

## Abstract

**Institution/department:** Charles University, Faculty of Pharmacy in Hradec Králové, Department of Social and Clinical Pharmacy

**Title of diploma thesis:** Changes in renal functions in older age and adjustments of drug dosing in seniors

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**Introduction:** Aging of the population is a natural process, when older age is often accompanied by a physiological or pathological decrease in renal functions. It is reported that at the age of 85 years and older, up to 50% of patients have a significant decrease in renal functioning, which requires adjustment of the dosage of drugs. Thus, the correct choice of drug regimen and dose adjustment of drugs in decreased renal functions is important especially in older age, when at the same time there is a more frequent occurrence of severe drug reactions caused also by other pharmacological changes and other risk factors. The aim of the thesis was to determine which drugs with the need for dose adjustment are most often prescribed in the Czech sample of patients of the EuroAgeism H2020 project, whether the dosage regimens for these drugs are correctly determined with respect to renal functions, and in which cases the most common drug errors occur in the dosage of drugs or in the administration.

**Methodology:** For the analysis of the thesis, the data of the Czech files of senior acute and outpatient care collected within the framework of the European project EUROAGEISM H2020 ESR7 (under the title “Inappropriate prescribing and availability of medication safety and medication management services in older patients in Europe”) in the period from November 2017 to April 2023 were used. A total of 1,602 elderly patients from different regions of the Czech Republic were included in the study. Data on impaired renal functions were only available for seniors examined in acute and outpatient care, and in both sets 296 patients with chronic kidney disease of various stages were identified, of which 220 seniors in acute care and 76 seniors in outpatient care.

The project was approved by the Ethics Committee of the Faculty of Pharmacy of Charles University in Hradec Králové and the data was collected with the help of a standardized protocol of comprehensive geriatric examination, which included all the data of the comprehensive geriatric assessment (socio-demographic data, clinical data related to diseases, functional characteristics, symptoms and senile frailty, and comprehensive data related to drugs used). Data was collected by medical and research workers by interviewing with patients and from medical documentation. Patients in intensive care with severe cognitive impairment or severe hearing and speech disorders were excluded from the study under the terms of the EuroAgeism H2020 project. All information was collected and recorded in anonymized form. For the analysis of drugs requiring dose adjustment in chronic kidney disease (CKD), AISLP databases were used – data from

SmPCs ("summaries of product data") and "the Renal Drug Handbook 5th edition". Dose adjustment tables for different grades of CKD were developed and used for the analyses.

The frequencies of the analyzed variables were statistically expressed in both absolute and relative frequencies (percentages). Continuous quantities were described by mean and standard deviation (SD). Differences between the groups were evaluated by Fisher's test, differences in continuous quantities by an Independent t-test, and were considered statistically significant at a probability level of  $p < 0.05$ . The pilot analyses were processed in the statistical software R, version 4.3.0.

**Results:** Among patients with an eGFR (estimated glomerular filtration rate) of 50 to 20 ml/min, 131 elderly patients were identified (data were partially absent for 3 subjects), including 86 patients examined in acute care and 45 patients examined in outpatient care. 61 elderly out of 131 subjects were prescribed at least 1 drug for which adjustments of at least one of the doses are required (46,6 %; of the total number of records of individual drugs (N=1224), 74 records (6%) were improperly chosen). Exceeded single dose was observed in 10 patients from acute care (12,8 %) and 8 patients from outpatient care (17,8 %), the risk daily dose was found in 1 patient from acute care (2,3 %) and 3 patients (4,4 %) from outpatient care. Inappropriateness of both doses (single and daily) was observed in 21 subjects in acute care (34,9 %) and 11 subjects in outpatient care (33,3 %).

**Conclusion:** From our analysis, most errors in single, daily or both dose selection were observed in patients with a slight decrease in renal function (eGFR category 50 to 20 ml / min). Errors were confirmed in 46,6 % of users. As a rule, in all categories of CKD, 6-8 % of errors were found in the number of drug records (expressed on the number of drug records, not on the number of patients). While drug regimens are more closely monitored in patients with eGFR below 20 mL / min, the elderly group with mild renal failure (eGFR 50 to 20 ml/min) should be given greater attention by physicians and clinical pharmacists in individualizing dosage to avoid possible further deterioration of renal function or severe drug reactions.

**Keywords:** rational pharmacotherapy in old age, inappropriate prescribing of drugs, renal function, dosage adjustments of drugs in old age

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