Prevalence of potentially inappropriate long term prescribing in general practice in the United Kingdom, 1980-95: systematic literature review

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Abstract

Objective—To determine the prevalence of potentially inappropriate long term prescribing in general practice in the United Kingdom.

Design—Review of 62 studies of the appropriateness of prescribing identified from seven electronic databases, from reference lists, and by hand searching of journals. A nominal group of 10 experts helped to define the appropriateness of prescribing.

Setting—General practice in the United Kingdom.

Main outcome measures—Prevalences of 19 indicators of inappropriate long term prescribing representing five dimensions: indication, choice of drug, drug administration, communication, and review.

Results—Prevalences of potentially inappropriate prescribing varied by indicator and chronic condition, but drug dosages outside the therapeutic range consistently recorded the highest rates. The lowest rates were generally associated with indicators of the choice of the drug, except cost minimisation. Communication is studied less frequently than other dimensions of prescribing appropriateness.

Conclusions—The evidence base to support allegations of widespread inappropriate prescribing in general practice is unsound. Although inappropriate prescribing has occurred, the scale of the problem is unknown because of limitations associated with selection of a standard, publication bias, and uncertainty about the context of prescribing decisions. Opportunities for cost savings and effectiveness gains are thus unclear. Indicators applicable to individual patients could yield evidence of prescribing appropriateness.

Introduction

The United Kingdom government has emphasised its determination to reduce costs and volumes of prescription drugs and improve prescribing quality.^{1 2} National initiatives, such as the Prescription Pricing Authority's reports on prescribing by individual general practitioners, have sought to improve general practitioners' prescribing practices and contain drug expenditure. However, wide variations in prescribing rates and costs have persisted geographically and in practices^{1 3} and been only partly explained.^{4 5} Lack of consensus among doctors about the best way to practise medicine may help to account for the unexplained variations⁶ as general practice lacks accepted standards of appropriate prescribing.⁷

General practitioners have been rebuked, nevertheless, for practices such as overprescribing drugs of limited clinical value and underprescribing generic drugs and inhaled steroids for asthma.¹ Such criticisms

lack credibility.⁸ Because prescribing in general practice is often long term⁹ we systematically reviewed published work on the prevalence of potentially inappropriate long term prescribing in general practice in the United Kingdom.

Methods

DEFINING APPROPRIATENESS

The medication appropriateness index is the only generic measure of prescribing appropriateness with documented feasibility, reliability, and internal validity,¹⁰ but its generalisability to general practice in the United Kingdom is unknown. To define prescribing appropriateness in British general practice we set up a panel of 10 experts. Nominated by national opinion leaders in primary care, they represented professional, patient, research, and policy perspectives of prescribing.

Because of the incomplete evidence for assessing the quality of prescribing the panellists met as a nominal group. Their one day remit was to use professional opinion to suggest consensus based criteria for screening the appropriateness of prescribing recorded in individual patients' medical notes. The group functioned through a highly controlled process that facilitates idea generation but has unknown reliability and validity.¹¹ Using transcripts of the meeting, we refined the 19 indicators of prescribing appropriateness in general practice that were identified as being relevant to individual patients and as not specific to a given disease or drug. They cover five dimensions: indication, choice of drug, drug administration, communication, and review (table 1).

ELIGIBILITY OF STUDIES

Unlike Cochrane style reviews of the effects of an intervention, our review focuses on the prevalence of inappropriate prescribing. We sought studies published in English, or with an English abstract, between 1980 and July 1995 owing to the lesser relevance of earlier studies. Studies were excluded if they did not explicitly refer to drug treatments,¹²⁻¹⁵ as in diabetic care¹⁶⁻²⁴, if they referred to prescribers' knowledge of and attitudes towards prescribing rather than their prescribing practices²⁵⁻³⁰; if they did not make clear the doctor's prescribing role in shared care arrangements^{31 32} or after discharge of patients from hospital³³; or if they had poor or uncertain validity because information on appropriateness was unclear³⁴⁻³⁶ or unsupported by the *British National Formulary*.³⁷⁻³⁹

SEARCH STRATEGY

A search of our personal reference files was followed by a computerised search of seven electronic databases including Medline. Because none of its medical subject headings directly encompasses the subject area of our review we used combinations of such headings, text words, and wild cards. We also identified studies from

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Table 1—Dimensions and indicators of prescribing appropriateness

Indicator	Definition
Indication	
Explicit and valid indication	The stated reason for prescribing the drug is upheld by the <i>British National Formulary</i>
No failure to prescribe	Drugs are always prescribed when and how they should be, according to the recommendations in the <i>British National Formulary</i>
Drugs of limited value	Drugs of limited value are avoided or the reason for their use is stated in the medical records
Choice of drug	
Cost minimisation	The drug prescribed is cheaper than alternative treatment(s) but just as safe and effective
Cost effectiveness	The ratio of benefits to costs is better than that for alternative treatments (including non-drug treatments)
Potentially serious interactions	Potentially hazardous drug-drug interactions, as recorded in the <i>British National Formulary</i> , are avoided or the prescriber explicitly states that the potential benefits outweigh the risks
Coprescribing	Drugs are prescribed simultaneously to make use of beneficial interactions between them
Unnecessary duplications	Drugs from the same chemical or pharmacological class are not prescribed simultaneously
Adverse drug reactions	Unexpected drug reactions (type B) are investigated and recorded. Prescribing of the drug is continued only with caution and monitoring
Contraindications	Contraindicated drugs, as recorded in the <i>British National Formulary</i> , are not prescribed unless the prescriber explicitly indicates that the potential benefits outweigh the risks
Drug administration	
Dose	The total daily amount of the drug prescribed falls within the range stated in the <i>British National Formulary</i> or the prescriber records the reason(s) why
Dosing frequency and duration	The dosing frequency and duration of the drug treatment fall within the ranges recommended in the <i>British National Formulary</i> or the prescriber records the reason(s) why
Delivery	The formulation and route and method of delivery are designed to maximise compliance for an individual patient
Regimen	The dosing schedule is made as simple as possible (to maximise compliance)
Communication	
Prescriber-patient	The prescriber gives information on the drug(s) to the patient—for example, on indications and directions for use
Prescriber-prescriber	The medical record contains a comprehensive and accessible list of all prescribed drugs and regular over the counter drugs used by the patient
Prescriber-pharmacist	The prescription contains all the information needed for dispensing by a pharmacist
Review	
Effectiveness	The prescription produces a beneficial outcome in the patient
Frequency of review	The drug treatment is reviewed by the general practitioner at least once a year or in accordance with the guidelines in the <i>British National Formulary</i>

the online public access catalogue in the Manchester region. The *British Journal of General Practice* and *Family Practice* were searched by hand by scanning their contents pages for key words and reading the abstracts of relevant articles. Experts were consulted through, for example, the electronic list server GP-UK. We scrutinised the reference lists of retrieved studies.

STANDARDS OF PRESCRIBING APPROPRIATENESS

We assessed evidence for violations of each indicator (table 1). Whenever possible our standard reference was the March 1995 issue of the *British National Formulary* because it is an authoritative source of drug information, widely available, and amenable to rapid reference.⁴⁰ When information in the *British National Formulary* was lacking on communication and effectiveness we had to judge whether our appropriateness criteria had been met.

STUDY CHARACTERISTICS

Table 2 is not published here owing to its large size but is available from SAB and on the *BMJ's* worldwide web page (<http://www.bmj.com/bmj/>); it shows the prevalences of potentially inappropriate long term prescribing in general practice in the United Kingdom during 1980-95. Rates were extracted from 62 studies, of which two thirds were published in the *BMJ* or *British Journal of General Practice*. Table 2 shows 90 citations because eligible studies could be cited more than once. Also, 12 citations provided more than one rate.

Constructs underpinning the rates arose from published work and help to validate the dimensions suggested by the expert panel. Because our aim was to report the best evidence representing different dimensions of appropriateness, we have cited rates from up to five studies of the same violation. We omitted two out of seven eligible studies of inadequate inhaler technique^{41 42} and four out of nine studies of excessive durations of benzodiazepine prescribing.⁴³⁻⁴⁶ Omitted studies were older or were of lower quality than those we retained.

Table 2 also shows the prevalences of violations of 16 of our 19 indicators. No eligible rates were identified for drugs of limited value or drug regimen, and measures of cost effectiveness are beyond the scope of the review because they cannot be easily referenced against the *British National Formulary* or alternative standards. At least 10 studies represent each of our five dimensions of inappropriate prescribing. Rates from 53 of the 90 citations were based entirely or in part on information in general practice medical records, and about half of the practice based citations concerned single practices. Most subjects were elderly in about a quarter of the citations.

METHODOLOGICAL QUALITY OF STUDY EVIDENCE

Each rate was scored 1 or 0 on each of eight quality criteria (table 3), according to whether the criterion was met. The individual scores were summed to describe the overall ability of the rate to meet our quality requirements. The possible range of total scores from 0 to 8 was categorised into groups of increasing merit: low (0-2), moderate (3-5), and high (6-8).

Of the citations in table 2, 44 contributed rates scoring in the highest third and none had rates in the lowest. Without exception, study populations were clearly defined, and for only 19 citations was the subject selection flawed by the sampling frame or sampling procedure. In general, constructs were defined clearly and when possible in accordance with the *British National Formulary*. Missing data were rarely reported but selection bias was suggested by participation rates below 80% in 35 citations. Our quality criterion for sample size was met by 22 citations. No rate was generalisable to the population of the United Kingdom.

Results

Prevalence varied by indicator and chronic condition. Drug dosages outside the therapeutic range consistently recorded the highest rates. Except for cost minimisa-

Table 3—Criteria for assessing quality of evidence from studies

Criterion	Definition
Clearly defined study population	The study population and target population are defined in explicit and unambiguous terms
Subject selection	Subjects are representative of the source or target population because of the method of sampling
Sample size	The width of the confidence interval is small (within 5% of the prevalence estimate or within 5 percentage points)
Definitions	The indicator(s) of prescribing appropriateness are clearly defined and, when appropriate, in accordance with the <i>British National Formulary</i>
Missing data	Missing data on the outcomes are <20%
Participation rates	Participation rates of practices, general practitioners, and patients are ≥80%
Content validity	Prevalences of all of the most important outcomes are based on valid methods of data collection
Generalisability	Results are generalisable to all general practices in the United Kingdom

tion, the lowest rates were generally associated with indicators of inappropriate choice of drug(s).

INDICATION

In nine papers the indications for drug treatment were invalid or unstated; two related to antihypertensive agents^{47 48} and one to diuretics.⁴⁹ The prescription of long acting benzodiazepines was criticised,^{46 50} and studies identified no valid reason for prescriptions for acid suppressing drugs,^{51 53} vitamin B-12 injections,⁵⁴ and concentrators for long term oxygen treatment.⁵⁵

Of 10 studies reporting general practitioners' failure to prescribe indicated drugs, eight described underprescribing for asthma.⁵⁶⁻⁶³ Others recorded no treatment for hypertensive patients.^{64 65} In six practices 234 out of 281 patients (83%) with heart failure were prescribed loop diuretics by their general practitioner but not angiotensin converting enzyme inhibitors.⁶⁶

CHOICE OF DRUG

Studies documented underprescribing of generic substitutes^{49 67-69} and prescribing of potentially hazardous drug combinations.^{70 71} Concurrent prescribing of benzodiazepines^{45 46 50 72 73} characterised from 6% (25/450)⁴⁶ to 21% (15/72)⁷³ of patients receiving long term benzodiazepines. Three studies referred to prescriptions for contraindicated drugs but not to prescribers' knowledge and minimisation of risks.^{50 71 74}

DRUG ADMINISTRATION

Underprescribing contributed to deaths from asthma⁷⁵ and subtherapeutic carbidopa dosages in patients with Parkinson's disease.⁷⁶ All 136 users of nitrazepam in 55 residential homes received >5 mg daily.⁵⁰ Inappropriate drug dosages were inferred from serum concentrations of theophylline,^{59 77-79} thyroid stimulating hormone,⁸⁰⁻⁸² digoxin,⁸³ and lithium⁸⁴ and from international normalised ratios outside normal therapeutic ranges.⁸⁵ Raised random blood glucose concentrations were reported in patients with insulin dependent diabetes, possibly owing to factors other than insulin dosage.^{86 87}

Excessive durations of benzodiazepine prescribing were reported for 0.4% to 2.6% of all patients in practices.^{45 72 73 88 89} Median durations of use ranged from 2.5^{46 50} to five years.^{45 88}

In five studies^{58 90-93} from 8% (n = 126)⁹³ to 38% (27/71)⁹⁰ of treated patients had an inadequate inhaler technique. Metered dose inhalers were most commonly used inadequately by patients with asthma (30%, n = 262).⁹¹

COMMUNICATION

Patients' understanding of their asthma treatment was often poor,^{58 94 95} and for 70% (32/46) of patients in one clinic, the general practitioner's version of the drug regimen differed from that reported during interviews with patients.⁹⁶ Inadequate writing of prescriptions⁹⁷ was exemplified by a lack of instructions⁹⁸ and errors in the prescription that were not potentially serious to

patients.⁹⁹ In London 12 007 out of 181 100 (0.07%) anomalies were potentially serious and detectable only by a pharmacist.¹⁰⁰

REVIEW

Prescribed drugs failed to control conditions such as hypertension^{48 64 65 101} and asthma as defined by the results of lung function tests,^{57 59} nocturnal waking at least once weekly,^{58 60} and high morbidity.^{92 102} Our experts recommended holding a review of drug treatment at least annually or in accordance with the *British National Formulary*. Failure to fulfil this criterion was reported in studies of elderly patients receiving repeat prescriptions¹⁰³ and patients prescribed antihypertensive drugs,^{47 64 104 105} digoxin,¹⁰⁶ drugs for chronic asthma,^{107 108} lithium,⁸⁴ antiepileptic drugs,¹⁰⁹ and thyroxine.¹⁰⁷

Discussion

Potentially inappropriate prescribing, in which appropriateness is relative to what prescribers should normally do,¹¹⁰ occurred in general practice during 1980-95. However, the scale of the problem is unknown and subsequent improvements or deterioration would have gone undetected. The external validity of the studies reviewed is unknown, and there is no standard against which we can assess the relative importance of each of our quality criteria. Our assessments are qualified by our choice of standard, publication bias, and uncertainty about the context of prescribing decisions.

THE STANDARD

There is no saliently better standard for our purposes than the *British National Formulary*. However, it refers to more drugs than general practitioners could expect to become familiar with; is revised less frequently than, say, the *Monthly Index of Medical Specialities*; may require supplementation with specialised publications such as manufacturers' data sheets; lacks information on drug cost effectiveness; and is constrained by the relative paucity of well designed comparative studies on drug efficacy and safety in general practice.¹¹¹ Retrospective application of the March 1995 issue of the *British National Formulary* to studies during earlier periods is problematic, but we can only sensibly assess prescribing appropriateness by current standards.

PUBLICATION BIAS

Our indicators are relevant to the full range of conditions amenable to drug treatments, and they emphasise patients rather than conditions or drugs. However, published work has focused on specific long term, and inappropriate rather than appropriate, drug treatments for a few conditions—namely, asthma, hypertension, insomnia, and anxiety. Some dimensions of prescribing appropriateness, most notably drug administration, accounted for many more publications than other dimensions such as communication.

CONTEXT

Investigators might not know or report the context in which apparently inappropriate prescribing decisions were made. They seldom refer, for example, to coexisting medical conditions or circumstances that might invalidate the uniform application of standard prescribing criteria in individual patients. We required that investigators report an explicit and valid justification for prescribing decisions that contradict our prescribing criteria. Because published work does not reliably show when the violations of our criteria are appropriate in a given case, we have reported the prevalence of potentially inappropriate prescribing or even of inappropriate recording of prescribing.

CONCLUSION

Though the amount of inappropriate prescribing in general practice in the United Kingdom is unknown, we have reported ample evidence to support assertions that inappropriate prescribing occurred during 1980-95. Our findings, however, overestimate the prevalence of inappropriate prescribing because published studies (a) provide no opportunity, beyond medical records, for prescribers to explain their decisions and (b) favour reports of bad prescribing, particularly for vague conditions and without reference to comorbidity, which cannot be generalised to the whole of general practice in the United Kingdom. There is no evidence for widespread inappropriate prescribing in general practice, and, contrary to the claims of the Audit Commission,¹ the scope for cost savings and effectiveness gains is unknown.

Prescribing indicators applicable to individual patients can yield evidence of prescribing appropriateness. Such indicators should address the overall appropriateness of each patient's drug regimen, complementing guidelines for managing specific conditions. Consequently, we have developed indicators that are applicable to patients' medical records and not specific to a given condition or drug and have assessed their feasibility, reliability, and validity.¹¹²

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Conflict of interest: None.

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