

# Abstract

## Charles University, Faculty of Pharmacy in Hradec Kralove

Training Workplace	Department of Social and Clinical Pharmacy
Doctoral Degree Program	Clinical and Social Pharmacy
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Title of Doctoral Thesis	Analysis of selected drug related problems solved by clinical pharmacist - scientific approach in clinical pharmacy practice

### Introduction and objectives:

Drugs and vaccines contribute to the prevention and treatment of disease, but it is well known that in addition to their benefits, their use is associated with risks and adverse effects that may be both predictable and unexpected. Thanks to the development of science and knowledge in areas that influence the processes of healthcare delivery, the high quality of healthcare and its accessibility to patients, and the increasing number of medicines used, the average age of the population is increasing and with it the risks associated with pharmacotherapy. The role of the clinical pharmacist in a healthcare facility is important in different areas of healthcare delivery, and the involvement of the clinical pharmacist in the patient care process has been shown to increase the safety and efficiency of that care while reducing the cost of treatment. The risks associated with the administration of medicines and adverse drug reactions increase the cost of treatment and their expenditure appears to be excessive according to published studies:

1. Analysis of medication problems and their risk factors by a clinical pharmacist, which could be the cause of hospitalization of geriatric patients in the geriatric ward of the University Hospital in Hradec Kralove
2. Identification and analysis of medication problems in an accredited hospital identified during a medication audit
3. Analysis of the significance and possibilities of using catheter locks with a focus on taurolidine

## Methodology:

1. A cross-sectional study was conducted to analyze the hospitalizations of patients admitted to the Geriatric Unit, which is one of the parts of the III. The study was conducted in the Geriatric Department, one of the units of the Internal Gerontometabolic Clinic of the University Hospital in Hradec Kralove. The cross-sectional study investigated whether hospitalization in the geriatric ward was related to DRPs.
2. An analysis of the results of medication audits in the HK Hospital for the period 2017-2020 was performed. The cross-sectional study was divided into two parts, a general part (analysis of audit questions according to the audit protocol) and a special part (evaluation of DRPs according to criteria adapted from the PCNE classification).
3. In vitro analysis of the efficacy of different concentrations of taurolidine on biofilm eradication was performed. Different concentrations of taurolidine were used: TauroSept 2%, TauroLock 1.35%, Taurolock half concentration i. e. 0.675% and 3.5% taurolidine solution (magistraliter preparation). The presence of *Staphylococcus (S.) epidermidis*, *S. aureus*, *S. hominis*, methicillin resistant *S. aureus* (MRSA), *Pseudomonas (P.) aeruginosa* (PSAE), multidrug-resistant *P. aeruginosa* (MR PSAE), vancomycin-resistant enterococci, *Klebsiella pneumoniae* producing extended-spectrum beta-lactamase (KLPN ESBL), *Candida (C.) albicans* and *C. glabrata*.

## Results:

1. 366 acute hospital admissions were included in the follow-up. The mean age of the patients was  $85.9 \pm 4.8$  (71-103). Women were older ( $86.2 \pm 5.2$ ) than men ( $85.4 \pm 4.1$ ). The majority of detected ADEs were in females (n=240, 65.6%). The mean number of medications taken before hospitalization was  $7.16 \pm 3.37$  (0-16). The prevalence of ADEs that were the reason for hospitalization was 11.75% (95% CI 8.45-15.05). The prevalence of ADEs is shown in Table 3. Gastrointestinal bleeding and ulcer formation were the most common ADEs (30.23%), followed by hyponatremia (23.26%) and digitalis intoxication (11.63%). Mineral imbalances were found in 30.23% of all ADEs. Anticoagulants and antithrombotics most often led to semi-medical hospitalization. Anticoagulants in 14% of cases and antithrombotics in 16.3% of cases. The manifestation of ADE was GIT bleeding, ulcerations and hematomas. Diuretics as the reason for ADE was identified in 30.2% of cases and ADEs manifested as hyponatremia, hypo-kalemia and dehydration. The drugs that most frequently caused the polypharmacy were

hydrochlorothiazide (n=6), digoxin (n=5), warfarin (n=5), acetylsalicylic acid (n=5) and furosemide (n=4). Of the 43 polyp admissions, 24 (55.8%) were assessed as potentially preventable.

2. In the period 2017-2020, the medical records from most of the inpatient departments of the HCF were evaluated, two per department. In the general part, the quality of pharmacotherapy prescription and documentation was evaluated using the compliance/non-compliance method (according to the audit protocol questions). The level of compliance with the set internal regulations and according to the current legislation was assessed. Compliance in at least 95% of the questions was considered as a positive evaluation or achievement of the objective. In the first year of the project, 10 out of 22 (54.5%) audited workplaces did not achieve this goal; on the other hand, 5 workplaces (22.7%) achieved the maximum possible rating, with no non-conformities. In 2018, this number was 10 out of 23 (43.5%), with only one workplace rated with no non-conformities. In 2019, there was an improvement in the rating across the HK FN, with only one clinic rated below 95%, and three (13%) clinics with no disagreements. In 2020, no clinic was rated below 1.9 (95%), and a total of 10 out of 16 rated clinics (62.5%) had no disagreements. Drug risk groups include (according to ATC classification) analgesics, CNS-affecting drugs, ATBs, cardiovascular drugs, and anti-coagulants and anti-platelet drugs.
3. Statistically significant decreases in CFU were observed after 30, 60 and 120 minutes for *S. hominis*, *S. epidermidis*, PAE, KLPN ESBL, KPC, *C. albicans* and *C. glabrata* strains, after 60 and 120 minutes for multidrug-resistant PAE, and after 120 minutes for *S. aureus*. For MRSA and VRE, there was no statistically significant decrease in CFU counts at any of the times tested.

### **Conclusion:**

DRPs and ADEs are still among the risks associated with hospitalization, as are catheter infections common in the hospital setting. The results indicate the importance of proper and regular assessment of benefits and risks related to efficacy and safety, especially for certain drug groups. Our challenge-ment shows that analgesics, CNS drugs, cardiovascular drugs, antiplatelet agents, antithrombotics and ATBs are among the most common. ATBs are an integral part of prevention and treatment in patients with venous catheter insertion. With regard to risk reduction and prevention of catheter infections, attention is turned to other drugs and agents that could prevent these risks. The use of catheter locks containing taurolidine instead of antibiotic catheter locks or catheter locks containing high percentage alcohol seems to be very promising.