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Review Article

DRUG RELATED PROBLEMS: AN OVER VIEW OF VARIOUS CLASSIFICATION SYSTEMS

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ABSTRACT

Identification and resolving the drug related problems (DRPs) in the prescriptions is the core activity in pharmaceutical care. Suitable classification of DRPs is a vital element in pharmaceutical care practice and research. Different DRP classification systems are published in the literature in various international journals. About fourteen different classifications on DRPs were found published with a different focus. Some classifications were hierarchical, categorized into main groups and subgroups. Various terminologies and definitions for DRPs, as well as guidelines for an optimal DRPs classification, were given. In this review, an effort was made to give a general idea about definition and classifications of DRPs. This knowledge may assist the pharmacy practitioner to identify, classify and resolve the DRP and useful for researchers.

Keywords: Drug-related problems, Pharmaceutical care.

INTRODUCTION

A rational, safe and cost effective drug treatment depends on competent diagnosing, prescribing, effective monitoring and evaluation of drug therapy, patient understanding and compliance in relation to the prescribed medication. Clinical pharmacist initiatives may contribute significantly to each of these objectives assuring a safe and effective medication use. Evidences have documented pharmacist's role in hospital settings in identifying and resolving clinically significant drug-related problems (DRPs). Pharmacists' role is much appreciated in improving medication adherence behavior in patients through suitably designed one to one-education strategies. Their efforts are also recognized in reducing the incidence of preventable adverse events, thereby improving cost effectiveness and decreasing the length of hospital stay.

DRP is defined as an event that may potentially affect the health outcomes in the patients. DRPs can occur at all stages of the medication usage process starting from prescribing to dispensing stage. Lack of follow-ups and reassessment of therapeutic outcomes may also contribute to DRPs. Pharmaceutical care is a co-operative activity in concert with other health care professionals and offered directly to the patient for improved quality use of medicines and achieving achieve the desired therapeutic outcomes. Pharmaceutical care identifies and resolves actual or potential DRPs [1].

DRPs pose a challenge to the clinician, and that may affect patient's clinical outcomes and may result in morbidity or mortality and increased health care costs. Health care costs may become a burden to the patient or may be to the government or to the third parties. Clinical Pharmacy is a discipline that promotes the quality use of medicines through evidence-based medicine and helps in identification and resolving DRPs. A clinical pharmacist through his/her clinical accuracy checking may identify DRPs and come out with suitable solutions to resolve the same. In overseas these services are provided in different settings like nursing homes and tertiary care hospitals [2]. Number of DRPs identified and resolved is a criterion to gaze the competency of the pharmacists.

Many authors have tried to define DRPs. Summating their opinions, DRPs may be defined as "an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes." Based on the published literature, DRPs may be subdivided into various categories. To validate these classifications, studies were performed using these categories on various patient populations. However, these studies focused on one selected patient group or on one or only a few categories of DRPs. Because of such differences in methodology and the use of different definitions on the DRPs concept, the frequency and type of DRPs among various patient groups, were found to define. Knowledge on possible differences between the guidelines and patient groups plays an important role in detecting and preventing the DRPs. The aim of this review is to identify the different classifications of DRPs and discusses their suitability for documenting DRPs in pharmaceutical care [3].

DRP CLASSIFICATIONS PUBLISHED IN LITERATURE

Various classifications were published in the literatures regarding definition and classification of DRPs. The published literature on DRPs was reviewed systematically, and the following classifications were found suitable for review and interpret.

The ABC of DRPs

In 2000, Meyboom *et al*. published a basic system for DRPs seen from a pharmacovigilance viewpoint. It is primarily for use in the WHO and focuses on side effects and adverse reactions. Each category has its own definition, but a general definition for DRPs was not given [4].

a. Type A (drug actions) adverse effects
b. Type B (patient reactions) adverse effects
c. Type C (statistical) adverse effects.

American Society of Hospital Pharmacists (ASHP) classification 1996

In 1993, the ASHP accepted a statement in which a crude classification of DRPs was proposed, although it was not named as such. In 1996, in a guideline for a standardized method for pharmaceutical care, the ASHP published a more detailed classification. DRPs were then defined as "medication-therapy problems."

The statement of 1993 was reviewed again in 1998, and a medication-related problem was defined as "…an event or circumstance involving medication therapy that actually or potentially interferes with an optimum outcome for a specific patient." In this classification, the DRPs were classified as follows [5]:

i. Medication with no indication
ii. Condition for which no drug is prescribed
iii. Medication prescribed inappropriately for a particular condition

iv. Inappropriate dose, dosage form, schedule, route of administration, or method of administration
v. Therapeutic duplication
vi. Prescribing of medication to which the patient is allergic
vii. Actual and potential adverse drug events
viii. Actual and potential drug–drug, drug–disease, drug–nutrient, and drug–laboratory test interactions that are clinically significant
ix. Interference with medical therapy by social or recreational drug use
x. Failure to receive the full benefit of prescribed therapy
xi. Problems are arising from the financial impact of therapy
xii. Lack of understanding of the medication
xiii. Failure of the patient to adhere to the regimen.

Cipolle/Morley/Strand classification

These authors used the term "drug-therapy problem" rather than "DRP." This concept generally refers to a system approach, including problems in the whole drug therapy chain, from the patient's perspective, published in 1999. The classification is in use in many community pharmacies in the US to evaluate pharmacists' activities in their daily provision of pharmaceutical care. Their definition does not seem to include potential DRPs and, therefore, can only be employed when the event has already been experienced by the patient [6,7].

Definition: Any undesirable event experienced by the patient that involves or is suspected to involve drug therapy and that actually or potentially interferes with a desired patient outcome.

In this classification, the DRPs were classified as follows:
i. Need for additional therapy
ii. Unnecessary therapy
iii. Wrong drug
iv. Dosage is too low
v. Adverse drug reaction
vi. Dose is too high
vii. Adherence problem.

Granada consensus

In 1998, a group of Spanish experts reached a consensus on the definition and analysis of DRPs, which was further revised in 2002. In the latter system, potential problems were excluded, and the definition focuses on negative clinical outcomes rather than on health problems of the patient in general. In the wording, this classification seems to focus ultimately on the patient's behavior. Based upon the definition, potential problems were excluded [8,9].

Definition: Drug Therapy Problems are health problems, understood as negative clinical outcomes, resulting from pharmacotherapy that for different causes, either do not accomplish therapy objectives or produce undesirable effects.

In this classification the DRPs were classified as follows:
i. Indication
   - Patient does not use the medicines needed
   - Patient uses medicines that he does not need.
ii. Effectiveness
   - Patient uses an erroneously chosen.
iii. Drug
   - Patient uses dose, interval, or duration inferior to the one needed.
iv. Safety
   - Patient uses a dose, interval, or duration greater than the one needed
   - Patient uses an agent that causes an adverse reaction.

Hanlon approach

Hanlon *et al*. have developed a method for assessing the appropriateness of medication based on the medication appropriateness index (MAI). This tool for assessing a medication is based upon taxonomy of inappropriateness that, in turn, was based upon key elements identified from the literature and clinical experience. The MAI has been used in several studies. As inappropriate medication is, or may cause, a DRP, their classification is included here, but no definition of appropriateness of drug therapy is given [10,11].
i. Indication
ii. Effectiveness
iii. Dosage
iv. Correct direction
v. Practical directions
vi. Drug–drug interaction
vii. Drug–disease interaction
viii. Duplication
ix. Duration
x. Expense.

Hepler–Strand classification

With their seminal publication on pharmaceutical care, Hepler and Strand also introduced several categories of DRPs. In this approach, problems and causes were not separated [12].

Definition: An event or circumstance involving a patient's drug treatment that actually or potentially interferes with the achievement of an optimal outcome.

In this classification, the DRPs were classified as follows:
i. Untreated indications
ii. Improper drug selection
iii. Subtherapeutic dosage
iv. Failure to receive drugs
v. Over dosage
vi. Adverse reactions
vii. Drug interactions
viii. Drug use without indication.

Krska *et al*. system

During a drug-use evaluation study, Krska *et al*. developed a classification based upon the DRPs they encountered during a research project in 332 patients. Like the Hanlon system, their classification is based upon drug-use evaluation. They have used the term "pharmaceutical care issue."

As per Krska *et al*., pharmaceutical care issue is an element of pharmaceutical care need which is addressed by the pharmacist [13,14].

In this classification the DRPs were classified as follows:
i. Potential/suspected adverse reactions
ii. Monitoring issues
iii. Potential ineffective therapy
iv. Education required
v. Inappropriate dosage regimen
vi. Untreated indication
vii. No indication
viii. Repeat prescription no longer required
ix. Inappropriate duration of therapy
x. Discrepancy between doses prescribed and used
xi. Potential drug–disease interaction
xii. Other.

Mackie classification

Mackie adapted the Cipolle *et al*. classification based upon her own findings on a random sample of 50 patients with one or more DRPs, and used the resulting classification for her own research. She appalled her classification as "clinical DRPs."

As per Mackie, a clinical DRP is considered to exist when a patient experience or is likely to experience either a disease or symptom having an actual or suspected relationship with drug therapy.

As per this classification, the DRPs were classified as [15]:
i. Appropriateness
ii. Unnecessary therapy
iii. No indication apparent
iv. Untreated indication
v. Safety
vi. Adverse reaction
vii. Clinically significant drug interaction
viii. Contraindication
ix. Effectiveness
x. Ineffective therapy
xi. Inappropriate choice of therapy
xii. Inappropriate formulation/delivery
xiii. Inappropriate dose/dosing schedule
xiv. Admitted non-adherence
xv. Monitoring required
xvi. Miscellaneous.

National Coordinating Council for Medication Error Reporting and Prevention (NCC-MERP) taxonomy of medication errors
This hierarchical classification by the NCC-MERP defines DRP as preventable event that may cause or lead to inappropriate medication use or patient harm, whereas the medication is in control of the health care professional, patient, or consumer.

NCC-MERP separates the problem from the causes, but does not provide clear intervention taxonomy. The error section includes errors (potential DRPs) that do not become relevant for the patient. While the definition seems promising, the classification seems mainly process oriented and focuses especially on administration of parenteral drugs in a non-ambulatory setting. Obviously, non-preventable DRPs are not included [16].

In this classification, the DRPs were classified as follows:
i. The medication is in control of the health care professional, patient, or consumer.
ii. Dose omission
iii. Improper dose
iv. Wrong strength/concentration
v. Wrong drug
vi. Wrong dosage form
vii. Wrong technique (includes inappropriate crushing of tablets)
viii. Wrong route of administration
ix. Wrong rate (probably relating to administration)
x. Wrong duration
xi. Wrong time
xii. Wrong patient
xiii. Monitoring error (includes contraindicated drugs)
xiv. Deteriorated drug error (dispensing drug that has expired)
xv. Other.

PAS coding system
The PAS coding originally was developed to document patients' questions on their drug therapy, not to classify DRPs. Problems, assessment, and solutions are classified separately. This system no longer exists due to its inability to support in the classification of DRPs [17].

Pharmaceutical Care Network Europe (PCNE) system (version 4.0)
The original classification was created in 1999 by pharmacy practice researchers during a working conference of the PCNE in an effort to develop a standardized classification system that is suitable and comparable for international studies. This hierarchical system comprises separate codes for problems, causes, and interventions and is hierarchically structured. It is currently in use in projects conducted in Sweden and the UK.

As per PCNE classification system, a DRP is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes [18].

In this classification the DRPs were classified as follows:
i. Adverse reaction(s)
ii. Drug choice problem
iii. Dosing problem
iv. Drug use/administration problem
v. Interactions
vi. Other.

Problem–intervention documentation (PI-Doc)
A hierarchical system for PI-Doc was developed in Germany with an emphasis on the user-friendliness in community pharmacy practice. The classification was first used in a study published in 1995 and has since then been used in several pharmaceutical care studies. It has been implemented in most German pharmacy-software systems. The classification was used in a study conducted in Denmark in a slightly modified format. The **s**ubcategories indicate the causes of a DRP [19,20].

In this classification, the DRPs were classified as follows:
i. Unsuitable drug choice
ii. Unsuitable use by the patient
iii. Unsuitable dosage
iv. Drug–drug interactions
v. Adverse reactions
vi. Other.

SHB-SEP classification
The Health Base Foundation developed this system in The Netherlands for use in pharmacy software's based on the medical Subjective/Objective/Evaluation/Plan structure; however, the S and O codes have been combined into one problem description. The main problem categories comprise both a patient- and pharmacy-oriented perspective.

The system is still being revised regularly, but each updated version is not sequentially numbered to facilitate differentiation from previous versions [21].
i. Patient initiative doubts or insufficient understanding (also second opinion)
ii. Question about drug use (dosage/advice/way of use)
iii. Worries about complications/adverse reactions
iv. Self-care advice
v. Advice on medical aids
vi. Information request (general/disease/complaint/disorder)
vii. Pharmacy team initiative administration
viii. Alterations in prescription (not based on medication-surveillance signal)
ix. Evaluation as result of a consultation by invitation
x. Evaluation without patient consultation.

Westerlund system
This system was developed as part of a PhD thesis and was first used in 1996. Prior to incorporation into the nationwide Swedish community pharmacy software in 2001, the Westerlund system underwent minor amendments.

The system includes an intervention classification and a manual for its use. All DRP and intervention categories are clearly defined. The current definition upon which the classification is based is shown as a DRP is a circumstance related to the patient's use of a drug that actually or potentially prevents the patient from gaining the intended benefit of the drug [22,23].

In this classification the DRPs were classified as follows:
i. Uncertainty about aim of the drug
ii. Drug duplication
iii. Drug–drug interaction
iv. Contraindication
v. Therapy failure
vi. Adverse effect

vii. Underuse of drug
viii. Overuse of the drug
ix. Other dosage problem
x. Difficulty swallowing tablet/capsule
xi. Difficulty opening drug container
xii. Other problem of administration/handling
xiii. Other.

CONCLUSION

Most classifications only have a problem and intervention section. The causes of the problem are included in the problem descriptions. Only some classifications have a separate section for the causes of the problems. Because of the multifaceted nature of various DRPs arising in practice and the reality that they have a cause as well as a consequence, it is very complicated to develop a system that gives a dependable classification based on a single choice. Therefore, an additional set of rules for classification is needed for cases that are indistinct.

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