Assessment of Pharmacoeconomic and Pharmacoepidemiological Consequences of the Adoption of the Clinical Decision Support System (CDSS) Components in a Surgical Hospital using the ACT/DDD Methodology

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Introduction

- ✓ A clinical decision support system (CDSS) is a health information technology that provides clinicians, staff, patients, or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health care.
- ✓ CDSS encompasses a variety of tools to enhance decision-making in the clinical workflow.
- ✓ These tools include computerized alerts and reminders to care providers and patients; clinical guidelines; condition-specific order sets; focused patient data reports and summaries; documentation templates; diagnostic support, and contextually relevant reference information.
- ✓ A working definition has been proposed by Robert Hayward (Centre for Health Evidence): "Clinical decision support systems link health observations with health knowledge to influence health choices by clinicians for improved health care".
- ✓ CDSSs constitute a major topic in artificial intelligence in medicine.

Aim of study

- ✓ The purpose of the study was to assess the consequences of introducing drug dose control into the medical information system (MIS) while adding the information of the prescribed drugs into the electronic health record by blocking the prescription when a single or daily dose is exceeded according to the instructions for use, with further doctor notification

Materials and methods

- ✓ Analysis and economic assessment of the several drug groups consumption were carried out using the ACT / DDD methodology before and after the introduction of a drug dose regimen monitoring into the surgical hospital MIS when adding the information of the prescribed drugs into the electronic health records.
- ✓ Monitoring included blocking the prescription when a single or daily dose is exceeded according to the instructions for use with further doctor notification.
- ✓ Data on the consumption of medicinal products for 01.02.21-31.04.21 (control) and 01.06.21-31.08.21 (study) were analyzed.
- ✓ Accounting for the length of stay in the Hospital was carried out according to the data "Discharged", "Patients at the end", "Intensive care" and the same period. The average length of hospital stay was used for screening evaluation of the consumption of medicines related to the provision of medical care.
- ✓ The assessment of the structure and volume of drug consumption was carried out on the basis of the following indicators: - the total number of consumed daily doses (DDD) of antimicrobial drugs (AMP) per patient over a period of time; - the total number of consumed daily doses (DDD) of antimicrobial drugs per 100 patients-days over a period of time.

Results

The main indicators of the hospital operation during the observation period are presented in Table 1.

Table 1. The main indicators of the hospital operation

Parameters	01.02.2021 - 30.04.2021	01.06.2021 - 31.08.2021
Quantity of medical inpatient records	5484	5730
Medical inpatient record with the prescriptions of the drugs in question	3227	3234
Frequency of prescriptions	59%	56%
Duration of treatment before the introduction of dose control of the drugs	6301	6036
Duration of treatment after the introduction of dose control of the drugs	13608	13061

The results of the analysis of antimicrobial drug consumption are presented in Table 2.

Table 2. The analysis of antimicrobial drug consumption

Department	01.02.2021 - 30.04.2021		01.06.2021 - 31.08.2021	
	DDD	Cost, rub.	DDD	Cost, rub.
Gynecological Department	2 258	179 071	244	32 846
Cardiac Surgery Department	716	160 666	801	113 579
Oncology Department	115	85 686	64	70 837
Department of Anesthesiology and Intensive Care 1	1 034	766 926	1 578	867 188
Department of Anesthesiology and Intensive Care 2	515	40 242	740	121 596
Therapeutic Department	12	1 625	33	1 307
Traumatology Department 1	159	65 814	277	74 484
Traumatology Department 2	100	25 544	98	20 895
Urological Department	1 747	388 688	1 934	445 095
Endocrinological Surgical Department	807	704 526	89	19 997
The overall result	7 464	2 418 787	5 858	1 767 824

Pharmacoepidemiological analysis showed that the excess of single and daily doses can occur in up to 15% of cases of drug prescription, which lead to a significant increase in the drug therapy cost. Based on the results of the drug consumption database statistical processing, it was determined that most violations of the dose regimen happened while prescribing antibacterial drugs, non-narcotic analgesics, and non-steroidal anti-inflammatory drugs. ACT / DDD analysis showed a significant decrease in the consumption of the indicated groups of drugs after the introduction of the dose regimen control. Economic analysis identified a reduction in the cost of drug provision.

The introduction of dose control did not affect the average length of stay in the intensive care unit. The results of the analysis of the stay of patients in the intensive care unit are shown in Table 3

Table 3. The analysis of the stay of patients in the intensive care unit

Department	The duration of stay in the intensive care unit	
	01.02.2021 - 30.04.2021	01.06.2021 - 31.08.2021
Gynecological Department	0,66 days; n=8	2,66 days; n=22
Cardiac Surgery Department	1,26 days; n=323	1,25 days; n=241
Oncology Department	2,1 days; n=84	2,35 days. ; n=82
Traumatology Department 1	0,23 days; n=156	0,21 days; n=100
Traumatology Department 2	0,22 days; n=107	0,22 days; n=105
Urological Department	1,05 days; n=18	2,58 days; n=8
Endocrinological Surgical Department	1,46 days; n=32	1,55 days; n=46

The introduction of monitoring of compliance with the dose regime in the MIS has led to a decrease in the registration of adverse events in patients with various surgical profiles. (Fig. 1).

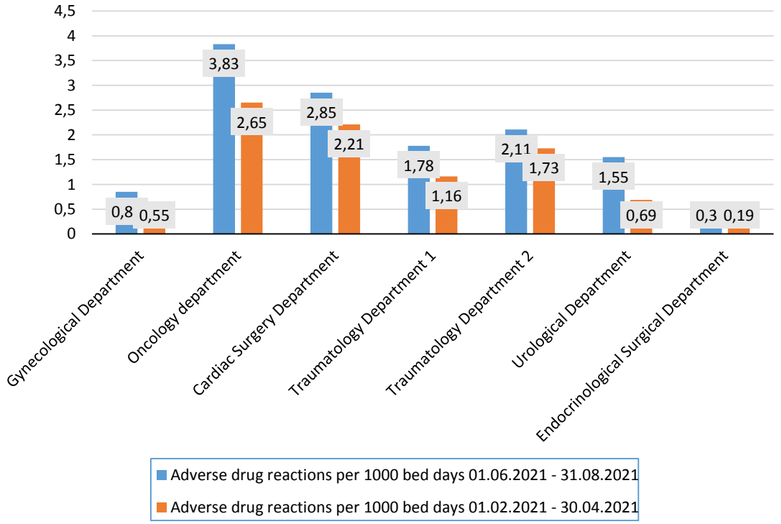

Figure 1. The adverse events

Conclusion

The introduction of CDSS elements into the real-world clinical practice by the example of dose control leads to a decrease in the irrational consumption of drugs and to a decrease in costs. ACT/DDD methodology, together with pharmacoeconomic and epidemiological analyses are important tools for assessing drug consumption in medical institutions, allowing to evaluate the consequences of the introduction of various management technologies, including CDSS elements.