Assessment of indicators for hospital drug formulary non-adherence

Abstract Background: Translation of rational drug therapy into practice remains an international problem. Although pharmacotherapeutic treatment guidelines (PTGs) as managerial tools are favoured over hospital drug formularies (HDFs), the latter are still applied in most hospitals. HDF enforcement often leads to time-consuming consultation from the perspective of both pharmacy staff and prescriber. So far, research on HDFs has only been conducted outside Europe. Moreover, this research has only been descriptive. Straightforward indicators qualitatively characterising HDF non-adherence have never been assessed.

Methods: A retrospective 1:1 case-control study was conducted across three general teaching hospitals. Non-HDF requests were compared with HDF requests. Data were multivariably analysed, considering patient, prescriber, drug, and HDF characteristics as possible indicators for non-adherence.

Results: HDF adherence was almost universal across characteristics. Non-adherence was characterised by newly marketed drugs, drugs that were part of patients’ pre-admission drug therapy, drugs with many fellow drugs within the drug group on the market, and drugs originating from a drug group for which the HDF was highly restrictive. Contrary to common perception, non-adherence was independent of medical specialty, therapeutic area, and patient characteristics.

Conclusion: This research provides an epidemiological framework for hospitals (drug and therapeutics committees) for evaluating pharmacy data on HDF non-adherence. It can be used for educational tailor-made feedback to prescribers and for drug selection when the inclusion of newly marketed drugs is considered or HDF restrictiveness for certain drug groups is reconsidered. Moreover, it demonstrates the importance of a regional approach involving secondary and primary health care to establish continuity in seamless care of drug therapy.

Keywords Hospital drug formulary (HDF) · Prescribing adherence · Pharmacoepidemiology · Indicators · Cross-sectoral pharmacotherapy

Introduction

Within our growing and ageing society, the need for rational health care taking account of effectiveness, safety, appropriateness, and economy is obvious. However, the translation of rationality into clinical practice remains an international problem. Particularly drug therapy has been of great concern [1, 2, 3]. Especially hospitals are under pressure because patients demand rapid recovery. Highly expensive new-technology drugs are prescribed and pharmacy staff are confronted with a
wide variety of patients’ pre-admission drug therapy originating from primary health care [4, 5, 6].

Similar to the situation in other countries, Dutch hospital drug and therapeutics (D&T) committees are managing rational prescribing within secondary health care [7, 8, 9, 10, 11, 12, 13, 14, 15, 16]. Among educational and administrative programmes, application of pharmacotherapeutic treatment guidelines (PTGs) and hospital drug formularies (HDFs) are considered effective [17, 18, 19, 20, 21, 22, 23]. HDFs were first introduced about 40 years ago in Northern America and have been used worldwide as managerial tools ever since. However, there is evidence of either poor adherence or unintended effects on hospital overall costs and possibly patient outcomes [8, 24, 25, 26, 27, 28, 29, 30]. Although PTGs are presently favoured over HDFs as managerial tools because of their disease-orientation rather than drug-orientation, HDFs are still commonly applied in over 90% of all Dutch hospitals. In about 60% of these hospitals, the HDF is considered “restrictive,” implying that non-HDF drugs are not dispensed. Internationally, most hospitals employ reactive management strategies including ad hoc interventions initiated by hospital pharmacists confronted with a non-HDF request. Proactive strategies obliging prescribers to contact hospital pharmacists prior to issuing a non-HDF request are employed in very few hospitals. Moreover, few hospitals systematically document HDF non-adherence by (electronically) registering quantitative and qualitative information. Even fewer hospitals use this documentation for feedback to prescribers or within their hospital D&T committee [31].

Several efficient procedures for dealing with non-HDF requests have been postulated [32, 33, 34, 35, 36]. However, the availability of research evidence on HDF non-adherence is limited. Moreover, most research has focussed on particular groups of drugs. A qualitative characterisation of non-HDF requests has never been performed [16, 37, 38, 39, 40]. This characterisation is important to identify areas of concern. The objective of this research is to assess indicators for HDF non-adherence by comparing HDF with non-HDF requests, considering patient, prescriber, drug, and HDF characteristics. Since the lack of cross-sectoral pharmacotherapeutic coherence is substantial, existing pre-admission drug therapy as a possible indicator for HDF non-adherence will be addressed in particular [41].

**Methods**

Setting

The research was conducted across three Dutch general teaching hospitals (1200-bed capacity) that are served from one regional hospital pharmacy. A regional hospital D&T committee biannually issues an HDF applying to the hospitals. It is restrictive and representative for Dutch HDFs, as identified by previous research [42, 43]. Electronic prescribing had not yet been implemented at the time of research. Consequently, all prescriptions included in this research were handwritten and delivered at the pharmacy. Within the hospital, any prescribing not concurrent with the HDF is considered as HDF non-adherence. All HDF non-adherence is routinely and systematically documented in a computerised database. Any prescription not concurrent with the HDF results either (a) in a therapeutic switch (automatically) or (b) in consultation between pharmacy staff and the prescriber. In the latter case, HDF non-concurrent prescriptions may or may not be changed into HDF-concurrent prescriptions. The reasons for not changing HDF non-concurrent prescriptions (either rational justification or unclear/irrational motives) are documented in the previously mentioned computerised database.

**Definitions**

Prescriptions not concurrent with the HDF are defined as “non-HDF requests”; prescriptions concurrent with the HDF are “HDF requests”. Drug requests are identified by their Anatomical-Therapeutic-Chemical (ATC) code at the level of seven characters. Therefore, requests concerning proprietary drugs not included in the HDF, but with equivalent generic drugs included (i.e., identical ATC-7 code), are not “non-HDF requests,” because automatic interchange between proprietary and generic drugs is common practice in the Netherlands.

**Design**

A retrospective 1:1 case-control study was conducted. Non-HDF requests were defined as “cases”; HDF requests were defined as “controls”. The explanatory variables (indicators) included patient characteristics (age, gender), prescriber characteristics (medical specialty, number of prescribers per medical specialty), drug characteristics (therapeutic area as defined by the ATC code, generic or proprietary product, dosage form, drug age, number of fellow drugs within the drug group on the market, and eventual continuation of pre-admission drug therapy), and HDF characteristics (level of HDF restrictiveness per drug group).

**Data collection**

All drug requests for inpatients hospitalised in any of the three general hospitals from 1 January 1998 until 31 December 1998 were considered eligible subjects. All drug requests for outpatients and inpatients hospitalised in medical institutions other than the general hospitals were excluded. Table 1 shows some baseline information. According to the research objectives, retrieval of 350 cases involving 350 different patients proceeded randomly from a computerised database. The prescription date was set as index date. Subsequently, 350 controls involving 350 different patients were randomly selected, matched on index date and hospital. There was no overlap of patients across cases and controls. Information on three pairs proved incomplete or otherwise invalid. Consequently, 692 drug requests were included (347 cases, 345 controls). Drug requests were retrieved from the Dutch National Drug Index and the HDF, respectively. HDF restrictiveness per drug group was expressed in terms of the percentage of fellow drugs on the market that is included in the HDF (ATC level 4-5). Information about eventual continuation of pre-admission drug therapy was retrieved from computerised community pharmacy databases that are linked on-line to the hospital pharmacy database. All patient data were made anonymous and subsequently processed with Microsoft Access 7.0.