**

Independent extraction of data from clinical notes and rating of prescribing appropriateness by the research pharmacist and specialist registrar resulted in agreement in 34/37 (92%) sets of records examined by both individuals (Kappa=0.68, good agreement) [16].

**Discussion**

Evidence based prescribing encompasses prescription of drugs (and other) treatments to patients with proven indications for those treatments and avoidance of treatments with no proven benefit or with a contraindication. This survey included indicators of evidence-based prescribing and is the first quality of prescribing survey in a randomly selected sample of UK nursing homes. The former South Thames Region encompasses a range of deprived and more affluent areas. Nursing homes in inner city, suburban and rural locations, attended by single-handed and group medical practices were included, and demographic data collected denoted a wide casemix range, indicating results are likely to be generalisable.

These indicators use ‘index’ drugs on individuals’ medication administration records to identify patients
likely to have specific diseases, avoiding the need to screen the clinical notes of every resident. Indicators use explicit criteria and data for these were obtained easily, making assessment quick and simple. Although all the indicators reported here were applicable in nursing homes, some identified low rates of inappropriate prescribing (e.g. the therapeutic duplication indicators) and may not be useful in enhancing prescribing quality.

It was not possible to derive a reference range of observed prescribing for each indicator that included homes with appropriate prescribing, whilst excluding units with inappropriate prescribing. This was due in part to wide casemix variation between units and small unit size and indicates that clinical data are required whenever the appropriateness of prescribing is assessed.

Prescribing was very variable between homes. Specific deficiencies in prescribing quality included inadequate prescription documentation and inappropriate benzodiazepine use. Systems deficiencies were also seen: some medication administration records in use did not have a drug sensitivities section, which hampers checking allergies at the point of prescribing.

A common criticism of notes-based prescribing audit is that the clinical notes may not contain adequate information. Although this may be argued for the current study, clinical information such as previous GI bleed or falls are likely to be documented in the notes. Further, the medical record is a legal document which exists for the purpose of documenting symptoms and diagnoses, and is often all the information prescribers have available.

Cluster-randomised trials are becoming increasingly prevalent, particularly where it is difficult to apply an intervention at the level of the individual subject. Intraclass correlations are helpful for planning these sorts of studies. However, it is rare for estimates to appear in the published literature [17].

Some nursing homes or GPs who declined to participate quoted concerns about resident confidentiality or time constraints, but overt resistance to audit was also identified. With increasing emphasis on evidence-based practice and implementation of Clinical Governance, objective audit tools such as these will be of use in comparing prescribing between units and to enhance prescribing quality.

**Key points**

- Elderly nursing home residents frequently receive multiple medications for multiple indications.
- Objective, evidence-based and simple to use prescribing appropriateness criteria have been developed to evaluate the quality of prescribing.
- When assessing benzodiazepine prescribing, steroids in airways disease, antithrombotics in atrial fibrillation and aspirin in cardiac ischaemia, prescribing data should be evaluated in the light of clinical data.
- Prescribing in a random sample of 22 homes was frequently suboptimal, including poor documentation, under and over prescribing.

**References**

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