Using prescribing indicators to measure the quality of prescribing to elderly medical in-patients*

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Abstract

Objectives: to evaluate the performance of hospitals using eight indicators designed to assess prescribing practice in medical in-patients aged ≥65 years.

Design: local coalition teams were invited to collect cross-sectional prescribing and clinical data on 100 consecutive medical in-patients aged ≥65 years during a specific week in April 1999.


Participants: all NHS Trust hospitals in Wales and England were invited to participate in the study.

Main outcome measures: the performance and inter-hospital variation of hospitals in eight indicators of prescribing. Also, the age-related appropriate use of anti-thrombotic stroke prophylaxis in atrial fibrillation, of aspirin in angina and of benzodiazepines.

Results: data were collected on 9,979 patients prescribed 70,458 medications. The number of hospitals achieving the prescribing goal for the indicators varied between 0 and 70. Frequency of administration instructions with ‘as required’ prescriptions were documented on 60% (10,403/17,258) of occasions. Generic (or acceptable proprietary) names were used for 84% (58,953/70,458) medications, 50% (4,870/9,778) of patients had documentation of allergy status on the drug chart and 23% (1,380/6,060) of patients had the potential risk of exceeding the maximum recommended dosage (4 g/24 h) of paracetamol. Long-acting hypoglycaemic drugs were prescribed to 50 patients. Anti-thrombotic stroke prophylaxis in atrial fibrillation were used appropriately for 53% (805/1,518) of patients, aspirin was used appropriately in angina for 90% (952/1,052) of patients and benzodiazepines were used appropriately for 49% (824/1,689) of patients. For the latter three indicators, the appropriate use of medications declined from 60% to 44%, 95% to 85% and 53% to 44% in patients aged ≥85 years compared with those aged 65–74 years.

Conclusions: prescribing indicators were effective in evaluating the performance of 102 hospitals on prescribing practice to medical in-patients aged ≥65 years. Prescribing to elderly medical in-patients is sub-optimal but targets were achieved by some hospitals. This should inspire those hospitals not achieving high standards to improve their performance. The higher level of inappropriate prescribing with increasing age is unacceptable.

Keywords: prescribing, indicators, governance

Introduction

Forty five per cent of NHS prescribing is for people of pensionable age [1] and prescribing for older people is complex [2]. The multiple morbidity associated with old age necessitates appropriate use of medications, and the recognition that primary and secondary prevention therapies can benefit older, as much as younger people has added to the need for multiple medication [3, 4]. However the hazards of prescribing many drugs, including side effects, drug interactions and difficulties of compliance have long been recognised as particular problems when prescribing for older people [5].
The Royal College of Physicians report in 1997 ‘Medication for Older People’ [6] indicated that excessive prescribing in older people was widespread and recommended careful consideration as to whether drug treatment was appropriate, to avoid over-prescribing. More recently, the need for appropriate and rational prescribing for elderly patients has been prioritised in The National Service Framework (NSF) for Older People [7]. The NSF acknowledged the problems of poly-pharmacy but highlighted that medicines are also under-used in older people. It has identified the need for linking prescribing data with clinical data and advocates the use of prescribing indicators including several developed for use in this study.

The problems of prescribing for older people have been specifically addressed by the National Sentinel Audit of Evidence Based Prescribing in Older People (EBPOP) [8]. Initiated in 1998, the audit set out to support improvements in prescribing and medication use in people aged 65 years and over. The audit assesses the quality of prescribing using indicators utilising data from patients’ drug charts and, in selected cases, data obtained from patients’ medical records. These indicators include measures of both descriptive and the appropriateness of prescribing. They can identify good or bad prescribing practice, and inappropriate over-prescribing or under-prescribing. This paper reports on the performance of 102 hospitals that evaluated the indicators.

Methods

The indicators

Two classes of indicators were evaluated. The development of the indicators has been published elsewhere [9–11].

Category a – descriptive prescribing indicators

Indicators with a defined optimal level of prescribing reflecting areas where maximal (100%) or minimal (0%) occurrence represents optimal prescribing were measured. These indicators are listed below and optimal prescribing is shown in brackets.

- The documentation of frequency of administration instructions with ‘as required’ (PRN) prescriptions (100%).
- The use of generic prescribing (or acceptable proprietary name*) (100%).
- The documentation of allergy status on the drug chart** (100%).
- The potential risk of exceeding maximum recommended dosage (4 g/24 h) of paracetamol (0%).
- The use of long-acting oral hypoglycaemic drugs (0%).

- *Proprietary names were acceptable where bio-availability varied between the different preparations, for fixed combinations, vitamins, dermatology products, compound antacids and bowel cleansing/clearing preparations.
- **Data collectors made an explicit decision regarding completion of the patients’ allergy/sensitivity section on the drug chart and accepted any of the following: a slash (or other such sign), an entry of NS or not specified, NKA or not known yet, NK or nil known etc. When the section had no documentation recorded, this was entered as incomplete.

Category b – appropriateness of prescribing indicators

Indicators requiring assessment of the optimal level of prescribing i.e. the appropriateness of prescribing were measured on an individual patient basis. Assessment of these indicators occurred when a patient was identified from the drug chart to have angina (prescription of a nitrate) or was prescribed a benzodiazepine. The prescription of digoxin was used as a guide to identify patients in atrial fibrillation (AF), which required confirmation from the clinical notes. Appropriateness was defined on a risk-benefit model of care [12], where the expected health benefit exceeds the negative consequences by a sufficiently wide margin that it is worth providing. The development of these indicators was based on published literature [9–11, 13]. These indicators are listed below:

- The appropriate use of anti-thrombotic (warfarin or 300 mg aspirin) stroke prophylaxis in AF.
- The appropriate use of aspirin (≥75 mg) in angina.
- The appropriate use of benzodiazepines.

Recruitment

The study was co-ordinated and managed by the Clinical Effectiveness and Evaluation Unit (CEEU) of the Royal College of Physicians of London supervised by a multidisciplinary steering group as one of a series of 10 National Sentinel Audits funded by the Department of Health. Invitations to Chief Executives of all hospital Trusts resulted in National Coverage of 102 hospitals.

Data collection

The methodology of the study has been published in full elsewhere [8] and includes information on the training of data collectors and the reliability and validity of the data. Local teams were formed within hospital Trusts. The project management were not prescriptive regarding the formation of these teams but encouraged the inclusion of pharmacists, physicians, nurses and audit personnel. Hospitals were asked to collect data from the drug charts and clinical notes of 100 consecutive in-patients aged...
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≥65 years under the care of general physicians and geriatricians during April 1999. The data were collected using a specifically designed Microsoft Access database. The prescription data, when entered into the software, provided prompts to the user to collect clinical data for relevant patients in response to specific questions, with definitions provided. The Yes/No answers to these questions were then used to derive appropriateness for the indicators of appropriateness (category b). Data capture occurred once for each patient and reflected currently available information. There was no tracking of patients from admission to discharge or outside of the admission. The accuracy of the clinical data was not investigated and was accepted as correct.

Data analysis

The software produced a local report of each hospital’s performance, which compared each hospital’s data against 20 pilot sites [9]. The local coalition teams also sent their data to the CEEU for statistical analysis and national benchmarking. A national report with locally identifiable information was returned to the hospitals. In addition, the age-related appropriate use of the category b indicators was also analysed. The patients were divided into three age groups: 65–74 years, 75–84 years and ≥85 years.

Statistical method

National results are expressed as mean (SD) or number (%) unless otherwise stated. Ninety-five per cent confidence intervals (CI) for indicator performance were computed. A chi-squared test for linear trend was used to test the association between age group (65–74 years, 75–84 years and 85 + years) and appropriateness of prescribing anti-thrombotics in atrial fibrillation, aspirin in angina, and of benzodiazepines.

Results were computed for each hospital and the median, inter-quartile and range are used to describe inter-hospital variation.

Ethical approval

The audit involved documentation of current drug regimens and the analysis of case notes. Patient contact did not occur and no patient identifiable information was required. The methodology of the study was presented to the Local Research Ethics Committee of Kings’ College Hospital who concluded that the study did not require research ethics approval.

Results

Demographic data

Data were collected from 102 hospitals, providing information on 9,979 patients prescribed a total of 70,458 medications (median 7 per patient). Medications were prescribed to 9,927 patients while 52 patients were not prescribed any medications. The mean age (SD) of the patients was 81(8) years and 40% were male. There was a wide range of performance between hospitals (Table 1).

Category a – descriptive prescribing indicators

Patients were prescribed 17,258 PRN medications. A frequency of administration instruction was documented on 10,403 (60%) occasions. There was a wide variance between hospitals, with three achieving the 100% target. Generic names were used for 58,953/70,458 (84%) medications and an acceptable proprietary name was used for 1,041/70,458 (1%) medications. Hence non-acceptable proprietary names were used for 10,464/70,458 (15%) medications.

The data collectors did not collect information on the completion of the allergy/sensitivity section on the drug chart for 201/9,979 (2%) patients. Where data were collected, the section was completed for 4,870/9,778 (50%) patients.

Medications containing paracetamol (6,560 prescriptions) were prescribed for 6,141/9,979 (62%) patients. Data collection on dosage was only completed for 6,060 patients prescribed 6,465 medications containing paracetamol. For 1,380/6,060 (23%) patients, the prescription was written such that it was possible to exceed the maximum recommended dose of 4 g in a 24-h period.

Long-acting hypoglycaemic drugs were prescribed to 50 patients in total. Glibenclamide was prescribed to 48 patients and chlorpropramide to 2 patients. The highest number of occurrence at any one hospital was 4 patients.

Category b – appropriateness of prescribing indicators

Anti-thrombotics were used appropriately for 805/1,518 (53%) patients in AF. Data were incomplete for another 17 patients. An anti-thrombotic was appropriately prescribed for 455 of these 805 patients and appropriately not prescribed due to the presence of contra-indications for the other 350 patients. Anti-thrombotics were not prescribed for 713 patients for whom a prescription would have been appropriate. The inter-hospital range for this indicator was from 0–100% with only one hospital achieving the target 100%. The appropriate use of anti-thrombotics declined with increasing age (Table 2). The chi-squared test for trend with age group was statistically significant ($\chi^2=24.6; df=1; P<0.001$).

Aspirin was used appropriately for 952/1,052 (90%) patients with angina. Data were incomplete for another 7 patients. It was appropriately prescribed for 639 of these patients and appropriately not prescribed due to the presence of contra-indications for the other 313 patients. The appropriate use of aspirin in angina
declined with increasing age (Table 2). The chi-squared test for trend with age group was statistically significant ($\chi^2 = 14.3; \text{df}=1; P<0.001$).

Benzodiazepines were prescribed for 1,840/9,979 (18%) patients; however the data collectors failed to collect clinical data for 151 patients. Hence the appropriateness of prescribing was assessed for 1,689 patients. Prescribing was appropriate for 824/1,689 (49%) patients and inappropriate for 865/1,689 (51%) of patients. Initiation of a benzodiazepine in hospital for an unacceptable indication accounted for 628/865 (73%) of inappropriate prescribing. This was a second indicator for which the inter-hospital range was maximal. The appropriate use of benzodiazepines declined with increasing age (Table 2). The chi-squared test for trend with age group was statistically significant ($\chi^2 = 5.8; \text{df}=1; P=0.02$).

**Discussion**

This study used prescribing performance indicators to evaluate the quality of prescribing for elderly medical in-patients. Through the formation of local teams, the study has enabled hospitals to evaluate local prescribing and provided data for national benchmarking. The formation of local teams facilitated communication, data collection and promoted local ownership of data. The local data collectors used bespoke software to collect data direct to disk, which was a unique feature of the study, and which facilitated central collation of data. However they still omitted to collect all the relevant data on some patients, which did not become apparent until the data were analysed centrally and at which time it was too laborious to go back to the original records.

The indicators have detected a number of significant deficiencies in prescribing, which included over and under-prescribing of medications. Previously developed indicators have failed to detect under-prescribing of clinically appropriate drugs [14–16]. Assessment of the appropriateness of prescribing using our indicators requires clinical data and by relating the indicator to the clinical background of the individual patient, it becomes relatively independent of the case-mix of the cohort, and records both errors of omission and commission.

Good prescribing requires that a drug prescribed ‘as required’ i.e. PRN should have the maximum frequency for administration recorded in order to avoid potential over-dosage and/or side effects. The failure to do so in over a third of PRN prescriptions must be of concern. If a patient were to be over-dosed with a PRN drug where the maximum frequency had not been documented, the prescriber and not the drug administrator would be likely to be held responsible.

The documentation on drug charts of patients’ allergy/sensitivity status was low and again there was wide inter-hospital variation. At certain hospitals,
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Diazepines were frequently inappropriately prescribed.

The overall application of the results in clinical practice [18]; however, the published data relating to these three indicators has been well known for some years and has received considerable attention in the medical press and communications. Doctors are responsible for completing this section on the drug chart in most hospitals; however appropriately trained nurses and pharmacists should be allowed to complete the section.

Paracetamol is very widely prescribed as an analgesic in older in-patients with nearly two thirds of all patients in our study being prescribed the drug, and a significant proportion of these patients had the potential to be administered a dose greater than the maximum recommended dose (4 g/24 h). This study provided no data on whether or not an over-dosage was administered to any patient nor whether adverse effects were experienced. However, the existence of the potential hazard is a marker of prescribing carelessness or ignorance. This degree of prescribing carelessness is clearly unacceptable, and should it occur when prescribing medications with a worse safety profile, the consequences could be more serious.

The use of generic prescribing was encouragingly high. Using generic names reduces confusion relating to drug names, costs and stock items [17]. However, our findings do not necessarily reflect that prescribers themselves used generic names. Pharmacists frequently change proprietary names to generic names, hence the high performance in this indicator reflects multi-professional involvement.

Quite appropriately, the use of long-acting oral hypoglycaemics was very low. However, our methodology did enable hospitals that were identified using the drugs to identify themselves.

The performance of hospitals on the appropriate use of anti-thrombotics in AF and benzodiazepines was poor, yet good on the appropriate use of aspirin in angina. These indicators are based on current published evidence and were discussed with many professionals before being incorporated into the study. It is acknowledged there is often a delay between publication and application of the results in clinical practice [18]; however, the published data relating to these three indicators has been well known for some years and has received considerable attention in the medical press and from pharmaceutical advisers. Despite this evidence base and widespread agreement with the evidence, the overall performance was disappointing. Anti-thrombotics were frequently inappropriately omitted. Conversely, benzodiazepines were frequently inappropriately prescribed.

Use of aspirin in angina was better but still with a wide inter-hospital variance.

The appropriate use of drugs reduced with increasing age for all three category b indicators (Table 2). The findings of a higher level of inappropriate prescribing in ‘older elderly’ in-patients suggests an element of ageism amongst prescribers. This is no longer acceptable as the NSF has prioritised rooting out age discrimination [7].

There was wide inter-hospital variation in most indicators and few hospitals achieved the target goal (Table 1). For category a indicators, it is difficult to imagine any reason why some hospitals achieved a much higher standard than others. For category b indicators, it is possible that some of the clinical data needed to justify that a prescription was appropriate was not documented in the patients’ clinical notes. Prescribing performance indicators that rely on clinical documentation will always be difficult to collect when clinical documentation is known to be poor [19]. However poor documentation is also an indicator of poor patient care [20]. It is a longstanding medico-legal principle that failure to document clinical care is interpreted as a failure of care. The clinical governance agenda and the recommendations for good clinical practice emanating from the General Medical Council support this [21].

Nevertheless it is important to state that these are indicators of performance derived from the prescription records and case notes. They are not absolute measures and poor performance should be an indication for investigation and not automatic castigation [22]. When a unit appears to have performed poorly, it ought to investigate whether the problem is of erroneous data collection, of poor organisation of the service or poor medical performance. Our data on reproducibility of the data collection tool suggests that erroneous data would not be the explanation [8].

Some hospitals have shown that the targets are achievable. Since indicators are not exact measures, there will be some variation for good reasons reflecting the difficulty of any guideline being relevant to all cases. At present we do not know what variation is appropriate to be accepted as representing high quality care. However the wide variations from evidence based practice in many hospitals cannot be considered acceptable today, and should be a justification for investigation and for action. If these data are to be used for national benchmarking, those hospitals achieving a low standard should be encouraged to achieve at least the standards of the better

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Table 2. The age related appropriate use of anti-thrombotics in AF, aspirin in angina, and benzodiazepines

<table>
<thead>
<tr>
<th>Age group</th>
<th>Appropriate use of anti-thrombotics in AF</th>
<th>Appropriate use of aspirin in angina</th>
<th>Appropriate use of benzodiazepines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (%)</td>
<td>Yes (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>65–74</td>
<td>107 (40%)</td>
<td>161 (60%)</td>
<td>16 (5%)</td>
</tr>
<tr>
<td>75–84</td>
<td>311 (43%)</td>
<td>415 (57%)</td>
<td>44 (9%)</td>
</tr>
<tr>
<td>≥ 85</td>
<td>295 (56%)</td>
<td>229 (44%)</td>
<td>40 (15%)</td>
</tr>
<tr>
<td>Total</td>
<td>713 (47%)</td>
<td>805 (53%)</td>
<td>100 (10%)</td>
</tr>
</tbody>
</table>
performing hospitals. This will also support governance by shifting the level of quality provided by the majority of health organisations closer to the performance of the exemplar services in the NHS [23].

This study has demonstrated sub-optimal prescribing for elderly patients and highlighted target areas for improving the quality of prescribing practice. It is no longer acceptable solely to report sub-optimal prescribing practice. The utilisation of these indicators will facilitate audit of prescribing and medication review as recommended in the National Service Framework on Medicines and Older People [7]. Of particular importance is the need to identify methods of improving prescribing quality. In future, additional indicators assessing the appropriateness of prescribing could be developed to cover a greater range of prescribing. These could relate to the National Service Framework on Coronary Heart Disease [24] and Mental Health [25], and standards for prescribing common to primary and secondary care.

Key points

- This study describes a mechanism for measurement of the quality of prescribing.
- There is marked inadequacy and great variation in quality of prescribing for those areas of prescribing assessed by the indicators.
- High standards of quality of prescribing are achievable.
- The appropriateness of prescribing decreases with increasing age.

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