

Identifikacija terapijskih problema tokom uvođenja usluga farmaceuta na Odeljenju gerijatrije Kliničko-bolnickog centra

Identification of drug-related problems during pharmaceutical care services - introduction to the Geriatric Department at the University medical center

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Sažetak

Uvod: Višestruki komorbiditeti i polifarmacija dovode gerijatrijske pacijente u povećan rizik od terapijskih problema, što može dovesti do povećanog morbiditeta, mortaliteta i troškova zdravstvene zaštite ovih pacijenata.

Cilj rada: Cilj studije je da identifikuje učestalost i uzroke terapijskih problema kod starijih pacijenata i faktore koji na njih utiču, kao i da proceni implementaciju usluga farmaceuta na gerijatrijskom odeljenju.

Metod: Farmaceut je analizirao terapiju hospitalizovanih pacijenata na odeljenju za gerijatriju, identifikovao terapijske probleme i formulisao preporuke za promenu terapije. Terapijski problemi su kategorizovani prema PCNE-DRP klasifikaciji, verzija 9. U studiju je uključeno ukupno 100 pacijenata, od kojih su 52% bili muškarci, prosečne starosti 79,7±7,88 godina.

Rezultati: Prosečan broj identifikovanih terapijskih problema je bio 2,36 po pacijentu. Najčešće uočen problem je bezbednost terapije (44,9%), zatim efikasnost terapije (33,1%) i nepotreban lek u terapiji (22%). Za većinu terapijskih problema uzrok je bio neadekvatan izbor leka (61%) i neadekvatan izbor doze (38,1%). Pacijenti sa atrijalnom fibrilacijom i hroničnom bubrežnom insuficijencijom imali su značajno veći broj terapijskih problema u poređenju sa pacijentima bez ovih komorbiditeta. Analizirana terapija za 100 hospitalizovanih gerijatrijskih pacijenata zahtevala je ukupno 229 intervencija. Međutim, stopa prihvatanja preporučenih intervencija bila je niska (25,9%).

Zaključak: Prevalencija terapijskih problema kod gerijatrijskih pacijenata je visoka, dok je stepen prihvatanja preporuka farmaceuta za promenu terapije nizak. Da bi se unapredila implementacija farmaceutskih usluga i poboljšala

Abstract

Introduction: Patients with multiple comorbidities and undergoing polypharmacy are at a high risk of experiencing drug-related problems (DRPs). These DRPs can lead to increased morbidity, mortality, and healthcare costs.

Objective: This study aims to identify the prevalence and causes of DRPs in geriatric inpatients, as well as the factors that contribute to them. Additionally, the study intends to evaluate the implementation of ward-based pharmacy services in the geriatric department.

Method: The pharmacist analyzed inpatient therapy, identified DRPs, and formulated recommendations. DRPs were categorized according to the PCNE-DRP classification, version 9. A total of 100 patients, of which 52% were men, average age of 79.7±7.88 years, were included in the study.

Results: Our study found that on average, each patient had 2.36 drug-related problems (DRPs). The most common DRP was related to treatment safety, accounting for 44.9% of cases, followed by treatment effectiveness (33.1%) and unnecessary drug treatment (22%). The main cause of DRPs was inadequate drug selection (61%) and inadequate dose selection (38.1%). Patients with atrial fibrillation and chronic renal failure had more DRPs than those without these conditions. In total, we identified 229 interventions to address these DRPs. However, the acceptance rate of these recommended interventions was low at 25.9%.

Conclusion: The rate of drug-related issues in elderly hospital patients was found to be high, but the rate of acceptance of interventions to address these issues was low. In order to enhance the implementation of pharmaceutical services and improve healthcare for elderly patients, it is crucial to improve the collaboration between healthcare providers and



zdravstvena zaštita starijih pacijenata, veoma je važno unaprediti saradnju između lekara i farmaceuta. Razumevanje veština farmaceuta može omogućiti prihvatanje farmaceuta kao dela multidisciplinarnog tima i uspešnu implementaciju farmaceutskih usluga.

Cljučne reči: klinička farmacija, terapijski problem, gerijatrija

Uvod

Svetska populacija brzo stari i kao rezultat toga ljudi duže žive. Starije osobe često koriste više lekova u cilju lečenja ili prevencije hroničnih zdravstvenih problema. Međutim, ovo može povećati rizik od pojave terapijskih problema (TP) zbog kombinacije višestrukih zdravstvenih problema i lekova. TP mogu voditi ka povećanju zdravstvenih troškova, morbiditeta i čak i mortaliteta. Promene u farmakokinetici/farmakodinamici lekova i smanjenje funkcije organa kod starijih osoba mogu dovesti do većeg broja TP¹⁻³.

Utvrđivanje i rešavanje terapijskih problema (TP) je bitan aspekt farmaceutske nege, naročito za starije osobe³. Evropska mreža farmaceutske nege (The Pharmaceutical Care Network Europe – PCNE-engl.) definiše TP kao događaj ili okolnost koja podrazumeva medikamentoznu terapiju koja utiče na željene zdravstvene ishode, bilo aktuelno ili potencijalno⁴. PCNE-DRP sistem klasifikacije je široko rasprostranjen u bolnicama jer se smatra potvrđenim sistemom za TP klasifikaciju⁵. Klinički farmaceuti nude jedinstveni pogled na terapijsku procenu što može voditi otkrivanju i sprečavanju TP, uključujući neželjene reakcije lekova i potencijalno opasne interakcije⁶⁻⁸. Uključivanje kliničkih farmaceuta, kao članova multidisciplinarnih zdravstvenih timova, može doprineti optimizaciji farmakoterapije za starije pacijente, poboljšanju kliničkih ishoda, smanjenju ponovnog prijema u bolnicu, sprečavanju hospitalizacije i voditi značajnom smanjenju zdravstvenih troškova⁹⁻¹².

Cilj

Ranije studije, rađene u Srbiji, bavile su se terapijskim problemima kod starijih, kao npr. upotreba više lekova, korišćenje suplemenata, pacijentovom brigom o neželjenim efektima leka ali i problemima u vezi same terapije i neredovnog uzimanja lekova^{13,14}. Cilj ove studije je da identifikuje terapijske probleme kod pacijenata koji su primljeni na Odeljenje gerijatrije Kliničko-bolničkog centra Zvezdara. Studija će se fokusirati na učestalost i uzroke ovih problema, kao i faktore koji dovode do njih. Uz to, studija će proceniti implementaciju usluga farmaceuta na Odeljenju gerijatrije.

pharmacists. Recognizing the unique skills and expertise that pharmacists bring to the table can facilitate their integration as a valuable member of a multidisciplinary healthcare team.

Keyword: clinical pharmacy, drug-related problems, geriatrics

Introduction

The world's population is rapidly growing older and as a result, people are living longer. Older individuals often rely on several medications to treat or prevent chronic health issues. However, this can put them at risk for drug-related problems (DRPs) due to the combination of multiple health problems and medications. DRPs can lead to an increase in healthcare costs, morbidity, and even mortality. As organs begin to function less efficiently and pharmacokinetics/pharmacodynamics change, the likelihood of DRPs also increases¹⁻³.

Identifying and resolving drug-related problems (DRPs) is an essential aspect of pharmaceutical care practice, particularly for older individuals³. The Pharmaceutical Care Network Europe (PCNE) defines a DRP as an event or circumstance involving drug therapy that interferes with desired health outcomes, either actually or potentially⁴. The PCNE-DRP classification system is widely used in hospitals because it is considered a validated system for DRP classification⁵. Clinical pharmacists offer a unique perspective in therapy evaluation, which can lead to the detection and prevention of DRPs, including adverse drug reactions and potentially dangerous interactions⁶⁻⁸. Involving clinical pharmacists as members of a multidisciplinary healthcare team can contribute to optimizing drug therapy for older patients, improving clinical outcomes, reducing readmissions, preventing hospitalization days, and leading to significant healthcare cost savings⁹⁻¹².

Objective

Previous studies have looked into drug-related issues in the elderly population in Serbia, such as the use of multiple medications, the use of over-the-counter drugs, patient concerns about side effects, and problems with therapy and non-adherence^{13,14}. The aim of this study is to identify drug-related problems in patients admitted to the Clinical Department of Geriatrics at Zvezdara University Medical Center. The study will focus on the frequency and causes of these problems, as well as the factors that contribute to them. Additionally, the study will evaluate the implementation of pharmaceutical care services in the geriatric department.

Metod

Postavka i dizajn studije

Prospektivna, interventna studija je sprovedena tokom 5 meseci na Odeljenju gerijatrije Kliničko bolničkog centra Zvezdara, Beograd, Srbija (Univerzitetaska nastavna bolnica). Studija je uključila pacijente starosti 65 godina i starije, koji su primljeni u gerijatrijsku ambulantu ili hitnu službu iste bolnice, sa akutnim gerijatrijskim problemima i posledično su hospitalizovani. Tokom ovog perioda farmaceut je izvršio pregled korišćenih lekova na Odeljenju gerijatrije. Klinički farmaceut je specijalistički obučeni farmaceut koji obezbeđuje direktnu negu pacijenta i sveobuhvatno upravljanje lekovima¹⁵. Farmaceut iz ove studije završio je studije farmacije u trajanju od 5 godina i doktorske studije, i u vreme ove studije bio je na završnoj godini specijalističkih studija iz kliničke farmacije. Tokom studija, stekao je veliko iskustvo, razvio veštine u pregledu lekova, interakcija lekova, farmakokinetike, farmakovigilance i farmaceutskog savetovanja. Farmaceut je stekao dodatno iskustvo kako u apoteci otvorenog tipa tako i u bolničkoj apoteci. Integrisanje u Odeljenje gerijatrije poslužilo je kao prvo iskustvo u bolničkoj sredini.

Kao deo studije i specijalističkog programa, farmaceut je pregledao dokumentaciju pacijenata, procenio njihovu terapiju, identifikovao terapijske probleme (TP) i napravio preporuke. Farmaceut je bio prisutan na odeljenju tri sata jednom nedeljno, ali nije učestvovao u jutarnjim vizitama ili drugim multidisciplinarnim sastancima tima.

Sve procedure su sprovedene u skladu sa etičkim standardima Nacionalnog istraživačkog komiteta i Helsinške deklaracije. Etički komitet Kliničko bolničkog centra Zvezdara u Beogradu, Srbija odobrio je studiju 22. januara 2021.

Sakupljanje podataka i analiza

Farmaceut je sproveo sveobuhvatan pregled terapije iz pacijentovih zdravstvenih nalaza. Pre ove studije farmaceuti nisu pregledali terapiju na ovom odeljenju. Zabeležene su demografske karakteristike pacijenata, bolesti i ranije propisani lekovi. Podaci pacijenata su sakupljeni iz medicinske dokumentacije tokom hospitalizacije – komorbiditeti, trajanje hospitalizacije, razlozi hospitalizacije, laboratorijski i mikrobiološki rezultati i lekovi. Tokom procesa pregleda lekova, farmaceut je koristio najnovije vodiče kliničke prakse, standardizovane baze podataka, kao što su *British National Formulary (BNF)*, *LexiComp Online*, sažetke karakteristika lekova, kao i STOPP/START kriterijume za potencijalno neadekvatno propisivanje lekova kod starijih osoba¹⁶.

Lek-lek interakcije (LLI) analizirane su korišćenjem online LexiInteract® baze podataka (Lexicomp Online®, Lexi-Comp, Inc., Hadson, Ohajo). Značajne i ozbiljne interakcije lekova smatrane su TP. Bazirano na pregledu lekova,

Method

Setting and study design

A prospective, interventional study was conducted over 5 months at the Clinical Department of Geriatrics of Zvezdara University Medical Center, Belgrade, Serbia. The study included patients aged 65 or over, admitted to the outpatient geriatric clinic or emergency department of the same hospital with acute geriatric problems, and successively hospitalized. During this period, a pharmacist carried out medication reviews at the geriatric department. A clinical pharmacist is a specialty-trained practitioner who provides direct patient care and comprehensive medication management¹⁵. The pharmacist in this study completed a five-year bachelor's degree program in pharmacy and a Ph.D. program, and at the time was a final year student of a postgraduate 'Clinical pharmacy' course. Throughout these studies, extensive experience was gained, developing skills in medication review, drug interactions, pharmacokinetics, pharmacovigilance, and pharmacist counseling. The pharmacist acquired additional experience in both the community pharmacy and the hospital's Pharmacy Department. Integrating into the geriatric department served as first experience in an inpatient ward setting.

As part of the study and training program, a pharmacist reviewed patient records, evaluated patient therapy, identified drug-related issues (DRPs), and made recommendations. The pharmacist was present at the ward for three hours once a week, but did not participate in morning rounds or other multidisciplinary team meetings.

All procedures were conducted in accordance with the ethical standards of the National Research Committee and the Helsinki Declaration. The Ethics Committee of Zvezdara University Medical Center in Belgrade, Serbia approved the study on January 22, 2021.

Data collection and analysis

The pharmacist conducted a comprehensive medication review of the patient's medical records. There was no pharmacist performing medication reviews in this department before this study. Patient demographic characteristics, medical conditions, and prescribed medications from the past were recorded. Patients' data were collected from medical documentation during the respective hospitalization: comorbidities, duration of hospitalization, reasons for hospitalization, laboratory and microbiological test results, and medications. In the medication review process, the pharmacist used the latest clinical practice guidelines, standardized databases such as the British National Formulary (BNF), LexiComp Online, summaries of drug characteristics, as well as STOPP/START criteria for potentially inappropriate prescribing in older people¹⁶.

farmaceut je procenjivao pacijentovu farmakoterapiju i njenu bezbednost i efikasnost.

STOPP/START kriterijumi su korisni u identifikaciji i pružanju podrške u prekidu terapije lekovima koji mogu naškoditi i uvođenju korisnih lekova (gde je adekvatno), ali i kao deo rutinske provere terapije kod starijih osoba sa komorbiditetima koji koriste više lekova. STOPP kriterijumi se koriste kako bi se identifikovali potencijalno neadekvatni lekovi (PNA), podeljeni po fiziološkim sistemima i dodatnim kategorijama, kao što su pacijenti sa velikim rizikom od pada, pacijenti koji uzimaju opioidne analgetike i oni koji uzimaju lekove sa antiholinergičkim dejstvom. START kriterijumi su napravljeni da identifikuju potencijalne propisivačke greške (PPG), što je drugi bitan aspekt neadekvatnog propisivanja, tj. kada neophodni lekovi nisu propisani uprkos jasnim i validnim indikacijama.

LexiComp Online je sveobuhvatni izvor koji ima 25 stavki. Uključuje šest izvora monografija o lekovima koji se propisuju na recept ali i suplementima, dve knjige internacionalnih monografija i individualne knjige posvećene monografijama o biljkama, obrazovanju pacijenata i u mlađoj i u starijoj dobi, trudnoći i dojenju, toksikologiji, alergijama na lekove, laboratorijskim i dijagnostičkim testovima i farmakogenomici. Interaktivni alati u sklopu LexiComp Online sačinjavaju identifikator tableta, alat za interakciju oralnih i topikalnih lekova, više od 100 kliničkih kalkulatora i dva alata za interakcije intravenskih lekova.

Pacijentova zdravstvena dokumentacija je temeljno pregledana kako bi se identifikovali terapijski problemi (TP) i napravile preporuke za neophodne promene u terapiji. Identifikovani TP su klasifikovani po PCNE-DRP klasifikaciji, verzija 9.00, koja ima 5 kategorija: problemi, uzroci, intervencije, prihvatanje intervencije i status TP. Termin "problem", u kontekstu terapije, odnosi se na očekivanu ili neočekivanu situaciju, koja može biti pogrešna. Ova studija razmatra i očigledne i potencijalne probleme. Uzrok problema je akcija ili nedostatak akcije koja je dovela do njegove pojave. Intervencija je predložena mera koju farmaceut može da preduzme kako bi sprečio ili rešio problem. Predložena akcija bi trebalo da poboljša ili bar održi pacijentovo zdravlje i dobrobit. "Prihvatanje" se odnosi na evaluaciju farmaceutovih predloga od strane lekara.

Farmaceut je dao preporuke za ordinirajuće lekare i specijalizante, najpre putem mejla, a onda i lično, kako bi se detaljno prodiskutovalo o preporukama i procenio odgovor lekara na preporuke. Konačna odluka o tome da li će se prihvatiti preporuke ili ne je bila na lekaru.

Drug-drug interactions (DDI) were analyzed using an online LexiInteract® database (Lexicomp Online®, Lexi-Comp, Inc., Hudson, Ohio). The significant and serious drug interactions were considered as DRPs. Based on the medication review, the pharmacist assessed the patient's medication therapy and evaluated its safety and effectiveness.

The STOPP/START criteria are helpful in identifying and supporting the discontinuation of harmful medication and the introduction of beneficial medication (where appropriate) as part of routine medication review in older people with multiple medical conditions and taking multiple medications. The STOPP criteria are used to detect potentially inappropriate medications (PIMs) based on physiological systems and additional categories such as patients at risk of falls, patients taking opioid analgesics, and patients taking drugs with anticholinergic properties. The START criteria are designed to identify potential prescribing omissions (PPOs), which is another crucial aspect of inappropriate prescribing, that is, when necessary medications are not prescribed despite clear and valid indications.

LexiComp Online is a comprehensive resource that features more than 25 items. It includes six sources of monographs on prescription and over-the-counter drugs, two books on international monographs, and individual books dedicated to herbal monographs, patient education for adult and pediatric populations, pregnancy and lactation, toxicology, drug allergies, lab and diagnostic tests, and pharmacogenomics. The interactive tools provided by LexiComp Online comprise a pill identifier, oral and topical drug interaction tool, more than 100 clinical calculators, and two intravenous drug interaction tools.

The patient's medical records were thoroughly reviewed to identify any drug-related problems (DRPs) and develop recommendations for necessary changes in therapy. The identified DRPs were classified according to the PCNE-DRP classification, version 9.00, which is divided into five categories: problems, causes, interventions, intervention acceptance, and status of the DRP. The term "problem" in the context of drug therapy refers to an expected or unexpected situation that could be wrong. This study considers both obvious and potential problems. The cause of a problem is the action or lack of action that led to its occurrence. The intervention is the proposed measure that a pharmacist can take to prevent or solve a problem. The proposed action should improve or maintain the patient's health and well-being. "Acceptance" refers to the evaluation of the pharmacist's intervention proposals by physicians.

The pharmacist conveyed the recommendations to the concerned physician and medical resident, first via email and then in person to discuss the recommendations in detail and assess the responsiveness of the physician towards them. The final decision on whether to accept or reject the recommendations was made by the physician.

Statistička analiza

Normalna distribucija varijabli je procenjena korišćenjem Kolmogorov-Smirnov testa. Kontinuirani podaci su opisani korišćenjem srednje vrednosti \pm standardne devijacije ili medijane i interkvartilnog raspona. Kategorički podaci su opisani u vidu frekvenci. Pirsonov test korelacije je korišćen za analizu korelacije između broja TP i pacijentovih varijabli. Kategorizovani podaci su analizirani korišćenjem Pirsonovog X^2 testa. SPSS 20.0 statistički softver paket je korišćen za sve statističke analize. P-vrednost manja od 0.05 se smatrala značajnom.

Rezultati

Tokom hospitalizacije farmaceut je sproveo proces pregleda terapije za ukupno 100 pacijenata. Karakteristike pacijenata su prikazane u Tabeli 1. Srednja starost pacijenata bila je 79.7 ± 7.88 godina, sa odnosom muškarci prema ženama 52%:48%. U proseku, svaki pacijent je dobio 8.5 lekova, a 93% njih je dobilo pet ili više lekova (polifarmacija). Tokom hospitalizacije, 37% pacijenata uzimalo je 10 ili više različitih lekova. Većina pacijenata imala je 4 ili 5 komorbiditeta.

Table 1. Characteristics of the patients

Tabela 1. Karakteristike pacijenata

Characteristic/Karakteristike		Number of patients/Broj pacijenata (%) or/ili Mean/Srednja vrednost \pm SD or/ili Median/Medijana [IQR]
Gender/Pol	Male/Muškarci	52 (52)
	Female/Žene	48 (48)
Age/Starost (years/godine)		79.7 \pm 7.88
Number of diagnoses/Broj dijagnoza		5 [4-6.75]
Number of drugs/Broj lekova		8.5 [6-10]
Renal function /Bubrežna funkcija	eGFR > 60 mL/min/1.73 m ²	66 (66)
	eGFR \leq 60 mL/min/1.73 m ²	34 (34)

eGFR – estimated glomerular filtration rate/ procenjena glomerularna filtracija

Farmaceut je identifikovao 236 terapijskih problema (TP) kod ovih pacijenata. Najmanje jedan potencijalni TP je identifikovan kod 85% pacijenata. U proseku, svaki pacijent je imao 2.36 ± 1.67 TP. Prema korelacionoj analizi, postojala je direktna pozitivna korelacija između broja komorbiditeta po pacijentu i broja TP (koeficijent korelacije (r) = 0.328, p = 0.001). Uz to, postojala je i direktna pozitivna korelacija između broja lekova po pacijentu i broja TP (koeficijent korelacije (r) = 0.607, p = 0.0001).

Statistical analysis

The normal distribution of variables was estimated using the Kolmogorov-Smirnov test. Continuous data was described using mean \pm standard deviation or median and interquartile range. Categorical data were described in terms of frequencies. Pearson's correlation test was utilized to analyze the correlation between the number of DRPs and patient variables. Categorized data were analyzed using Pearson's Chi-square test. The SPSS 20.0 statistical software package was used for all statistical analyses. A p-value of less than 0.05 was considered significant.

Results

During the hospitalization, a pharmacist conducted a medication review process for a total of 100 patients. The patient characteristics are presented in Table 1. The mean age of the patients was 79.7 ± 7.88 years, with a male to female ratio of 52%:48%. On average, each patient received 8.5 drugs, with 93% of them receiving five or more drugs (polypharmacy). During hospitalization, 37% of patients received 10 or more different drugs. The majority of patients had 4 or 5 comorbidities.

The pharmacist has identified 236 potential Drug Related Problems (DRPs) in the patients. At least one potential DRP was identified in 85% of the patients. On average, each patient had 2.36 ± 1.67 DRPs. According to the correlation analysis, there was a direct positive correlation found between the number of comorbidities per patient and the number of DRPs (correlation coefficient (r) = 0.328, p = 0.001). Additionally, there was a direct positive correlation between the number of drugs per patient and the number of DRPs (correlation coefficient (r) = 0.607, p = 0.0001).

U našoj studiji, našli smo različite kategorije terapijskih problema (TP) i njihove uzroke, prema PCNE klasifikaciji, što je pokazano u Tabeli 2. Načešće uočeni TP su bili bebednost terapije (44.9%), zatim efikasnost terapije (33.1%) i nepotreban lek u terapiji (22%). Za većinu uočenih TP uzrok je bio neadekvatan izbor leka (61%). Razlozi su bili neadekvatna kombinacija lekova (17.8%), nekompletna terapija (17.4%) i lek bez indikacija (16.5%). Štaviše, neadekvatna doza bila je uzrok 90 TP (38.1%), uglavnom zbog previsokih doza lekova.

In our study, we found different categories of Drug Related Problems (DRPs) and their causes, according to the PCNE classification, which are presented in Table 2. The most commonly observed DRP was treatment safety (44.9%), followed by treatment effectiveness (33.1%) and unnecessary drug treatment (22%). For most of the DRPs detected, the cause was inadequate drug selection (61%). This was due to an inappropriate combination of drugs (17.8%), incomplete drug treatment (17.4%), and no indication for drug (16.5%). Additionally, inadequate dose was the cause of 90 DRPs (38.1%), which were mainly due to high dosages.

Table 2. PCNE categories of possible drug-related problems, causes and pharmacist interventions

Tabela 2. PCNE kategorije potencijalnih terapijskih problema, uzroka i intervencija farmaceuta

Problem (total/ukupno 236)		n (%)
P1.	Treatment effectiveness/Efikasnost terapije	78 (33.1)
P1.1.	No effect of drug treatment despite correct use/Terapija nije efikasna	15 (6.4)
P1.2.	Effect of drug treatment not optimal/Efikasnost terapije nije optimalna	22 (9.3)
P1.3.	Untreated symptoms or indication/Nelečeni simptomi ili indikacija	41 (17.4)
P2.	Treatment safety/Bezbednost terapije	106 (44.9)
P2.1.	Adverse drug event (possibly) occurring/ (Potencijalno) ispoljavanje neželjenog događaja leka	106 (44.9)
P3.	Other/Ostalo	52 (22.0)
P3.2.	Unnecessary drug-treatment /Nepotreban lek u terapiji	52 (22.0)
Cause/Uzrok (total/ukupno 236)		n (%)
C1.	Drug selection/Izbor leka	144 (61.0)
C1.1.	Inappropriate drug according to guidelines/formulary/ Neodgovarajući lek prema vodičima	11 (4.7)
C1.2.U1.1.	Inappropriate drug (within guidelines but otherwise contraindicated)/ Neodgovarajući lek (lek je kontraindikovan, iako je izabran prema vodičima)	5 (2.1)
C1.3.	No indication for drug/ Lek bez indikacije	39 (16.5)
C1.4.	Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements/ Neodgovarajuća kombinacija lekova, ili lekova i biljnih lekova, ili lekova i dijetetskih suplemenata	42 (17.8)
C1.6.	No or incomplete drug treatment in spite of existing indication/ Uprkos postojećoj indikaciji, ne postoji lek u terapiji ili je terapija nekompletna	41 (17.4)
C1.7.	Too many drugs prescribed for indication/ Propisano previše lekova za indikaciju	6 (2.5)
C3.	Dose selection/Izbor doze	90 (38.1)
C3.1.	Drug dose too low/ Doza leka je suviše niska	26 (11.0)
C3.2.	Drug dose too high/ Doza leka je suviše visoka	59 (25.0)
C3.3.	Dosage regimen not frequent enough/ Interval doziranja je suviše dug	4 (1.7)
C3.4.	Dosage regimen too frequent/ Interval doziranja je suviše kratak	1 (0.4)
C6.	Drug use process/Proces davanja leka	2 (0.9)
U6.1.	Inappropriate timing of administration or dosing intervals/ Neadekvatno vreme davanja leka pacijentu ili interval doziranja	2 (0.9)
Interventions/Intervencije (total/ukupno/Uz 229)		n (%)
I3.	At drug level/Na nivou leka	219 (95.6)
I3.1	Drug changed to .../Lek promenjen na...	14 (6.1)

13.2	Dosage changed to .../Doziranje promenjeno na...	98 (42.8)
13.4	Instructions for use changed to../ Uputstvo za upotrebu promenjeno u ..	2 (0.9)
13.5	Drug paused or stopped/Lek privremeno ili trajno obustavljen	64 (27.9)
13.6	Drug started/Uvođenje leka	41(17.9)
14.	Other intervention or activity/Druga intervencija ili aktivnost	10 (4.4)
14.1	Other intervention (specify)/ Druga intervencija (specificirati)	10 (4.4)

Data are presented as n (%)/Podaci su prikazani kao n (%)

Studija je analizirala korelaciju između TP i različitih demografskih i kliničkih karakteristika gerijatrijskih pacijenata. Rezultati su predstavljeni u Tabelama 3 i 4. Atrijalna fibrilacija je bila češće povezana sa problemima efikasnosti terapije, dok je problem bezbednosti terapije bio češći kod pacijenata sa hroničnom bubrežnom insuficijencijom (HBI). Problem efikasnosti terapije primećen je češće kod gerijatrijske populacije starosti od 60 do 79 godina. Pacijenti koji su dobijali više od 8 lekova imali su veću verovatnoću da iskuse TP, kao što je bezbednost terapije i nepotreban leku terapiji.

The study analyzed the correlation between DRPs and various demographic and clinical characteristics of geriatric patients. The results were presented in Tables 3 and 4. Atrial fibrillation was found to be more commonly associated with the problem of treatment efficacy whereas the problem of therapy safety was more prevalent in patients with chronic renal failure (CRF). The problem of treatment effectiveness was observed more frequently in the geriatric population aged between 60 and 79 years. Patients receiving more than 8 drugs were more likely to experience DRPs such as treatment safety and unnecessary drug treatment.

Table 3. Relationship between demographic and clinical characteristics of patients with the presence of DRPs in different categories
Tabela 3. Povezanost demografskih i kliničkih karakteristika pacijenata sa prisustvom terapijskih problema različitih kategorija

Characteristic/Karakteristike	Number of patients/Broj pacijenata (%)		X ²	p
	With/Sa P1	Without/Bez P1		
Atrial fibrillation/Atrijalna fibrilacija	26 (63.4)	15 (36.6)	5.778	0.016
Age/Starost (years/godine)	60-79	30 (62.5)	6.732	0.009
	≥80	19 (36.5)		
	With/Sa P2	Without/Bez P2		
CRF/HBI	24 (70.6)	10 (29.4)	4.449	0.035
Drugs/Lekovi (number/broj)	0-8	17 (34)	19.643	0.000
	9-15	39 (78)		
	With/Sa P3	Without/Bez P3		
Drugs/Lekovi (number/broj)	0-8	13 (26)	14.586	0.000
	9-15	32 (64)		

Data are presented as n (%); X² – Pearson's Chi-square; CRF- chronic renal failure; **P1.** Treatment effectiveness; **P2.** Treatment safety - Adverse drug event (possibly) occurring; **P3.** Other - Unnecessary drug-treatment.

Podaci su predstavljeni kao n (%); X² – Pirsonov hi kvadrat; HBI – hronična bubrežna insuficijencija; P1. Efikasnost terapije; P2. Bezbednost terapije- (Potencijalno) ispoljavanje neželjenog događaja leka; P3. Ostalo – Nepotreban lek u terapiji

Table 4. Relationship between demographic and clinical characteristics of patients with the causes of identified DRPs
Tabela 4. Povezanost demografskih i kliničkih karakteristika pacijenata sa uzrocima identifikovanih terapijskih problema

Characteristic/Karakteristike		Number of patients/Broj pacijenata (%)		X ²	p
		With/Sa C1.3.	Without/Bez C1.3.		
Drugs/Lekovi (number/broj)	0-8	11 (22)	39 (78)	10.866	0.002
	9-15	27 (54)	23 (46)		
Age/Starost (years/godine)	60-80	12 (25)	36 (75)	6.621	0.010
	≥80	26 (50)	26 (50)		
Gender/Pol	Male/Muškarci	25 (48,1)	27 (51,9)	4.669	0.031
	Female/Žene	13 (27,1)	35 (72,9)		
		With/Sa C1.4.	Without/Bez C1.4.		
Drugs/Lekovi (number/broj)	0-8	8 (16)	42 (84)	13.071	0.000
	9-15	25 (50)	25 (50)		
Atrial fibrillation/Atrijalna fibrilacija		19 (46,3)	22 (53,7)	5.594	0.018
Diabetes melitus		17 (43,6)	22 (56,4)	3.821	0.050
		With/Sa C1.6.	Without/Bez C1.6.		
Age/Starost (years/godine)	60-80	20 (41,7)	28 (58,3)	8.552	0.003
	≥80	8 (15,4)	44 (84,6)		
		With/Sa C3.2.	Without/Bez C3.2.		
Drugs/Lekovi (number/broj)	0-8	12 (24)	38 (76)	10.667	0,001
	9-15	28 (56)	22 (44)		
CRF/HBI		19 (55,9)	15 (44,1)	4.717	0.030

Data are presented as n (%); X² – Pearson's Chi-square; CRF- chronic renal failure; C1.3. No indication for drug; C1.4. Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements; C1.6. No or incomplete drug treatment in spite of existing indication; C3.2. Drug dose too high.

Podaci su predstavljeni kao n (%); X² – Pirsonov hi kvadrat; HBI – hronična bubrežna insuficijencija; C1.3 Lek bez indikacije; C1.4 Neodgovarajuća kombinacija lekova, ili lekova i biljnih lekova ili lekova i dijetetskih suplemenata; C1.6. Uprkos postojećoj indikaciji, ne postoji lek u terapiji ili je terapija nekompletna; C3.2. Doza leka je suviše visoka.

Primećeno je da su lekovi bez indikacija bili propisivani češće muškaracima i pacijentima preko 80 godina. Sa druge strane, nekompletna terapija je bila češća među pacijentima mlađim od 80 godina starosti. Pacijenti koji su dobijali više od 8 lekova imali su veću verovatnoću za propisivanje leka bez indikacije, neadekvatnu kombinaciju lekova i previsoke doze lekova. Neadekvatne kombinacije lekova su češće bile prisutne kod pacijenata sa atrijalnom fibrilacijom i dijabetes melitusom. Pacijenti sa HBI su imali veću verovatnoću da im se proprišu preterano visoke doze lekova.

Farmaceut je identifikovao i analizirao terapijske probleme (TP) za 100 starijih hospitalizovanih pacijenata. Predložio je ukupno 229 intervencija koje se odnose na ove probleme (kao što je pokazano u Tabeli 2). Među preporukama, 42.8% uključuje promenu doze, dok se preko 40% odnosi na započinjanje ili isključivanje lekova. Specijalisti koji brinu o starijima prihvatili su samo 25.9% preporuka farmaceuta. Za 51.9% preporučenih intervencija stopa prihvatanja je bila

It was observed that drugs without indication were prescribed more frequently to males and patients aged 80 years or above. On the other hand, incomplete drug treatment was more common among patients below 80 years of age. Patients who received more than eight drugs were more likely to be prescribed drugs without indication, inappropriate combinations of drugs, and doses that were too high. Inappropriate drug combinations were frequently observed among patients with atrial fibrillation and diabetes mellitus. Patients with CRF were more likely to be prescribed excessively high doses of drugs.

The pharmacist identified and analyzed medication-related problems (DRPs) for 100 hospitalized elderly patients. They proposed a total of 229 interventions to address these issues (as presented in Table 2). Among the recommendations, 42.8% involved changing the dosage, while over 40% involved initiating or discontinuing medication. Elderly care specialists accepted only 25.9% of the pharmacist's recom-

nepoznata. Grafikon 1 pokazuje stepen prihvatanja za različite tipove intervencija koje je predložio farmaceut. Najčešće prihvaćene preporuke uključuju prećenje pacijenata, započinjanje novog leka i smanjenje doze. Najređe prihvaćene preporuke su bile one povezane sa promenom doznog intervala i povećanjem doze.

mendations. For 51.9% of the proposed interventions, the acceptance rate was unknown. Figure 1 shows the acceptance rates for different types of interventions suggested by the pharmacist. The most commonly accepted recommendations included monitoring the patient, starting a new medication, and reducing the dosage. The least accepted recommendations were those related to changing the dosing interval and increasing the dose.

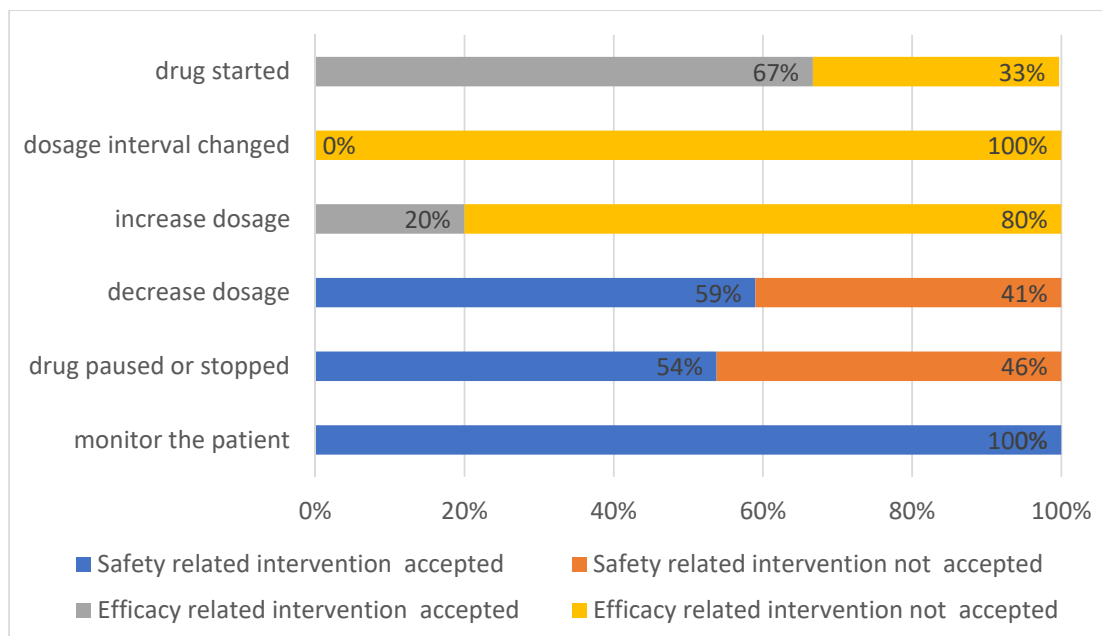


Figure 1. Frequencies of safety and efficacy-related interventions issued by the acceptance rate. Variables are expressed as a percentage of the total intervention with a known status of acceptance.

Grafikon 1. Učestalosti intervencija u vezi sa bezbednošću i efikasnošću prema stepenu prihvatanja. Varijable se izražavaju kao procenat od ukupnog broja intervencija sa poznatim statusom prihvatanja.

Diskusija

Ova studija fokusira se na identifikaciju i analizu TP kod gerijatrijskih pacijenata koji su bolnički lečeni. Ovo je takođe prva studija na temu uvođenja usluga farmaceutske nege na odeljenje gerijatrije u Srbiji. Studija je utvrdila da je prisustvo TP često u ovoj populaciji pacijenata, sa prosečno 2.36 TP po pacijentu. Primarni TP je bezbednost terapije, a izbor leka je vodeći uzrok TP.

U našoj analizi, našli smo da je prosečan broj uočenih terapijskih problema () po pacijentu bio niži nego u prethodno objavljenim istraživanjima koja uključuju starije pacijente (2.6-8.9 TP po pacijentu)¹⁷⁻¹⁹. Međutim, naši rezultati bili su viši u poređenju sa studijom sprovedenom u Francuskoj, koja je našla 0.8 TP po pacijentu²⁰. Važno je uočiti da razlike u

Discussion

This study focuses on the identification and analysis of DRPs in geriatric inpatients. It's also the first study on the implementation of pharmaceutical care services in the geriatric department in Serbia. The study found that the presence of DRPs is common in this patient population, with an average of 2.36 DRPs per patient. The primary DRPs type is treatment safety, and drug selection is the leading cause of DRPs.

In our analysis, we found that the average number of detected Drug-Related Problems (DRPs) per patient was lower than the numbers presented in previously published studies involving elderly patients (2.6-8.9 DRPs per patient)¹⁷⁻¹⁹. However, our findings were higher compared to a study conducted in France, which reported 0.8 DRPs per patient²⁰. It

rezultatima mogu biti posledica različitih faktora, kao što su razlike u broju pacijenata, trajanju studije, prisustva farmaceuta na odeljenju, tipu zdravstvene ustanove, propisivanju lekova, saradnji lekara i drugim varijablama.

Naša studija je pokazala da je bezbednost terapije bila najčešće uočeni terapijski problem (TP), a za njim efikasnost terapije i nepotreban lek u terapiji.

Većina TP uočenih u studiji uzrokovane su neadekvatnim izborom lekova. Ovo je bilo posledica neodgovarajuće kombinacije lekova, nekompletne terapije a ili primene lekova bez indikacija. Neadekvatna doza je takođe bila značajan uzrok TP, i u većini slučajeva radilo se o pacijentima sa previsokim dozama lekova (Tabela 2). Ovi nalazi su u skladu sa studijom sprovedenom u Turskoj, koja je takođe koristila PCNE klasifikaciju¹⁰. Štaviše, rezultati naše studije su u skladu sa prethodno uočenim terapijskim problemima sa kojom se sreće populacija starijih pacijenata. Ovi problemi mogu da predisponiraju ove pacijente za neželjenije reakcije lekova, neadekvatno propisivanje lekova i pogrešno doziranje¹⁷⁻²⁰.

Već je pokazano da uzimanje više propisanih lekova može voditi većem broju terapijskih problema (TP), a polifarmacija je poznati factor rizika za TP^{10,21}. Naša studija je pokazala da postoji pozitivna korelacija između broja lekova koje osoba uzima i broja TP. Naši rezultati takođe ukazuju da uzimanje više lekova u terapiji specifično povećava prevalencu terapijskih problema koje utiču na bezbednost i nepotrebnu upotrebu lekova (kako je prikazano u Tabeli 3). Osim toga, uzimanje 8 i više lekova (polifarmacija) je povezano sa neadekvatnim kombinacijama lekova, uzimanjem lekova bez indikacija i uzimanjem većih doza lekova nego što je potrebno (kako je pokazano u Tabeli 4).

Atrijalna fibrilacija i hronična bubrežna insuficijencija (HBI) pokazali su se kao faktori rizika za terapijske probleme (TP)^{22,23}. U našoj studiji našli smo da je atrijalna fibrilacija bila povezana sa problemima efikasnosti terapije dok je HBI bila češće povezana sa problemima bezbednosti terapije. Druge studije su takođe pokazale da su srčana insuficijencija, atrijalna fibrilacija i renalna insuficijencija često primećene kod pacijenata sa TP²²⁻²⁴. Uz to, pacijenti sa atrijalnom fibrilacijom i dijabetes melitusom su imali više šanse da imaju neodgovarajuću kombinaciju lekova. Slično tome, prethodne studije su pokazale da pacijenti sa aritmijama, srčanom insuficijencijom i respiratornim bolestima u većem riziku da dožive potencijalno relevantne interakcije između lekova²⁵. Kardiovaskularni i antitrombotički lekovi su takođe često povezani sa terapijskim problemima i opasnim interakcijama^{20,26}.

Mada ne možemo da isključimo druge faktore koji mogu da utiču na prirodu terapijskih problema kod starijih (bračni status, mesto stanovanja, obrazovanje, itd.), rezultati studije pokazuju da je efikasnost terapije bila češći problem kod mlađih gerijatrijskih pacijenata (60-79 godina). Shodno tome, nepotpun terapijski režim je češće primećen kod pa-

is important to note that the difference in results could be attributed to various factors such as differences in the number of patients, study duration, presence of a pharmacist at the ward, type of health facilities, prescribing drugs, physician collaboration, and other variables.

Our study found that treatment safety was the most commonly observed Drug-Related Problem (DRP), followed by treatment effectiveness and unnecessary drug treatment. Most of the DRPs detected in the study were caused by inadequate drug selection. This was due to an inappropriate combination of drugs, incomplete drug treatment, or no indication for the drug. Inadequate dose was also a significant cause of DRPs, with a majority of cases having a dose that was too high (Table 2). These findings are consistent with a study conducted in Turkey that also used the PCNE classification¹⁰. Furthermore, our study's results align with previously observed therapeutic problems that the elderly population experiences. These issues can predispose these patients to adverse drug reactions, inadequate drug prescribing, and incorrect dosing¹⁷⁻²⁰.

It has been already reported that taking more prescribed medications can lead to more drug-related problems (DRPs), and having multiple medications (polypharmacy) can increase the risk of DRPs^{10,21}. Our study found that there is a positive correlation between the number of medications a person takes and the number of DRPs they experience. Our results also suggest that having a higher number of drugs in a therapy regimen specifically increases the prevalence of therapeutic problems that impact safety and the unnecessary use of drugs (as shown in Table 3). Additionally, taking eight or more medications (polypharmacy) is associated with inappropriate drug combinations, taking drugs without an indication, and taking drugs with higher than necessary dosages (as shown in Table 4).

Atrial fibrillation and chronic renal failure (CRF) are known to be risk factors for drug-related problems (DRPs)^{22,23}. In our study, we found that atrial fibrillation was associated with treatment efficacy issues, while CRF was more commonly associated with treatment safety problems. Other studies have also found that heart failure, atrial fibrillation, and renal failure are frequently observed in patients with DRPs²²⁻²⁴. Additionally, patients with atrial fibrillation and diabetes mellitus were more likely to have inappropriate drug combinations. Similarly, previous studies have shown that patients with arrhythmias, heart failure, and respiratory tract disease are at a higher risk of experiencing potentially relevant drug interactions²⁵. Cardiovascular drugs and antithrombotic drugs are also commonly associated with therapeutic problems and dangerous interactions^{20,26}.

cijenata mlađih od 80 godina, dok su lekovi bez indikacija bili češći propisivani kod pacijenata starijih od 80 godina. Uz činjenicu da upotreba lekova bez jasne indikacije neće uticati na zdravstveno stanje starijih pacijenata, ipak može imati ozbiljne sporedne efekte. U prospektivnoj, multicentričnoj studiji sprovedenoj u 21 bolnici u Holandiji, 16.5% svih bolničkih prijema, koji su mogli biti izbegnuti, nastali su kao posledica nedostatka jasnih indikacija za upotrebu lekova²⁶.

Nakon identifikacije i karakterizacije TP, farmaceut je preporučio intervencije za 100 hospitalizovanih gerijatrijskih pacijenata. Analizirana terapija zahtevala je ukupno 229 intervencija, u skladu sa preporukama farmaceuta, Tabela 2. Preko 40% preporuka uključivalo je promenu doze. U većini slučajeva doza je bila previsoka jer nije bilo prilagođavanja za klirens kreatinina. ACE inhibitori, digoksin, aminofilin i trimetazidin su bili najčešće propisani lekovi sa većom dozom od preporučene. Predoziranje je čest uzrok terapijskih problema kod pacijenata sa HBI i studije pokazuju da se preporuke za doziranje bazirane na klirensu kreatinina često ignorišu kod starijih²⁷. Sa druge strane, antibiotici su obično bili primenjivani u manjim dozama nego što je preporučeno. Predoziranje povećava rizik od neželjenih efekata, dok subdoziranje može da smanji ili eliminiše terapijsku efikasnost leka. Optimalno doziranje je izazov u bolnicama gde mnogi pacijenti imaju nestabilna klinička stanja i insuficijenciju bubrega ili jetre, jer neki lekovi zahtevaju dnevno prilagođavanje doze. U tom kontekstu, uloga farmaceuta je ključna pri prilagođavanju doze u cilju poboljšanja bezbednosti i efikasnosti terapije.

Značajan broj terapijskih problema (TP) dešava se kada pacijenti ne dobijaju neophodne lekove propisane po relevantnim vodičima ili dobijaju nepotrebne lekove. Naša studija je pokazala da su pacijentima nedostajale sledeće grupe lekova u njihovoj terapiji: statini, acetilsalicilina kiselina (ASA), gvožđe, ACE inhibitori, antibiotici i vitamin D. Pokazalo se da je 42% starijih pacijenata ima propisan najmanje jedan lek bez očigledne indikacije²⁸, što je uporedivo sa našim nalazima, jer smo mi našli da je 39% gerijatrijskih pacijenata uzimalo jedan lek bez očigledne indikacije. Najčešće propisivan lek bez jasne indikacije je bio alopurinol. S toga, više od 40% farmaceutskih intervencija je uključivalo uvođenje ili isključivanje odgovarajućih lekova. I nedovoljno i preterano propisivanje identifikovani su kao relevantni problemi kod hospitalizovanih pacijenata, a koji se mogu popraviti adekvatnom farmaceutskom negom^{29,30}.

Stopa prihvatanja preporuka od strane kliničara za hospitalizovane pacijente varira od manje od 40% do preko 90%^{7,10,19-21,23,31}. Naša studija je pokazala da specijalisti koji se bave lečenjem starijih pacijenata imaju nizak stepen prihvatanja preporuka farmaceuta (25.9%). U 51.9% preporučениh intervencija, stepen prihvatanja je bio nepoznat. Najčešće prihvaćene preporuke podrazumevale su praćenje pacijenata, započinjanje primene leka i smanjenje doze. Najmanje prihvaćene preporuke uključivale su promenu doznog intervala

Although we cannot rule out other factors that may influence the nature of therapeutic problems in the elderly (marital status, place of residence, education, etc.), the results of the study indicate the effectiveness of therapy was a more common problem in younger geriatric subjects (60-79 years). In accordance, incomplete drug treatment was more commonly observed in patients younger than 80 years, while the drug without indication was more often prescribed in patients older than 80 years. In addition to the fact that the use of drugs without a clear indication will not have an impact on the health condition of elderly patients, it can have severe side effects. In a prospective multicenter study conducted in 21 hospitals in the Netherlands, 16.5% of all drug-induced and avoidable hospital admissions were due to a lack of a clear indication for drug use²⁶. After identifying and characterizing DRPs, the pharmacist proposed interventions for 100 hospitalized geriatric patients. The analyzed therapy required a total of 229 interventions, according to the pharmacists' recommendations in Table 2. Over 40% of the recommendations involved changing the dosage. In most cases, the dosage was too high because there was no adjustment for creatinine clearance. ACE inhibitors, digoxin, aminophylline and trimetazidine were the most commonly prescribed drugs with a higher than recommended dose. Overdose is a common cause of therapeutic issues in patients with CRF, and studies show that dosing guidelines based on creatinine clearance are often ignored in the elderly²⁷. On the other hand, antibiotics were usually applied at a lower dose than recommended. Overdosing increases the risk of adverse effects, while underdosing can reduce or eliminate the drug's therapeutic effect. Optimal dosing is a challenge in hospitals where many patients have unstable clinical conditions and kidney or liver failure, as some drugs require daily dose adjustments. In this context, the pharmacist's role is crucial in dose adjustment to improve treatment safety and effectiveness.

A considerable number of Drug-Related Problems (DRPs) occur when patients do not receive the necessary medications prescribed in relevant guidelines or receive unnecessary drug treatment. Our study found that patients lacked the following groups of drugs in their therapy: statins, acetylsalicylic acid (ASA), iron, ACE inhibitors, antibiotics, and vitamin D. It has been reported that 42% of elderly patients have been prescribed at least one drug without an obvious indication²⁸, which is comparable to our findings as we found that 39% of geriatric patients were taking one drug without an obvious indication. The most commonly prescribed drug without a clear indication was alopurinol. Thus, more than 40% of pharmacists' interventions involved initiating or discontinuing the corresponding drugs. Both under-prescription and over-prescription have been identified as relevant issues in hospitalized patients that can be improved by adequate pharmaceutical care^{29,30}.

i povećanje doze (Grafikon 1). Ovi nalazi sugerišu da su preporuke vezane a bezbednost terapije imale veću verovatnoću da budu prihvaćene nego one povezane sa efikasnošću. Slični rezultati su prijavljeni i u studiji sprovedenoj u Jedinici za lečenje dijabetesnog stopala u Medicinskom centru u Izraelu³².

Postoji nekoliko potencijalnih razloga zašto je stopa prihvatanja intervencija farmaceuta niska u Srbiji. Klinički farmaceuti su još uvek novi kod nas i često nailaze na prepreke, kao što su nedefinisana uloga i neadekvatna podrška. U ovoj studiji, prvi put lekari su interagovali sa farmaceutima koji su pregledali terapijske protokole, te je moguće da nisu bili svesni procesa farmaceutske nege ili veština farmaceuta. Farmaceuti su visoko obrazovani zdravstveni profesionalci, ali njihova primarana uloga je često viđena kao nekoga ko nabavlja i izdaje lekove, pre nego ko je ravnopravni član multidisciplinarnog tima. Uz to, u ovoj studiji farmaceut je bio specijalizant, što je moglo da doprinese niskom nivou prihvatanja preporuka. Štaviše, farmaceut je provodio ograničeno vreme na Odeljenju gerijatrije i bilo je malo direktno komunikacije, što je takođe moglo da doprinese niskom nivou prihvatanja intervencija. Konačno, u zemljama u kojima nedostaje podrška za farmaceute u bolničkom okruženju, kao što je Srbija, same intervencije farmaceuta nisu dovoljne da bi se postigla prava implementacija usluga farmaceutske nege.

Ograničenja

Studija je procenjivala intervencije farmaceuta retrospektivno, tako da terapijski problemi (TP) nisu bili klasifikovani kao mogući ili trenutni (manifestni) problemi. Istraživanje je sprovedeno na odeljenju gerijatrije, u srpskoj bolnici, a rezultati se ne mogu generalizovati na druge bolnice ili populacije. Ovo okruženje imalo je za rezultat malu veličinu uzorka, što se može smatrati još jednim ograničenjem studije. Zbog vremenskih i resursnih ograničenja, ishodi razrešenja TP, kao što su smanjenje troškova i kvalitet života, nisu procenjivani.

Terapijski problemi i bolesti koje vode upotrebi lekova su kompleksna pitanja koja otežavaju utvrđivanje jasne uzrok-posledica veze. Postoje različiti faktori koji mogu da utiču na terapijske probleme kod gerijatrijskih pacijenata, uključujući pol, godišnji prihod, bračni status, mesto stanovanja, nivo obrazovanja, upotrebu suplemenata i biljnih lekova, kao i pacijentova lična razmišljanja i sumnje u vezi terapije. S toga je važno razmotriti sve ove faktore kada se procenjuju terapijski problemi kod starijih pacijenata.

The acceptance rate of recommendations by clinical physicians for admitted patients varies from less than 40% to over 90%^{7,10,19-21,23,31}. Our study found that elderly care specialists had a low acceptance rate of pharmacists' recommendations (25.9%). In 51.9% of proposed interventions, the acceptance rate was unknown. The most commonly accepted recommendations included monitoring the patient, starting the drug, and reducing the dose. The least accepted recommendations involved changing the dosing interval and increasing the dose (Figure 1). These findings suggest that safety-related recommendations were more likely to be accepted than efficacy-related recommendations. Similar results were reported in a previous study conducted at the diabetic foot unit of the Medical Center in Israel³².

There are several potential reasons why the acceptance rate of pharmacist intervention is low in Serbia. Clinical pharmacists are still new to the country and often face obstacles, such as undefined roles and inadequate pharmacist support. This study was the first time doctors had interacted with a pharmacist performing medication reviews, so they may not have been aware of the pharmaceutical care process or the skills of pharmacists. Pharmacists are highly knowledgeable healthcare professionals, but their primary role is often seen as procurement and dispensing of medicines, rather than being equal members of a multidisciplinary team. Additionally, in this study, the pharmacist was a postgraduate student, which could have contributed to the low level of acceptance. Furthermore, the pharmacist spent limited time in the geriatric department, and there was low direct communication, which could have also contributed to the low level of acceptance of interventions. Finally, in countries that lack systemic support for pharmacists in hospital settings, such as Serbia, pharmacist intervention alone may not be sufficient to achieve true implementation of pharmaceutical care services.

Limitations

The study evaluated pharmacist interventions retrospectively, so the Drug Related Problems (DRPs) were not classified as possible or actual (manifest) issues. The research was conducted in a geriatric unit at a Serbian hospital, and the results cannot be generalized to other hospitals or populations. This setting resulted in a relatively small sample size, which can be considered as another limitation of the study. Due to time and resource restrictions, outcomes of the resolution of DRPs, such as cost savings and quality of life, were not assessed.

Drug-related problems and diseases leading to drug use are complex issues that make it difficult to establish a clear cause-and-effect relationship. There are various factors that can influence drug-related problems in geriatric patients, including gender, annual income, marital status, place of residence, education level, use of over-the-counter drugs and

Zaključak

Ova studija sprovedena od strane farmaceuta otkrila je da značajan broj terapijskih problema (TP) može da se nađe kod starijih pacijenata u kratkom vremenskom periodu. Ova studija ukazuje da farmaceutska nega na gerijatrijskom odeljenju može da uključi različite mere, kao što su prilagođavanje doze leka, detektovanje prekomerne ili nedovoljne doze lekova i identifikaciju interakcija među lekovima, jer su oni identifikovani kao najčešći uzroci TP. Ciljane intervencije, kao što su procena polifarmacije, procena terapije pacijenata sa atrijalnom fibrilacijom i HBI takođe može biti primenjena. Međutim, studija takođe nalazi i niski stepen prihvatanja farmaceutskih intervencija. Ističe potrebu za većom saradnjom između doktora i farmaceuta. Da bi se ovo postiglo, doktori treba da se informišu i upoznaju sa procesom farmaceutske nege i veštinama farmaceuta. Farmaceuti, sa druge strane, treba da poboljšaju svoje znanje o sigurnosti preparata i lekova da bi bili bolja podrška lekarima. Uz to, farmaceuti treba da provedu više vremena na odeljenju gerijatrije u direktnoj komunikaciji sa doktorima. Izgradnja poverenja započinje prihvatanjem preporuka vezanih za bezbednost terapije, kao što su prilagođavanje doze, pronalaženje slučajeva preterane upotrebe lekova, procena polifarmacije i interakcije lekova, a onda postepeno širenje na preporuke koje se odnose na efikasnost, kao što je utvrđivanje nedovoljne upotrebe lekova, odabir lekova i režima doziranja.

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herbal remedies, as well as the patients' personal thoughts and concerns regarding therapy. Hence, it is important to consider all these factors when assessing drug-related problems in elderly patients.

Conclusion

The present study conducted by a pharmacist has revealed that a significant number of Drug Related Problems (DRPs) can be detected in older patients in a short amount of time. This study suggests that pharmaceutical care in the geriatric department could include various measures such as adjusting drug dosage, detecting over- or underuse of drugs, and identifying drug-drug interactions, as these were found to be the most common causes of DRPs. Targeted interventions such as evaluating polypharmacy, assessing the therapy of patients with atrial fibrillation and CRF, can also be implemented. However, the study also observed a low acceptance rate of pharmacist intervention, highlighting the need for greater collaboration between doctors and pharmacists. To achieve this, doctors should be informed and familiarized with the pharmaceutical care process and pharmacist skills. Pharmacists, on the other hand, should improve their knowledge of therapeutics and medication safety to better support physicians. Additionally, pharmacists should spend more time in the geriatric department in direct communication with doctors. Building confidence could start with acceptance of safety-related recommendations, such as adjusting the dosage, detecting overuse of drugs, evaluating polypharmacy, and drug interactions, and then gradually expanding to efficacy-related recommendations, such as detecting underuse of drugs, drug selection, and regimen design.

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