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ANDRIY ZIMENKOVSKY, MYROSLAVA SEKH, ULYANA YANYSHYN

Algorithm for the development of systemic pharmaceutical care messages aimed at clinicians as exemplified by community – acquired pneumonia

Abstract

Introduction. Medication errors, which are increasing in number every year worldwide, represent a significant part of the development of adverse pharmacotherapy results, what creates the need to develop additional tools and means that could effectively provide mechanisms of rational pharmacotherapy.

Aim. Development of an algorithm for the creation of systemic messages of pharmaceutical care aimed at clinicians, concerning specific nosology.

Material and methods. The object of the study was the medical documentation of 540 patients of the therapeutic unit who were diagnosed with community-acquired pneumonia. The quality analysis of the prescribed pharmacotherapy was conducted according to our modified European Classification Scheme PCNE V5.01 for detection of drug-related problems (DRP).

Results. As many as 8386 DRPs were detected in the analyzed 540 medical prescriptions. Based on them, 276 systemic pharmaceutical care messages were formed, which are related to nosology in general and aimed at clinicians.

Conclusions. According to the results of the pharmacotherapy quality assessment of 540 patients, in particular those with community-acquired pneumonia, 8386 DRPs were identified, which confirmed our scientific hypothesis regarding its low quality. The proposed algorithm for the development of systemic pharmacy care messages aimed at clinicians may serve as an additional tool that could effectively provide rational pharmacotherapy mechanisms.

Keywords: quality of pharmacotherapy, community-acquired pneumonia, pharmaceutical care.

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INTRODUCTION

Due to the rapid development of the pharmaceutical science and industry, the rapid expansion of the range of pharmaceutical agents (PA) is observed. A major modern world problem is their quality and rational use in different nosologies. There is a need to create additional tools and means that can effectively provide mechanisms of rational pharmacotherapy (PhT). Drug-related problems (DRPs) account for a large proportion of the development of adverse PhT outcomes [1], which are increasing every year all over the world [2]. DRPs are the leading cause of death, particularly in the USA [1] and the third cause of death in the UK [2]. According to the National Patient Safety Agency (NPSA), DRPs occur at all stages of PhT, thus causing an average of 4.6 days of prolonged hospitalization and increasing the cost of PhT by approximately $2000-2500 per patient [3]. In the USA, the leading role in the DRP structure is occupied by the errors associated with the use of PA (7-9 thousand cases per year) [4], and the subsequent elimination of adverse drug reactions (ADR) accounts for $40-42 billion per year [3,5]. According to the relevant scientific literature, DRPs most often occur when antibacterial agents (ABA) are used [1], with the wrong dose of PA being the most common [1].

AIM

The aim of the study was to develop an algorithm for the creation of systemic messages of pharmaceutical care aimed at clinicians, as exemplified by CAP.

MATERIALS AND METHODS

The object of the study was the medical documentation of 540 patients of the therapeutic unit, who were diagnosed with community-acquired pneumonia and successfully treated in one of the inpatient healthcare institutions of Lviv. PAs that were used for PhT of the underlying disease (CAP), its complications and concomitant pathology were analyzed [6]. The number of 298 (55.2%) men and 242 (44.8%) women prevailed among the examined patients. The average age of the patients was 57.2 (average sample deviation equaled ± 18.33 years).

Evidence-based information of good practice of prescribing medicines included domestic and international guidelines [7-9], instructions for the medical use of PAs in Ukraine and data of the State Registry of PAs of Ukraine [10]. As a result, inappropriate (incorrect or irrational) PA orders were revealed in 531 medical prescriptions.

Department of Clinical Pharmacy, Pharmacotherapy and Medical Standardization, Danylo Halytsky Lviv National Medical University, Lviv, Ukraine

The quality analysis of the prescribed PhT was conducted using the PCNE V5.01 European Classification Scheme for PhT Quality Assessment (PhTQ) adapted to the national conditions through the identification of Drug-Related Problems (DRP) [11]. There was no conflict of interests during the study.

The following methods were applied: system analysis, analytical, comparative, information retrieving, clinico-pharmacological, clinico-pharmaceutical, statistical, situational.

CONCLUSIONS

The average amount of PA per patient was 11.84±4.08, indicating, in our opinion, that there was significant polypragmasy. Using the Pearson pair correlation method, we analyzed the relationship between the number of PAs per patient and the number of bed-rest days. The results indicated direct average strengths of reliable correlational relations. This means that more bed-rest days were combined with more PAs administered to the patient.

We performed PhT Quality Assessment (PhTQ) according to the PCNE V 5.01 classification system for DRP detection accepted in the European Union as a part of the overall PhTQ assessment system. Domestic scientists [12] proposed their own definition of DRP (which we used in the study) as a system of evaluation and quality improvement of the therapeutic process, including PhT, based on 4 main components: drug problems, their causes, clinical and pharmaceutical interventions and the results of these interventions. It is worth noting that nowadays in Ukraine we do not see the possibility to use the latest versions of the PCNE classification system due to the presence of many rubrics that cannot be adapted to domestic conditions. We currently consider the DRP classification of the 5th version, which we used in the section "Problems", to be the most compliant for Ukraine.

Besides the existing DRPs that are clinical in their content, many technical DRPs were identified during the study. The essence of these remarks is to identify unintelligible, unreadable, misspelled or written indiscriminately prescriptions of doctors in general, or in particular the doses of PAs, frequency of administration, route of administration and the like. Although PCNE V5.01 does not provide documentation of these problems, some scholars [12] identify them in a separate heading (P7), which, in our opinion, is positive and complements the results of the assessment.

At the same time, for the use in clinical prescribing practice in Ukraine, the European Classification Scheme PCNE V5.01 was supplemented by domestic researchers [12] with the DRP rubric coded as P8, which includes the problems of evidence-based medicine (EBM), the development of the registry system and the compliance assigned to PhT by current clinical protocols for this particular nosology (Table 1), which is relevant for Ukraine.

TABLE 1. List of rubrics developed by A. B. Zimenkovsky et al., 2012, with the "code" P.8.

Code V5.01	Problem
P 8.1	The absence of CPs of certain nosology
P 8.2	The lack of PA in the currently used CP for certain clinical case
P 8.3	The absence of PA in the State Registry of PAs
P 8.4	The lack of evidence-based data concerning clinical effectiveness of PA

As a result, we found 8386 DRPs [6], a detailed list of which is given in Table 2.

TABLE 2. Detection of DRPs by the PCNE V5.01 classification scheme in the context of the analyzed medical prescriptions.

Code PCNE V5.01	Name of the DRP rubric according to the PCNE Classification Scheme V5.01	Number of cases	
		abs.	%
1	2	3	4
P 2.1.	Irrational (improper) PA was prescribed	431	5.14
P 2.2.	Improper drug form was prescribed	170	2.03
1	2	3	4
P 2.3.	Application of the same PA from one group	229	2.73
P 2.4	There are contraindications to the application of PA	21	0.25
P 2.5	There are no strict indications for the application of PA	1039	12.39
P 2.6	There are strict indications for the application of PA but the PA was not prescribed	474	5.65
P 3.1.	PA was administered in subtherapeutic dose	53	0.63
P 3.2.	PA was administered in extra dose	110	1.31
P 3.3	The duration of PT is insufficient	495	5.90
P 3.4	The duration of PH is increased	301	3.59
P 5.1	Possibility of potential interaction PA-PA	2029	24.20
P 7.1	Technical DRP	1214	14.48
P 8.2	The lack of PA in the currently used CP for certain clinical case	820	9.78
P 8.3	Absence of PA in the State Registry of PAs	664	7.92
P 8.4	The lack of evidence-based data concerning clinical effectiveness of PA	336	4.00
Total		8386	100

In order to further emphasize the attention of clinicians to common, including systemic, DRPs in PhT of patients with CAP, which were revealed in the PhTQ assessment, we have proposed an algorithm for generating systemic PhC messages aimed at physicians relating to specific nosology in general.

Thus, our proposed algorithm includes:

1. conducting a PhTQ assessment of the examined category of patients with detection of DRP according to the modified European Classification Scheme PCNE (n=8386);
2. isolation of DRPs related to PhT of specific nosology (not taking into account PhT complications and concomitant pathology of the patient) (n=1086);
3. the creation of PhC messages aimed at clinicians;
4. dissemination of the developed messages of PhC in the form of clinical and pharmaceutical referrals in health care institutions.

As a result of careful analysis, it was found that DRPs were most often associated with: the incorrect choice of empirical antibacterial therapy (ABT) that did not comply with the current clinical protocol (n=360 cases [33.15%]); the inadequate duration of the ABA PhT course (n=224 (20.64%)); the failure to account for interactions between prescribed medications (n=140 cases (12.89%)); the use of drugs of one PhTG (n=115 (10.64%)); the routine use of antifungal PA for the prevention of fungal infection without testing the fungal flora (n=90 (8.29%)); the use of non-steroidal anti-inflammatory PAs (NSAIDs) (n=90 (8.29%)); glucocorticoids (GC)

(n=28 (2.58%)); antiviral PAs in case of bacterial infection (n=24 (2.22%)) and incorrectly selected dose of ABA (n=15 (1.30%)) (Figure 1).

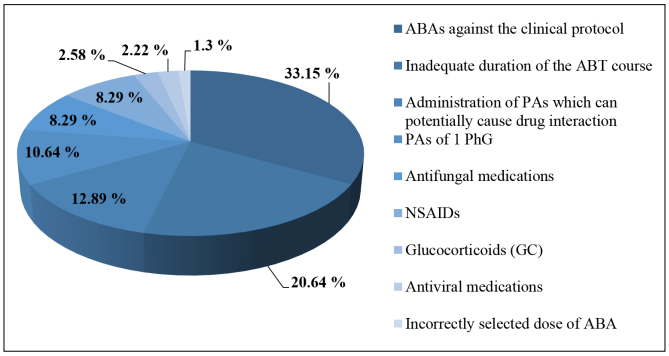

FIGURE 1. Poles opinon on the hierarchy of professioanl prestige based on the arithmetic mean.

Based on these, we have generated 276 systemic PhC messages to increase clinicians' awareness of: appropriate, inappropriate, and hazardous interactions between baseline and ancillary (symptomatic) PAs used in CAP PhT; the correct choice of empirical ABT, optimal dosage and duration of PhT, as well as the rational use of PAs from different PhTG.

DISCUSSION

The issues related to PhTQ are being actively discussed by the international scientific community nowadays. One of the major causes of adverse outcomes of PhT of patients with different nosologies is the increasing number of DRPs [1], and the overall economic burden of eliminating them, ranging from $40-42 billion a year worldwide [2].

On the other hand, the irrational use of PAs and polypragmasy lead to the development of serious adverse drug reactions (ADR) to PAs in patients. In the USA alone, 3.5-8.8 millions are hospitalized annually and 100-200 thousands die as a result of ADRs to PAs [13]. At the same time, economic losses due to the increase in the length of stay of the patient in the hospital amount to $4-5 billion per year in the USA [14] and €9 billion in Europe [14]. More than 1/2 of such complications arises as a result of irrational or incorrect choice of even quality medications as well as due to the fact that drug interaction is overlooked, the patient's age, concomitant pathology, etc. are not taken into account. According to NPSA, ABAs belong to the 8 PA groups, among which the errors related to their proper use are most commonly encountered. The target group of our study included CAP patients for whom PhT is based on ABAs. According to our PhTQ assessment study, it was found that more than 1/2 (55.07%) of all DRPs concerned the selection of ABAs that did not comply with the national clinical protocol for this nosology, the inappropriate duration of the ABT course, and the incorrectly selected dose of ABAs.

The results of PhTQ assessment as exemplified by patients with CAP, confirmed our scientific hypothesis about its poor quality. The number of 8386 DRPs was detected in the analyzed 540 medical prescriptions. In order to raise the physicians' awareness of the potential risks of inadequate PhT, including the hazardous and inappropriate interactions between PAs used in the individual PhT scheme, the correct choice of empirical ABT, including the optimal dosage regimen and duration of PhT, and the rational use of PAs from different PhTGs, we proposed an algorithm and developed PhC systemic messages for physicians that included 276 elements that can serve as an additional tool in improving PhTQ of patients.

CONCLUSIONS

1. Based on the results of the pharmacotherapy quality assessment of 540 patients with community-acquired pneumonia, 8386 DRPs were revealed, which confirmed our scientific hypothesis that the quality of pharmacotherapy of patients with community-acquired pneumonia needs to be better and emphasizes the need for means to effectively enhance its rationality.
2. Our algorithm for the development of systemic pharmaceutical care messages aimed at clinicians, as exemplified by community-acquired pneumonia, may serve as a prototype for the development of similar messages for other nosologies.

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Corresponding author
Doc. Juliana Janyshyn
69 Pekarska St., 79019 Lviv, Ukraine
E-mail: pidgirna2016@ukr.net