European Journal of Internal Medicine 26 (2015) 399–406

Contents lists available at ScienceDirect

European Journal of Internal Medicine

journal homepage: www.elsevier.com/locate/ejim

Original Article

Drug-related problems identification in general internal medicine: The impact and role of the clinical pharmacist and pharmacologist

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ARTICLE INFO

Article history:
Received 27 December 2014
Received in revised form 18 May 2015
Accepted 19 May 2015
Available online 9 June 2015

Keywords:
Drug-related problems
Internal medicine
Hospital

ABSTRACT

Background: Patients admitted to general internal medicine wards might receive a large number of drugs and be at risk for drug-related problems (DRPs) associated with increased morbidity and mortality. This study aimed to detect suboptimal drug use in internal medicine by a pharmacotherapy evaluation, to suggest treatment optimizations and to assess the acceptance and satisfaction of the prescribers.
Methods: This was a 6-month prospective study conducted in two internal medicine wards. Physician rounds were attended by a pharmacist and a pharmacologist. An assessment grid was used to detect the DRPs in electronic prescriptions 24 h in advance. One of the following interventions was selected, depending on the relevance and complexity of the DRPs: no intervention, verbal advice of treatment optimization, or written consultation. The acceptance rate and satisfaction of prescribers were measured.
Results: In total, 145 patients were included, and 383 DRPs were identified (mean: 2.6 DRPs per patient). The most frequent DRPs were drug interactions (21%), untreated indications (18%), overdosages (16%) and drugs used without a valid indication (10%). The drugs or drug classes most frequently involved were tramadol, antidepressants, acenocoumarol, calcium–vitamin D, statins, aspirin, proton pump inhibitors and paracetamol. The following interventions were selected: no intervention (51%), verbal advice of treatment optimization (42%), and written consultation (7%). The acceptance rate of prescribers was 84% and their satisfaction was high.
Conclusion: Pharmacotherapy expertise during medical rounds was useful and well accepted by prescribers. Because of the modest allocation of pharmacists and pharmacologists in Swiss hospitals, complementary strategies would be required.

1. Introduction

Pharmacotherapy is becoming increasingly complex, and inappropriate drug prescription might be associated with increased healthcare costs and hospital admissions as well as prolonged hospital stays, reduced quality of life, and increased morbidity or mortality [1–4]. A drug-related problem (DRP) is defined as an event or circumstance involving drug therapy that actually or potentially interferes with the desired health outcomes [5]. The majority of DRPs are predictable and potentially avoidable [6]. DRP frequency might be reduced by pharmacotherapy optimization, such as medication reviews led by pharmacists or clinical pharmacologists [7–9]. The positive effects of these medication reviews on costs were reported [10,11]. Moreover, these interventions were associated with reduced durations of hospital stay or decreased frequency of re-admissions as well as with better control of certain biomarkers (lipid levels, anticoagulation levels or blood pressure) and disease events such as decompensated heart failure or thromboembolic events [12].

Inappropriate drug use has been largely studied in the elderly, a population characterized by frailty, polymorbidity and polymedication; fewer studies have addressed the question in internal medicine wards, in which younger patients are admitted. It has been shown that polymorbidity and polymedication were independent risk factors of DRPs, whereas age and gender were not [13,14]. Elderly and middle-

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http://dx.doi.org/10.1016/j.ejim.2015.05.012
0953-6205/

aged patients admitted to internal medicine wards suffer from multiple diseases or have several risk factors and receive a large number of drugs. They are thus at high risk for DRPs. In a French study, the in-hospital incidence rate of adverse drug reactions (ADRs) in internal medicine was 10.1 per 1000 patient-days, and 80% of the ADRs were considered preventable [15].

Our study was conducted in two internal medicine wards at the Geneva University Hospitals, a 2000-bed university health center in Switzerland. The Geneva University Hospitals have the following two complementary information centers for caregivers regarding medication use: the Clinical Pharmacology and Toxicology medical service for pharmacotherapeutic questions (such as drug–drug interactions, ADRs, selection of drugs and dosage, use of drugs in pregnancy, extreme age populations or organ dysfunction) and a Pharmacy hotline for pharmacotechnical questions (such as intravenous drug dilutions, intravenous drugs compatibilities, or tablet crushability for administration through a nasogastric feeding tube). This study is a joint collaboration between these two entities, through a clinical pharmacist and a clinical pharmacologist tandem, working together, addressing the question of DRPs in internal medicine by screening medical records, attending medical rounds, and providing advice for pharmacotherapy optimization. Whereas most studies evaluating DRPs are retrospective, our study offers the advantage of being prospective. We sought to optimize the impact of our intervention by prioritizing DRPs to be reported to prescribers during rounds.

The aims of the study were as follows: (1) to detect all of the DRPs in the included patients and to identify the drugs or drug classes most frequently causing the problems; (2) to assess which intervention (none, verbal advice and written consultation) was required for each DRP according to its clinical relevance or complexity; (3) to measure the acceptance rate of the prescribers and the actual impact on the prescription; and (4) to assess the satisfaction of the prescribers regarding the suggestions for treatment optimization.

2. Methods

2.1. Patients and design

This prospective interventional study was conducted during a consecutive 6-month period. From September 2011 to February 2012, a clinical pharmacist and a clinical pharmacologist (i.e. a physician specializing in clinical pharmacology and internal medicine) both attended medical rounds approximately once a week on two internal medicine wards. All the patients admitted in the visited internal medicine wards were considered eligible and there were no exclusion criteria. The following data and comorbidities as well as the known risk factors for DRPs were systematically recorded for each patient: sex, age, and the number of drugs prescribed; the occurrence of hypertension, coronary heart disease, heart failure, atrial fibrillation, diabetes, and reduced renal function (a creatinine clearance ≤50 ml/min according to the Cockroft–Gault formula); previously reported liver dysfunction; chronic obstructive pulmonary disease or asthma; a previous history of a transient ischemic attack or stroke, malignant disease, alcohol abuse, tobacco use; and polypharmacy (≥5 drugs).

2.2. Detection of DRPs and the drugs or drug classes involved

The actual and potential DRPs were classified into the following seven categories, as previously described by Hepler and Strand when they first described the process of pharmaceutical care: *drug interaction*, *subtherapeutic dosage*, *overdosage*, *drug use without indication*, *untreated indication*, *improper drug selection*, and *adverse drug reaction* [16]. The treatment adherence problems were not addressed in the study. The day before the medical round, a clinical pharmacist screened the medical records of the patients on the ward and performed a structured medication review with an assessment grid (Table 1) to detect the DRPs. The assessment grid was developed by compiling the clinical decision supports classically used for medication reviews (e.g., drug interaction screening tools [17–19], drug databases [20–22] or textbooks [23–26] and published tools for the medication review [27]).

All of the identified DRPs were discussed between the clinical pharmacist and the clinical pharmacologist before the medical round to determine their clinical relevance and to prioritize interventions.

DRPs might be dependent on each other, and only primary DRPs are presented in the results. An unwanted drug interaction might require a dose reduction (*overdosage* is a secondary DRP) or an ADR might render a drug inappropriate for a patient (*improper drug selection* is a secondary DRP). Because drug interactions involve, by definition, at least two drugs, only the drug/drug class causing the DRP and associated with the highest patient risk (because of the efficacy/toxicity ratio modulation) is presented in the results.

2.3. Decision on the intervention

Based on the potential clinical relevance and complexity of the detected DRPs, an attitude was determined, as follows: (1) no intervention and/or continuation of usual follow-up by caregivers, (2) verbal advice to the physicians and/or nurses during medical rounds (treatment optimization or recommendation to introduce monitoring) or (3) verbal advice during medical rounds followed by a written specialized clinical pharmacology consultation.

No intervention was conducted for non-clinically relevant DRPs or when appropriate monitoring was already provided (e.g., monitoring of blood pressure, heart rate, kalemia and serum creatinine). Clinical relevance of DRPs has previously been defined by Dooley et al. and Blix et al. DRPs were thus considered non-clinically relevant if they were non major, i.e. the chance of noticed effect was lower than 20%, the chance of harmful effect was lower than 5%, or they would not require intervention due to the lack of detrimental effects [13,28]. Written specialized consultations were reserved for complex clinical pharmacological situations, when specifically requested by prescribers to induce a change in current clinical practice, or when ADRs had to be reported to the Swiss national pharmacovigilance center (Swissmedic).

2.4. Acceptance and application rate by prescribers

The acceptance rates of treatment optimization recommendations made to prescribers during the medical round were measured. In case of recommendation acceptance by the physicians during medical rounds, the prescription medical records were systematically re-screened after five days to assess whether the treatments had actually been changed according to the advice (application rate).

2.5. Prescribers' satisfaction survey

The satisfaction level of prescribers during medical rounds was rated with an anonymous questionnaire assessing the following factors:

(1) The physician education level (a categorical choice);
(2) The global opinion on the participation of the pharmacotherapy experts in medical round: general usefulness of pharmacotherapy experts, time for verbal advices, and optimal frequency of attending (a categorical choice);
(3) The usefulness of the advice for preventing specific DRPs (a four-point Likert scale). An average score was attributed to each type of DRP by attributing different points according to the level of