



---

## **A Review Article on Pharmaceutical Care: Avenue on Drug-Related Problems**

*<sup>1</sup>Grace L. Agad, <sup>2</sup>Kimberly David, <sup>3</sup>Lhyrenz S. Jallores, <sup>4</sup>Zoeijill A. Sinsuat*

<sup>1,2,3,4</sup>Pharmacy Department, School of Allied Health Sciences, San Pedro College, Davao City, Philippines

---

### **Abstract**

Adverse drug responses and medication errors, which involve mistakes made during drug prescription, distribution, or administration, are among the issues connected to drugs. Adverse drug events can be defined as injuries, regardless of whether they are caused by drug usage. Drug-related disorders (DRPs) are common among hospitalized patients, resulting in unavoidable bad health results. The review was conducted using various journal databases, including PubMed, Integrated Pharmacy Research and Practice, MedCrave, Sage Pub, Semantic Scholar, National Library of Medicine, etc. From these databases, articles are reviewed and discussed. The researchers reviewed studies conducted on different patients globally, with no restrictions on the year of publication. The tables present the findings of the article reviewed. Each article is discussed in detail and reviewed manually. Problems stemming from the use of drugs are quite common among hospitalized patients of all different specialties. The involvement of clinical pharmacists in routine clinical practice needs to be considered a standard operating procedure. Therefore, in order to reduce the number of difficulties associated with medicine, hospitals should educate younger physicians on the concepts behind drug doses. Clinical and hospital pharmacists, working in partnership with medical professionals, contribute to the reduction of DRPs via the use of manual or online prescription auditing and medication reconciliation procedures. The number of DRPs increases in direct proportion to the total quantity of drugs included inside prescriptions. It is possible to discover numerous DRPs by a thorough intervention carried out by community pharmacists on discharged patients or their representatives.

---

### **Introduction**

Drugs work as a dualistic therapeutic tool. They are intended to treat, prevent, or diagnose diseases, signs, or symptoms, but improper use can cause patient morbidity and even death. Adverse drug responses and medication errors, which involve mistakes made during drug prescription, distribution, or administration, are among the issues connected to drugs. Adverse drug events can be defined as injuries, regardless of whether they are caused by drug usage. Drug-related disorders (DRPs) are common among hospitalized patients, resulting in unavoidable bad health results [1]. According to the World Health Organization (2021), primary health care is a societal approach to health that aims to provide the best possible level of health and well-being, as well as equitable distribution, by focusing on people's needs as early as possible. Medical care, however, falls short of what should be offered for many illnesses and in many countries. Recent studies, for example, found that the quality of treatment and diagnosis in Chinese basic healthcare institutions was poor, with issues such as the overuse of antibiotics [2]. DRPs were a prominent cause of death in the United States, accounting for approximately 3-6% of hospital admissions and costing the country \$130 billion annually.

DRPs are characterized as either intrinsically or extrinsically toxic. The interaction of the drug's pharmaceutical, chemical, and pharmacological components with the human biosystem causes intrinsic toxicity. As a result, inherent toxicity has come to be associated with adverse drug reactions (ADRs). Extrinsic toxicity relates to issues created by the healthcare practitioner or the patient's medication administration. A medication error has occurred because the drug was not used correctly.

Drug-related problems are prominent in people with dementia and cognitive impairment. Comprehensive medication reviews conducted by pharmacists as part of a medical team may be crucial for avoiding, detecting, and correcting these issues [3].

This article discusses the contributing factors to drug-related problems, as well as how they can be prevented and resolved.

---

### **Methodology**

In this article review on Drug-Related Problems: A Cornerstone for Pharmaceutical Care, the researchers searched, collected, and analyzed a wide range of articles related to the topic. The review was conducted using various journal databases, including PubMed, Integrated Pharmacy Research and Practice, MedCrave, Sage Pub, Semantic Scholar, the National Library of Medicine, etc. From these databases, articles are reviewed and discussed. The search term included the following: drug-related problems among geriatric patients; drug-related problems among patients with diabetes, hypertension, or hyperlipidemia; drug-related problems in prescribing for coronary artery diseases; drug-related problems in community pharmacies; drug-related problems among patients with chronic kidney disease; and drug-related problems among pediatric cardiology patients. The researchers reviewed studies

conducted on different patients globally, with no restrictions on the year of publication. The tables present the findings of the article reviewed. Each article is discussed in detail and reviewed manually.

## Results and Discussions

Title	Author/Year	Method	Findings
A Systematic Review: Drug-Related Problems in Hospitalized Patients with Chronic Kidney Disease: (2021) UK	Paudyal et al (2021)	A review of studies published in English that investigated DRPs in hospitalized CKD patients was conducted. Two independent reviewers gathered the data and used the Joanna Briggs Institute (JBI) tool to assess its quality. The Cochrane Library (Wiley) and Scopus (ELSEVIER) were used to search the literature. [4]	The prevalence of DRPs in CKD has been reported to vary between 12 and 87%. Ineffective treatment, inappropriate drug choices, and dosing issues were among the most prevalent DRPs. DRPs commonly feature antibiotics, H2-antihistamines, and oral antidiabetics (metformin). DRPs were associated with CKD severity, the number of drugs given, age, length of hospital stay, and gender. [4]
“Causes of Prescribing Errors in Hospital Inpatients: A Prospective Study” (2002) UK	Dean et al (2002)	88 serious potential medication errors were discovered by pharmacists at a UK teaching hospital. We examined our data using human error theory and interviewed 44 prescribers [5]	Based on the findings, most errors were caused by lapses in attention or by prescribers failing to follow applicable regulations.[5]
“Medication errors involving continuously infused medications in a surgical intensive care unit” (2004) US	Erstad et al (2004)	All intravenous drug infusions in the postoperative ICU were examined for proper flow-sheet charting, concentration, infusion rate, and dose delivered, along with patients' heights and weights. The data were evaluated to identify the mistake rate, the kinds of errors that occurred, and the weight used to calculate the dose. Inpatient weight measurement variations were compared.[6]	More than 10% of weight-based and non weight-based infusion dosages for 71 patients were wrong, according to the American Society of Anesthesiologists (ASAN).In the surgical intensive care unit, there were 105.9 errors per 1,000 patient days with continuously infused drugs.[6]
“Incidence and severity of intravenous drug errors in a German hospital” (2004) GERMANY	Barber & Taxis (2003)	A prospective ethnographic study was conducted on two wards of a German non-university hospital utilizing disguised observation. [7]	22 nurses were observed administering 122 intravenous medication preparations and administrations. In the production and administration of 58 of 122 i.v., there were one or more errors. Multiple-stage preparations and the administration of possibly incompatible drugs as intermittent infusions were both prevalent errors. [7]
“Medication Errors in Hospitalized Cardiovascular Patients” (2003) US	LaPointe & Jollis (2003)	We conducted a systematic assessment of a clinical pharmacist's experience on cardiology wards between September 1, 1995, and February 18, 2000. We grouped medication errors based on the type of error, drugs involved, individuals engaged, drug administration stages involved, and time of year most commonly associated with errors.[8]	4768 of the 14 983 pharmacist interventions were linked to medication errors, resulting in 24 medication errors per 100 admissions. The most common cause of medication errors is the incorrect drug or dose, with cardiovascular medications accounting for 41.2% of all cases. Most errors are related to prescribers, and the shift from outpatient to inpatient is a common point for these errors to occur.[8]

<p>“Frequency and determinants of drug administration errors in the intensive care unit” (2002) NETHERLANDS</p>	<p>van den Bemt et al (2002)</p>	<p>To detect administrative problems, the disguised-observation technique was used (nurses observe medicine administrations without disclosing the purpose of the observation to the nurses). [9]</p>	<p>104 administrations had at least one erroneous time error when they provided or omitted drugs for 24 patients, and 77 administrations had errors when they included or omitted them. The errors were associated with the day of the week, time of day, and drug class. There were more errors in hospitals that did not yet have full-time specialized intensive care physicians.[9]</p>
<p>“Medication administration errors in adult patients in the ICU” (2001) USA</p>	<p>Calabrese et al (2001)</p>	<p>Setting: Five intensive care units (ICUs) in the United States. An observational evaluation[10]</p>	<p>With 71 errors, the most prevalent type of error was incorrect infusion rate. The pharmacological classes most frequently related with errors were vasoactive medications and sedative/analgesics. 159 errors were communicated to the patient but did not result in injury, increased monitoring, or action [10]</p>
<p>“The Critical Care Safety Study: The incidence and nature of adverse events and serious medical errors in intensive care” (2005)</p>	<p>Rothschild et al (2005)</p>	<p>One-year prospective observational research was carried out. Incidents were gathered using a comprehensive method that included direct continuous observation. Separately, two physicians assessed incident type, severity, and preventability, as well as system-related and individual performance failures. [11]</p>	<p>In 79 patients, 120 adverse events were discovered, including 66 unpreventable and 54 preventable adverse events, along with 223 significant mistakes. 13% of adverse events were potentially fatal, and 11% of major errors were possibly fatal. The majority of serious medical errors happened during the ordering or administration of treatments, particularly medications. Slips and lapses were more common than rule-based or knowledge-based errors in performance level failures.[11]</p>
<p>“Adverse drug reactions in a department of systemic diseases-oriented internal medicine: prevalence, incidence, direct costs and avoidability” (2000)</p>	<p>Lagnaoui et al (2000)</p>	<p>This prospective cohort study was based on all admissions to an internal medicine unit over a 4-month period. Patients were intensively followed in order to assess any ADR occurring during the hospital stay. The causality, direct costs, and preventability were all evaluated. [12]</p>	<p>156 ADRs occurred in 116 patients of 444 admissions; 95 of them had ADRs upon admission, which were the reason for admission in 32. During their stay, twenty-one patients experienced 26 ADRs. The estimated annual cost of ADRs that result in hospitalization is €11,357 per hospital bed. Approximately 80% of ADRs are possibly preventable.[12]</p>
<p>“ Medication Errors and Adverse Drug Events in Pediatric Inpatients” (2001)</p>	<p>Kaushal (2001)</p>	<p>During the course of six weeks in April and May 1999 a prospective cohort study of 1120 patients who were admitted to two academic institutions. [13]</p>	<p>They evaluated 10 778 prescription orders and detected 616 medication errors, 115 possible adverse drug events (ADEs), and 26 ADEs. 5 of the 26 ADEs might have been avoided. The avoidable ADE rate was three times greater in infants than adults. Potential ADEs were substantially more common in neonates in the intensive care unit.[13]</p>
<p>“Clinical and Economic Impact of Adverse Drug Reactions in Hospitalized Patients” (2000)</p>	<p>Suh et al (2000)</p>	<p>Over five months, data on ADRs from patients admitted to a New Jersey hospital were collected, reviewed, and evaluated. Patients who encountered ADRs during hospitalization were matched with controls</p>	<p>According to the therapeutic class, the leading causal medications were anti-infective, cardiovascular, antineoplastic, and analgesic/anti-inflammatory treatments. The most commonly</p>

		to determine the economic impact of ADRs. Every ADR was evaluated for its severity, the patient's outcomes were established, and specific classes of drugs were found to be highly causative of ADRs. [14]	impacted organ systems were the gastrointestinal, dermatologic, and immunological systems. Based on their diagnosis-related group code, 131 people were matched with 1338 patients without an ADR. [14]
"Reporting of adverse drug reactions in relation to general medical admissions to a teaching hospital in Hong Kong" (1994)	Chan & Critchley (1994)	All ADRs were to be reported by registrars and interns in these words using standard report forms.. [15]	122 ADRs were discovered in 98 patients out of 430 investigated, with only six adequately recorded. The diagnosis was either overlooked or inaccurate in 29 cases, accounting for 24% of all ADRs. The remaining 71% of ADRs were ignored totally.[15]
"The Nature of Adverse Events in Hospitalized Patients" (1991)	Leap et al (1991)	Independently identifying the adverse occurrences, two medical reviewers assessed them for negligence, management mistakes, and degree of disability. Each occurrence was categorised by one of the authors based on the type of harm. The researchers looked into the relevance of differences in rates of carelessness and disability among groups with at least 30 adverse events.[16]	Negligence has been less likely to be the cause of adverse outcomes during surgery than it was of nonsurgical ones. For 58 percent of the adverse events, management errors were detected. Diagnostic and non-invasive treatment errors had the most significant proportion of adverse outcomes caused by negligence.[16]
"Medication Safety: Survey of Drug-Related Problems Identified by Community Pharmacies" (2007)	Hammerlein et. al (2007)	All identified DRPS were recorded using a survey that was conducted in a community pharmacy.  A modified version of the problem-intervention-documentation system was used to classify the DRPS. [17]	10,427 DRPs were recorded by the community pharmacist. [17]
"Drug-related problems and medication reviews among old people with dementia" (2017)	Pfister et. al (2017)	Patients 65 years and older with dementia or cognitive impairment were used in a randomized controlled trial.[18]	A total of 310 DRPs were found by clinical pharmacists in 66% (140/212) of the intervention group subjects.[18]
"Adverse drug reaction risk factors in older outpatients" (2003)	Hajjar et. al (2003)	A comprehensive literature search was conducted for the purpose of finding published studies on ADRs in elderly patients.[19]	An expert panel deliberated for two rounds before agreeing on 21 factors, comprising 12 medication-related factors and 9 patient characteristics.[19]
"Hospitalization and Death Associated With Potentially Inappropriate Medication Prescriptions Among Elderly Nursing Home Residents" (2005)	Lau et. al (2005)	Participants used generalized estimating equations to perform multivariate logistic regression analyses on longitudinal data.[20]	Compared to residents who had no exposure to PIRx, residents who had exposure had higher odds of being hospitalized in the following month. [20]
"Multidisciplinary medication review in nursing home residents: what are the most significant drug-related problems? The Bergen District Nursing Home (BEDNURS) study" (2003)	Ruths et. al (2003)	Cross sectional study was conducted in examining 1354 residents of 23 nursing homes in Bergen, Norway who used drugs.[21]	In a survey of more than 1,000 inhabitants of Cambridge, England, psychotic medicines were responsible for 38% of all concerns related to possible prescription misuse.  The most frequently cited causes of medication-related disease were risk of

			adverse drug reactions (26%) and improper drug choice for indication (20%).[21]
“Drug-related problems in patients with angina pectoris, type 2 diabetes and asthma – interviewing patients at home” (2006)	Haugbolle et. al (2006)	The study's data were gathered by conducting medication reviews, in-home interviews, and DRP registrations for 414 patients.  The following patient populations' data were gathered over the years indicated: 123 patients with angina pectoris in 1999; 192 patients with type 2 diabetes in 2000; and 99 patients with asthma in 2001.[22]	The two most prevalent DRP sub-categories identified in all three patient groups were "Improper use of medications by the patient" and "Other Problems" (limited understanding of the condition, inappropriate lifestyle, fear of medication, lack of information, etc.).  Patients with type 2 diabetes had an average of 4.1 DRPs, those with angina pectoris had an average of 2.8 DRPs, and those with asthma had an average of 4.0 DRPs.[22]
“A study of medication reviews to identify drug-related problems of polypharmacy patients in the Dutch nursing home setting” (2007)	Finkers et. al (2007)	Patients who used many medications and had an average age of 80 were included in the study, which was conducted between October 2005 and May 2006 in nursing homes in the Netherlands (n = 742 beds).[23]	In 87% of patients, 62% of issues were categorized as "unclear or not proven indication" or "need for review" of the prescription medication.[23]
“Surveys of drug-related therapy problems of patients using medicines for allergy, asthma and pain” (2000)	Nilsson et. al (2000)	The data was gathered under typical medical situations and may be used to survey patient epidemiology of DRTP.[24]	13,895 (31%) of the 44,504 individuals with prescriptions documented in the research had DRTPs found.  144 (13% of the 1,135 customers who purchased OTC medications for hay fever/pollen allergies tested positive for DRTP.[24]
Drug Related Problems in Radio and Nuclear Pharmacy (2018)	Patel et. al (2018)	Utilizing the patient's medication information, data was gathered with a data collecting form.[25]	In the study, there were 2.60 Drug Related Problems (DRP) per patient.  The logistic difficulty (35.38), imagination problem (37.69%), and administrative problem (87.69%) were the most often encountered issues. [25]
Pharmacist intervention in drug-related problems for patients with cardiovascular diseases in selected community pharmacies in Northern Cyprus (2016)	Gökçekuş et al (2016)	A four-month prospective observational study of DRPs and pharmacist interventions in cardiovascular disease patients was performed at four community pharmacies in North Cyprus. The Pharmaceutical Care Network Europe PCNE DRP classification tool V6.2 was then used to analyze and classify the interventions. [26]	More than half (54%) of patients seeking treatment for drug-related side effects (DRPs) had issues with drug usage in relation to their pre-existing conditions. The remaining 37% of patients did not have any DRP, but the status of their current illness or co-morbidity would worsen if no care was provided. [26]
A clinical study on drug-related problems associated with intravenous drug administration (2014)	Vijayakumar et al (2014)	A four-month prospective observational research was conducted. Patients who received more than two drugs via IV were enrolled and analyzed. [27]	DRPs were found in nearly half of the patients (46.3%) receiving IV medicines through peripheral line. 76 (69.09%) of the 110 patients were male, with the remaining being female. A significant association between DRPs and gender (P = 0.03) was discovered.[27]

Assessment of Drug Related in Stroke Patients Admitted in Various Clinics of Pakistan (2020)	Bilal, F. (2020)	In Pakistan, a hospital-based prospective research was conducted in the neurology ward of a tertiary care hospital. Demographic and clinical data were gathered from the special case records. The data from this study was analyzed to assess the pattern, rate, and consequences of drug-related issues in stroke patients.[28]	The majority of drug-related issues were discovered in individuals aged 51-70 years. Amlodipine-induced constipation (23.3%) was the most often reported ADR. Health care experts reported the acceptance rate of interventions to be (98.2%), however only 71% noticed a change in medication treatment.[28]
Identification of potential drug-related problems in the elderly: the role of the community pharmacist (2006)	Vinks et al (2006)	Ten different types of possible DRPs were identified and classified into three groups. The study was conducted in 16 community pharmacies in the Netherlands from June 2002 to February 2003. Medication assessments were performed on senior patients aged 65 and over who were taking six or more medicines concurrently.[29]	The average number of prescriptions written per patient was 8.7. The largest risk for possible DRPs was related with the use of NSAIDs (OR 29.9) and digoxin (OR 15.7). The probable DRPs were divided into three categories: patient-related 4, prescriber-related 55.7%, and drug-related 39.6%. [29]
Drug-related problems in hospitalized patients on polypharmacy: the influence of age gender (2005)	Koh and Kutty (2005)	A retrospective cross-sectional investigation was carried out in a Singaporean acute-care hospital. The Mann-Whitney test was used to determine if there was a statistically significant relationship between patients' age and gender and their likelihood of developing DRPs. [30]	There were no significant connections between age and gender with developing DRPs in 347 individuals prescribed polypharmacy (43% female and 58.2% geriatrics). Greater medication use was related with increased risk among patients with DRPs on admission, but not in inpatients.[30]
Comparison of Drug-Related Problems in Different Patient Groups (2004)	Viktil et al (2004)	Patients that were hospitalized to four different types of departments at five different hospitals in Norway were included sequentially. Medical data and information obtained at multidisciplinary morning meetings were used to assess the DRPs of the patients. [31]	The average age was 70.8 years, the gender split was 58.6%, and 81% had at least one DRP. The study also found significant disparities in the types of DRPs between the patient groups. Nonoptimal dosage and the requirement for more medicine were the most common DRPs.[31]
Drug-related problems in hospitalized patients with HIV infection (2008)	Mok and Minson (2008)	HIV-infected patients who were receiving antiretroviral medication at the time of admission to hospital for an HIV-related reason were examined. The medical records of patients were reviewed in order to detect medication-related issues and adverse drug events associated with treatment.[32]	Drug-drug interactions and inadequate antiretroviral regimens were the most prevalent drug-related issues among patients. The mean length of stay did not differ significantly between patients with and without these issues. Admission by non-infectious diseases specialists was an independent risk factor for experiencing at least one drug related issue while hospitalized. [32]
Characterization of drug-related problems in elderly patients on admission to a medical ward (1995)	Courtman and Stallings (1995).	The incidence, nature, avoidability, and risk factors associated with drug-related disorders (DRPs) among geriatric patients at a Toronto hospital were investigated. Each DRP was classified according to its avoidability (avoidable, perhaps avoidable, or inescapable) and contribution to hospitalization (main cause, contributing, or non-contributing).[33]	Upon admission, 41% of patients had a DRP, with the majority (96.8%) being preventable and involving routinely given medicines. In 31% of instances, the DRP was the primary or contributory reason for admission.DRPs were not statistically associated to age, gender, renal function, native language, or length of stay.[33]
Drug-related problems identified in medication	Stafford et al (2009)	We gathered a national sample of medication reviews performed between	In 234 medication evaluations, there were 1,038 drug-related concerns reported.

reviews by Australian pharmacists (2009)		1998 and 2005. These reviews were self-selected by pharmacists and submitted to the major authority responsible for certifying Australian pharmacists to do medication reviews as part of the accreditation process. Each evaluation characterized the drug-related concerns found by category and substances involved. [34]	The number of difficulties in reviews for home-dwelling patients was greater (4.9 +/- 2.0) than in care-facility residents. Oral hypoglycemics and analgesics/antipyretics more likely to be related with issues in patients living at home.[34]
Analysis and categorization of Drug Related Problems in a Tertiary care teaching hospital- A Prospective Observational Study (2016)	Vimali et al (2016)	For patient data collection, a specifically prepared proforma was employed, and the study was authorized by the institutional ethics committee. Patients who have been hospitalized for more than three days and are willing to give informed permission to participate in the study are eligible. [35]	Among the 100 instances examined, an average of 46% were reported with DRPs relating to safety issues, 28% were linked to efficacy, and 26% were related to need. The patients with DRPs had an average age of 335 years. A total of 42 comorbidities and 76 complaints were identified, with an average of 42 drugs administered per patient. [35]
Drug therapy-related problem management in Nigeria community pharmacy - process evaluation with simulated patient (2022)	Segun and Damilola (2022)	A cross-sectional study was conducted in Ibadan, Nigeria, with three simulated patients (SPs) accessing 36 chosen community pharmacies in 11 local government regions. A self-administered questionnaire was used to examine pharmacists' perceived obstacles to identifying, treating and preventing DTRPs.[36]	Community pharmacists saw challenges to DTRP diagnosis and resolution as a lack of access to patient's/medical client's history and the lack of detection tools. The number of community pharmacists who could recognize and resolve DTRPs varied somewhat between vignettes but was acceptable (40.9%).[36]
Pharmaceutical care issues identified by pharmacists in patients with diabetes, hypertension or hyperlipidaemia in primary care settings (2012)	Chua et. al (2012)	A comprehensive controlled experiment that assessed the results of medical general practitioners, pharmacists, dietitians, and nurses in primary care settings for diabetes, hypertension, and hyperlipidaemia. [37]	More than half of the PCIs (52%) were evaluated as probably clinically inconsequential, 38.9% as having limited clinical importance, 8.9% as certainly clinically significant and posing a risk to the patient, and one (0.2%) as being life threatening. [37]
Outcomes of clinical pharmacist 's interventions in solving drug-related problems in geriatric patients of rural teaching hospital (2016)	Maheshkumar et. al (2016)	The study included 520 patients of both sexes in the geriatric age group (60 years) who were admitted to Annamalai University hospital in the southern Indian city of Chennai. Following patient consent, demographic data, medical and medication history were collected from the patient's case sheet. [38]	The majority of patients (38.84%) were between the ages of 60 and 64, resulting in a significant increase in the number of medications. The cardiovascular system was the most commonly associated system with 147 (28.26%) patients. According to the study, 56.53% of geriatric patients were prescribed 6-8 drugs for disease treatment. [38]
Appropriateness of Antibiotics Use and Associated Factors in Hospitalized Patients at University of Gondar Specialized Hospital, Amhara, Ethiopia: Prospective Follow-up Study (2021)	Demssie et.al (2021)	RAND conducted a hospital-based prospective follow-up study on the use of antibiotics in patients with upper respiratory infections. Data was gathered through chart review and interviews with prescribers and patients using a pre-tested questionnaire based on the RAND modified Delphi method. The frequency distribution and percentage distribution of dependent variables were examined. Furthermore, bivariate and multivariate analyses were	There were 303 study participants, with a mean age of 44.07 years and a majority of 173 (57.1%) of the participants being females. Males used antibiotics more appropriately than females [5.99 (AOR 95% CI 2.00-7.98)], and employed participants used them more effectively than nonemployees. Antibiotics were used more appropriately in patients who received antibiotics after blood culture and cerebrospinal fluid culture than in those who did not. Patients who believed

		used to evaluate the factors that influence the factors. [39]	that the prescribed antibiotics would prevent disease complications were more likely to take them. [39]
Drug-related problems in prescribing for coronary artery diseases in Vietnam: cross-sectional study (2019)	Truong et.al (2019)	A retrospective cross-sectional study of outpatients with CADs in a general hospital in Can Tho, Vietnam. DRPs were categorized using the Pharmaceutical Care Network Europe criteria. We discovered the frequency and patterns of DRPs. DRP determinants were identified using logistic regression. [40]	DRPs included incorrect indication (3.5%), incorrect dosage (22.2%), incorrect frequency of use (24.2%) and incorrect time of taking medications (4.1%). Errors were found in 61.1% of 683 patients (mean age 63.4; 64.3% female). Prescriptions for 5 drugs are more likely to be filled at an inconvenient time and to result in drug interactions (ORa = 6.48; 95% CI = 2.59-16.24). [40]
A Survey to Assess the Prevalence of Drug-Related Problems Identified in Community Pharmacy at Palakkad District (2016)	Dr. C. I. Sajeeth	The search resulted in a total of 256 prescriptions. The survey was planned as a prospective observational study. The study was carried out over a period of six months. After obtaining patient consent, a predefined data entry form was created to collect the data required for the study. [41]	Drug interactions, inaccurate frequency, and inaccurate dose were among the drug-related issues identified in the community pharmacy. In 37.5% of prescriptions, the demographic profile of the patient was recorded. The dose and frequency of drug administration were also mentioned in 35.54% of the prescriptions. [41]
Pharmaceutical care program for onco-hematologic outpatients: safety, efficiency and patient satisfaction (2016)	Ribed et. al (2016)	ASCO's pharmacological care program was developed in accordance with ASCO recommendations. A pharmacological follow-up was designed and structured into three clinical interviews over the course of six months. Patients initiating therapy with oral antineoplastic drugs without pharmacist monitoring in 2011 were compared to patients starting treatment in 2013. The statistical program SPSS was used for the analysis, and p 0.05 and 1.0 and 21.0 were considered significant. [42]	The study included a total of 249 patients in total. 275 medication errors were recorded [106 in the control group and 169 in the intervention group (p = 0.008)]. The pharmacist intervened on 362 occasions, with 88.8% of the time being accepted, primarily to reinforce patient education and literacy and to provide information on co-administration with other drugs and herbal medicines. Adherent patients in the intervention group increased by 20% at the sixth month of treatment (p 0.001). There was a lot of happiness. [42]
Drug related problems identified by European community pharmacists in patients discharged from hospital (2004)	Paulino et. al (2004)	The research was carried out in 112 community pharmacies across Europe, including Austria, Denmark, Germany, the Netherlands, Portugal, and Spain. Patients having a prescription after being discharged from the hospital were solicited to participate in the research by community pharmacists between February and April 2001. To detect drug-related issues, a patient questionnaire was employed. Pharmacists recorded drug-related issues, pharmacy interventions, prescriber type, and patient and pharmacy factors. [43]	Drug-related death and disability (DRP) is defined as uncertainty or lack of knowledge about a drug's purpose or function (133; 29.5%) and side effects (105; 23.3%). Patients with more drug regimen changes (drugs stopped, new drugs started, dosage modifications) and who used more drugs were more likely to develop DRPs. Community pharmacists documented 305 interventions in 205 DRP patients. [43]
Drug-related problems identified during pharmaceutical care interventions in an intensive care unit at a tertiary university hospital	Tharanon et. al (2022)	From January 2015 to December 2020, a retrospective descriptive research was done at a tertiary university hospital in Bangkok, Thailand. The drug-related issues were classified using Cipolle et al categorization. In this study, the severity of drug-related	Drug-related problems were found in 73.9% of critically ill patients admitted to the medical intensive care unit. Dosage too high (27.7%), ineffective drug (17.2%), need for additional drug therapy (15.3%), dosage too low (14.3%) and



		issues was graded by adapting The National Coordinating Council for Medication Error Reporting and Prevention Taxonomy of Medication Error to reflect damage from drug-related problem-related patient outcomes. [44]	adverse drug reaction (9.7%) were the most common drug-related issues. To provide personalized pharmacotherapy, pharmacists' interventions were advised based on drug related problem identification. [44]
The burden of polypharmacy and pattern of comorbidities among chronic kidney disease patients in clinical practice (2018)	Fasipe et. al (2018)	This was an 18-month descriptive, prospective research that reviewed the medical case records of consenting adult CKD patients visiting a Nigerian tertiary renal care facility from January 2015 to June 2016. [45]	This study included 123 consented adult CKD patients, with a mean age of 53.81 16.03 years. Furosemide (88, 71.6%), enoxaparin (67, 54.47%), lisinopril (65, 52.9%), oral calcium carbonate (63, 51.2%), -calcidiol (62, 50.4%), and erythropoietin (61, 49.6%) were the most commonly prescribed medications. The majority of respondents had two or more comorbidities, the most common of which were hypertension (103, 83.70), diabetes mellitus (39, 31.70%), obesity (24, 19.51%), heart failure (11, 8.90%), obstructive uropathy (8, 6.50%), HIV (7, 5.70%). [45]
Prevalence and Pattern of Potential Drug-Drug Interactions among Chronic Kidney Disease Patients in South-Western Nigeria(2017)	Olumuyiwa et. al (2017)	This was a descriptive retrospective research conducted at the Kidney Care Centre in Ondo City. For the study, the case records of 123 adult patients with CKD who were handled at the center between January 2015 and June 2016 were evaluated. Sociodemographic data, serum creatinine, number and list of drugs at the time of last clinic attendance for outpatients as well as comorbidities such as hypertension, diabetes mellitus, HIV infection, stroke, and heart failure were retrieved. [46]	123 CKD patients were studied, with 82 (66.67%) males and 41 (33.33%) females. Hypertension (83.74%) and diabetes mellitus (31.71%) were the most common comorbid conditions. A total of 1237 prescriptions were written, with the average number of medications prescribed per patient being 10.06 3.97. The prevalence of potential DDIs was 95.9%, with the mean of 1.27 DDIs per prescription. [46]
A study of medication-related problems in stroke patients: A need for pharmaceutical care	Kanagala et. al (2016)	A prospective, observational research was done on 133 stroke patients aged 18 and up who were admitted to the general medicine department. Using the Pharmaceutical Care Network Europe Foundation categorization system, the incidence of DRPs was determined throughout a 6-month research period. [48]	A total of 133 patients were screened for DRP. Among them, 120 patients had at least one DRP. A total of 254 DRPs were identified (average 2015 DRP per patient case). [48]
Community pharmacists' routine provision of drug-related problem-reduction services (2022)	Ghaith M. Al-Taani (2022)	Survey of community pharmacists in Irbid, Jordan to assess the degree of DRP-reduction service provision. The study includes descriptive data as well as a multivariate linear regression model for characteristics linked with high DRP reduction service supply. Background and practice characteristics, services given frequently by pharmacists to treat DRPs, and barriers and facilitators are all part of the study. [49]	Survey of community pharmacists reveals barriers to effective DRP-reduction services. Economic aspects were the most frequently encountered DRPs in routine community pharmacy practice (76.0%). Lack of recognition of the pharmacist role was also cited as a barrier to effective service delivery. The presence of medical records for patients in the pharmacy, high satisfaction in professional relationships with physicians and pharmacists' age were predictors of high total scores. [49]

---

## Conclusion

Problems stemming from the use of drugs are quite common among hospitalized patients of all different specialties. The involvement of clinical pharmacists in routine clinical practice needs to be considered a standard operating procedure. Therefore, in order to reduce the number of difficulties associated with medicine, hospitals should educate younger physicians on the concepts behind drug doses. They should also work to cultivate a culture in which the act of writing prescriptions is appreciated and formally evaluate the actions taken by pharmacists. Community pharmacists are perfectly suited for the task of detecting and addressing drug-related problems within the framework of community pharmacies. In addition, it is possible that preventative measures, responses, and resolutions to these difficulties may need full drug reviews to be carried out by clinical pharmacists as a member of a healthcare team. Community pharmacists have the potential to play a pivotal part in the detection, evaluation, and prevention of possible DRPs in the aged population.

Polypharmacy and a pattern of associated specific comorbidities might potentially increase the likelihood of drug-related complications such as DDIs and ADRs. According to the findings, age and gender were revealed to be significantly less important predictors of DRP in patients who had polypharmacy compared to the number of drugs that were provided. With the assistance of a pharmacist, it should be possible to reduce the majority of DRPs. Clinical and hospital pharmacists, working in partnership with medical professionals, contribute to the reduction of drug related problems via the use of manual or online prescription auditing and medication reconciliation procedures. The number of DRPs increases in direct proportion to the total quantity of drugs included inside prescriptions. It is possible to discover numerous DRPs by a thorough intervention carried out by community pharmacists on discharged patients or their representatives.

## References

---

- [1] Garin, N., Sole, N., Lucas, B., Matas, L., Moras, D., Rodrigo-Troyano, A., Gras-Martin, L., & Fonts, N. (2021). Drug related problems in clinical practice: a cross-sectional study on their prevalence, risk factors and associated pharmaceutical interventions. *Scientific Reports*, 11(1). <https://doi.org/10.1038/s41598-020-80560-2>
- [2] Ni, X. F., Yang, C. S., Bai, Y. M., Hu, Z. X., & Zhang, L. L. (2021). Drug-Related Problems of Patients in Primary Health Care Institutions: A Systematic Review. *Frontiers in Pharmacology*, 12. <https://doi.org/10.3389/fphar.2021.698907>
- [3] Pfister, B., Jonsson, J., & Gustafsson, M. (2017). Drug-related problems and medication reviews among old people with dementia. *BMC Pharmacology and Toxicology*, 18(1). <https://doi.org/10.1186/s40360-017-0157-2>
- [4] Alruqayb, W. S., Price, M. J., Paudyal, V., & Cox, A. R. (2021). Drug-Related Problems in Hospitalised Patients with Chronic Kidney Disease: A Systematic Review. *Drug Safety*, 44(10), 1041–1058. <https://doi.org/10.1007/s40264-021-01099-3>
- [5] Dean, B., Schachter, M., Vincent, C., & Barber, N. (2002). Causes of prescribing errors in hospital inpatients: a prospective study. *The Lancet*, 359(9315), 1373–1378. [https://doi.org/10.1016/s0140-6736\(02\)08350-2](https://doi.org/10.1016/s0140-6736(02)08350-2)
- [6] Herout, P. M., & Erstad, B. L. (2004). Medication errors involving continuously infused medications in a surgical intensive care unit. *Critical Care Medicine*, 32(2), 428–432. <https://doi.org/10.1097/01.ccm.0000108876.12846.b7>
- [7] Barber, N., & Taxis, K. (2004). Incidence and severity of intravenous drug errors in a German hospital. *European Journal of Clinical Pharmacology*, 59(11), 815–817. <https://doi.org/10.1007/s00228-003-0689-9>
- [8] LaPointe, N. M. A., & Jollis, J. G. (2003). Medication Errors in Hospitalized Cardiovascular Patients. *Archives of Internal Medicine*, 163(12), 1461. <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/215749>
- [9] van den Bemt, P. M. L. A., Fijn, R., van der Voort, P. H. J., Gossen, A. A., Egberts, T. C. G., & Brouwers, J. R. B. J. (2002). Frequency and determinants of drug administration errors in the intensive care unit\*. *Critical Care Medicine*, 30(4), 846–850. <https://doi.org/10.1097/00003246-200204000-00022>
- [10] Calabrese, A. D., Erstad, B. L., Brandl, K., Barletta, J. F., Kane, S. L., & Sherman, D. S. (2001). Medication administration errors in adult patients in the ICU. *Intensive Care Medicine*, 27(10), 1592–1598. <https://doi.org/10.1007/s001340101065>
- [11] Rothschild, J. M., Landrigan, C. P., Cronin, J. W., Kaushal, R., Lockley, S. W., Burdick, E., Stone, P. H., Lilly, C. M., Katz, J. T., Czeisler, C. A., & Bates, D. W. (2005). The Critical Care Safety Study: The incidence and nature of adverse events and serious medical errors in intensive care\*. *Critical Care Medicine*, 33(8), 1694–1700. <https://doi.org/10.1097/01.ccm.0000171609.91035.bd>
- [12] Lagnaoui, R., Moore, N., Fach, J., Longy-Boursier, M., & Bégau, B. (2000). Adverse drug reactions in a department of systemic diseases-oriented internal medicine: prevalence, incidence, direct costs and avoidability. *European Journal of Clinical Pharmacology*, 56(2), 181–186. <https://doi.org/10.1007/s002280050738>
- [13] Kaushal, R. (2001). Medication Errors and Adverse Drug Events in Pediatric Inpatients. *JAMA*, 285(16), 2114. <https://doi.org/10.1001/jama.285.16.2114>

- [14] Suh, D. C., Woodall, B. S., Shin, S. K., & Santis, E. R. H. D. (2000). Clinical and Economic Impact of Adverse Drug Reactions in Hospitalized Patients. *Annals of Pharmacotherapy*, 34(12), 1373–1379. <https://doi.org/10.1345/aph.10094>
- [15] Chan, T. Y. K., & Critchley, J. A. J. H. (1994). Reporting of adverse drug reactions in relation to general medical admissions to a teaching hospital in Hong Kong. *Pharmacoepidemiology & Drug Safety*, 3(2), 85–89. <https://doi.org/10.1002/pds.2630030205>
- [16] Leape, L. L., Brennan, T. A., Laird, N., Lawthers, A. G., Localio, A. R., Barnes, B. A., Hebert, L., Newhouse, J. P., Weiler, P. C., & Hiatt, H. (1991). The Nature of Adverse Events in Hospitalized Patients. *New England Journal of Medicine*, 324(6), 377–384. <https://doi.org/10.1056/nejm199102073240605>
- [17] Hammerlein, A., Griese, N., & Schulz, M. (2007). Survey of Drug-Related Problems Identified by Community Pharmacies. *Annals of Pharmacotherapy*, 41(11), 1825–1832. <https://doi.org/10.1345/aph.1k207>
- [18] Pfister, B., Jonsson, J., & Gustafsson, M. (2017). Drug-related problems and medication reviews among old people with dementia. *BMC Pharmacology and Toxicology*, 18(1). <https://doi.org/10.1186/s40360-017-0157-2>
- [19] Hajjar, E. R., Hanlon, J. T., Artz, M. B., Lindblad, C. I., Pieper, C. F., Sloane, R. J., Ruby, C. M., & Schmader, K. E. (2003). Adverse drug reaction risk factors in older outpatients. *The American Journal of Geriatric Pharmacotherapy*, 1(2), 82–89. [https://doi.org/10.1016/s1543-5946\(03\)90004-3](https://doi.org/10.1016/s1543-5946(03)90004-3)
- [20] Lau, D. T., Kasper, J. D., Potter, D. E. B., Lyles, A., & Bennett, R. G. (2005). Hospitalization and Death Associated With Potentially Inappropriate Medication Prescriptions Among Elderly Nursing Home Residents. *Archives of Internal Medicine*, 165(1), 68. <https://doi.org/10.1001/archinte.165.1.68>
- [21] Ruths, S. (2003). Multidisciplinary medication review in nursing home residents: what are the most significant drug-related problems? The Bergen District Nursing Home (BEDNURS) study. *Quality and Safety in Health Care*, 12(>3), 176–180. <https://doi.org/10.1136/qhc.12.3.176>
- [22] Haugbølle, L. S., & Sørensen, E. W. (2006). Drug-related problems in patients with angina pectoris, type 2 diabetes and asthma – interviewing patients at home. *Pharmacy World & Science*, 28(4), 239–247. <https://doi.org/10.1007/s11096-006-9023-9>
- [23] Finkers, F., Maring, J. G., Boersma, F., & Taxis, K. (2007). A study of medication reviews to identify drug-related problems of polypharmacy patients in the Dutch nursing home setting. *Journal of Clinical Pharmacy and Therapeutics*, 32(5), 469–476. <https://doi.org/10.1111/j.1365-2710.2007.00849.x>
- [24] Nilsson, J. L. G., Andersson, Å., Källemark, S., Lieberman-Ram, H., Ullenius, B., Wendel, A., & Åberg, Å. (2000). Surveys of drug-related therapy problems of patients using medicines for allergy, asthma and pain. *International Journal of Pharmacy Practice*, 8(3), 198–203. <https://doi.org/10.1111/j.2042-7174.2000.tb01005.x>
- [25] Patel, J. P., Bhatt, S. P., & Sinha, O. (2018). Drug Related Problems in Radio and Nuclear Pharmacy. *Undefined*. <https://www.semanticscholar.org/paper/Drug-Related-Problems-in-Radio-and-Nuclear-Pharmacy-Patel-Bhatt/b4394a318702b663fde21fe8dbf6ed16def6a640>
- [26] Gökçekuş, L., Meštrović, A., & Başgut, B. (2016). Pharmacist intervention in drug-related problems for patients with cardiovascular diseases in selected community pharmacies in Northern Cyprus. *Tropical Journal of Pharmaceutical Research*, 15, 2275-2281.
- [27] Vijayakumar, A., Sharon, E.V., Teena, J., Nobil, S., & Nazeer, I.A. (2014). A clinical study on drug-related problems associated with intravenous drug administration. *Journal of Basic and Clinical Pharmacy*, 5, 49 - 53.
- [28] Bilal, F. (2020). Assessment of Drug Related Problems in Stroke Patients Admitted in Various Clinics of Pakistan. <https://www.semanticscholar.org/paper/Assessment-of-Drug-Related-Problems-in-Stroke-in-of-Bilal/>
- [29] Vinks, T.H., Koning, F.H., Lange, T.M., & Egberts, T.C. (2005). Identification of Potential Drug-related Problems in the Elderly: The Role of the Community Pharmacist. *Pharmacy World and Science*, 28, 33-38.
- [30] Koh, Y., Kutty, F.B., & Li, S. (2005). Drug-related problems in hospitalized patients on polypharmacy: the influence of age and gender. *Therapeutics and Clinical Risk Management*, 1, 39 - 48.
- [31] Viktil, K., Blix, H.S., Reikvam, A., Moger, T.A., Hjemaas, B.J., Walseth, E.K., Vraalsen, T.F., Pretsch, P., & Jørgensen, F. (2004). Comparison of Drug-Related Problems in Different Patient Groups. *Annals of Pharmacotherapy*, 38, 942 - 948.
- [32] Mok, S., & Minson, Q. (2008). Drug-related problems in hospitalized patients with HIV infection. *American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists*, 65(1), 55–59. <https://doi.org/10.2146/ajhp070011>
- [33] Courtman, B., & Stallings, S. (1995). Characterization of drug-related problems in elderly patients on admission to a medical ward. *The Canadian journal of hospital pharmacy*, 48 3, 161-6 .
- [34] Stafford, A. C., Tenni, P. C., Peterson, G. M., Jackson, S. L., Hejlesen, A., Villesen, C., & Rasmussen, M. (2009). Drug-related problems identified in medication reviews by Australian pharmacists. *Pharmacy world & science : PWS*, 31(2), 216–223. <https://doi.org/10.1007/s11096-009-9287-y>

- [35] Vimali., M., SurendraReddy, N., & Ranganayakulu, D. (2016). Analysis and categorization of Drug Related Problems in a Tertiary care teaching hospital- A Prospective Observational Study. *Imperial journal of interdisciplinary research*, 2.
- [36] Segun, S. J., & Damilola, L. S. (2022). Drug therapy-related problem management in Nigeria community pharmacy - process evaluation with simulated patients. *BMC health services research*, 22(1), 209. <https://doi.org/10.1186/s12913-022-07535-z>
- [37] Chua, S. S., Kok, L. C., Yusof, F. A. M., Tang, G. H., Lee, S. W. H., Efendie, B., & Paraidathathu, T. (2012, November 12). *Pharmaceutical care issues identified by pharmacists in patients with diabetes, hypertension or hyperlipidaemia in primary care settings - BMC Health Services Research*. BioMed Central. Retrieved December 5, 2022, from <https://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-12-388#citeas>
- [38] Maheshkumar, V., Dhanapal, C., & Ramakrishna, R. (2016). Outcomes of clinical pharmacist's interventions in solving drug-related problems in geriatric patients of. *The Pharma Innovation*. Retrieved from <https://www.thepharmajournal.com/archives/2016/vol5issue1/PartB/4-10-43.pdf>
- [39] Demssie, A. A., Zemene, D. K., Gizeaddis, B. M., & Tewodros, T. A. (December 7, 2021). Appropriateness of Antibiotics Use and Associated Factors in Hospitalized Patients at University of Gondar Specialized Hospital, Amhara, Ethiopia: Prospective Follow-up Study. *SAGE Journals*. Retrieved from <https://journals.sagepub.com/doi/10.1177/00469580211060744>
- [40] Truong, T. A., Phan, N. K., Vo, V. Q., Diep, H. G., Vuong, K. H., Le, T. V., . . . Nguyen, T. (2019). Drug-related problems in prescribing for coronary artery diseases in Vietnam: cross-sectional study. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/31520568/>
- [41] Sajeeth, D. I. (2016). A Survey to Assess the Prevalence of Drug-Related Problems Identified in Community Pharmacy at Palakkad District. *Semantic Scholar*. Retrieved from <https://www.semanticscholar.org/paper/A-Survey-to-Assess-the-Prevalence-of-Drug-Related-Sajeeth/07569b04c910e8fa80706312bf0794fbae52307d>
- [42] Ribed, A., Jiménez, R. R., Vilaplana, V. E., Peinado, I. I., Alonso, A. H., Codina, C., & Sáez, M. S. (2016). Pharmaceutical care program for onco-hematologic outpatients: safety, efficiency and patient satisfaction. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/26715547/>
- [43] Paulino, E. I., Bouvy, M. L., Gastelurrutia, M. A., Guerreiro, M., & Buurma, H. (2004). Drug related problems identified by European community pharmacists in patients discharged from hospital. *International Journal of Clinical Pharmacy*. Retrieved from <https://link.springer.com/article/10.1007/s11096-004-2268-2>
- [44] Tharanon, V., Putthipokin, K., & Sakthong, P. (2022, April 19). Drug-related problems identified during pharmaceutical care interventions in an intensive care unit at a tertiary university hospital. *SAGE Journals*. Retrieved from [https://repository.arizona.edu/bitstream/handle/10150/554839/AZU\\_TD\\_BOX71\\_E9791\\_1974\\_92.pdf;jsessionid=B7AD3A13115D86ADFF2CFBA4F808F01A?sequence=](https://repository.arizona.edu/bitstream/handle/10150/554839/AZU_TD_BOX71_E9791_1974_92.pdf;jsessionid=B7AD3A13115D86ADFF2CFBA4F808F01A?sequence=)
- [45] Fasipe, O., Akhideno, P., Ibiyemi-Fasipe, O., & Idowu, A. (2018). The burden of polypharmacy and pattern of comorbidities among chronic kidney disease patients in clinical practice. Retrieved from <https://www.semanticscholar.org/paper/The-burden-of-polypharmacy-and-pattern-of-among-in-Fasipe-Akhideno/3de2ffa65667f8f729cda53457d078704cf3fa11>
- [46] Olumuyiwa, F. J., Akinwumi, A. A., Ademola, A. O., Oluwole, A. B., & Ibiene, O. E. (2017). Prevalence and Pattern of Potential Drug-Drug Interactions. Retrieved from <https://www.unimed.edu.ng/oer.unimed.edu.ng/JOURNALS/1/5/J-Fasipe-Olumuyiwa-A-Akinbodewa-Akinwumi-I-O-Adejumo-Ademola-I-B-Akawa-Oluwole-E-Okaka-Ibiene2---Prevalence-and-Pattern-of-Potential-DrugDrug-Interactions-among-Chronic-Kidney-Disease-Patients-in-Sou>
- [47] Elhabib, M., Yousif, M., Ahmed, K., Abunada, M., Almgari, K., & Eldalo, A. (2022). Impact of Clinical Pharmacist-Led Interventions on Drug-Related Problems Among Pediatric Cardiology Patients: First Palestinian Experience. Retrieved from [https://pdfs.semanticscholar.org/d1ed/b3ac09deeb9e6770ac28d679efeee8c7b887.pdf?\\_ga=2.24348223.482718504.1666156023-341165937.1662159271](https://pdfs.semanticscholar.org/d1ed/b3ac09deeb9e6770ac28d679efeee8c7b887.pdf?_ga=2.24348223.482718504.1666156023-341165937.1662159271)
- [48] Kanagala, V., Anusha, A., Rao, B., Challa, S., Nalla, K., & Gadde, R. (2016). A study of medication-related problems in stroke patients: A need for pharmaceutical care. *Journal of Research in Pharmacy Practice*. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4966245/>
- [49] Al-Taani, G. M. (2022). Community pharmacists' routine provision of drug-related problem-reduction services. Retrieved from <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0267379>