



INTERNATIONAL JOURNAL OF PHARMACEUTICAL RESEARCH AND DEVELOPMENT (IJPRD)

Platform for Pharmaceutical Researches & Innovative Ideas
www.ijprd.com

POLYPHARMACY IN ELDERLY PATIENTS AT DISCHARGE MEDICATION

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ABSTRACT

Objective: This research was conducted to determine the prevalence of Polypharmacy in discharge prescriptions among the elderly patients of Sungai Petani, Kedah state, Malaysia. **Method:** This observational, retrospective study was conducted with elderly patients randomly selected with discharge medications. The data was documented from patients' medical profile, using a well designed data collection form. The recorded data includes socio-demographic characteristics, type of ward, past medical and medication history, allergies, diagnosis and discharge medication. The data thus collected was analyzed using SPSS version 14. **Results:** A total of 91 patients were enrolled into this study. On discharge, 87.9% of the prescriptions were indicative of Polypharmacy. The patients having more than 6 drugs prescribed were slightly older and more frequently male. It was also noted that Malayee population were found to have more of Polypharmacy at discharge (76% < 6 drugs and 75.8% ≥ 6 drugs) when compared to other races. Multivariable logistic regression model showed that age per sex was not significantly associated with the outcome. Polypharmacy prior to admission, cumulative co-morbidity, diabetes mellitus, congestive heart failure, chronic obstructive pulmonary disease and hypertension were the significant correlates for Polypharmacy at discharge. The Polypharmacy prescribing trend in hospitals for discharged patients seems to be mostly due to co-morbidities, including depression, dementia, confusion, intolerance and forgetfulness in elderly patients. **Conclusion:** Through this study, it can be concluded that, increased number of drugs is mainly due to multiple diseases. Polypharmacy cannot be avoided in poly patho-physiological conditions as the patients require intensive drug treatment.

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Key Words

Polypharmacy, elderly, discharge medication, prevalence.

INTRODUCTION

There are numerous definitions for Polypharmacy, and the criteria vary from study to study. The word refers to the administration of numerous medicines, often for multiple indications, at the same time^[1,2]. Other definitions include prescribing more medication than is clinically indicated, medical regimen that includes at least one unnecessary medication, or the empiric use of five or more medications. The UK's National Service Framework (NSF) defines it as the prescription of four or more drugs. In yet some other studies, the minimum limit for Polypharmacy has been at least 5 drugs, more than 5 drugs, at least 7, or at least 10 drugs^[3-11]. Polypharmacy is sometimes characterized in more detail as minor (2 to 3 drugs), moderate (4 to 5 drugs), or major (> 5 drugs) Polypharmacy^[9].

Polypharmacy may be appropriate or inappropriate. It may be inappropriate for a number of reasons, e.g., more drugs prescribed than necessary, the prescription of drugs with unacceptable side effects or co-prescription of drugs with harmful drug-drug and drug-disease interactions. A major concern about Polypharmacy is the potential for interactions and adverse drug reactions. Non-adherence or decreased adherence, increased risk of hospitalizations, medication errors and increased costs resulting from treatment of adverse events are other problems associated with inappropriate Polypharmacy^[1].

Therapy adherence rates are diminished by complex drug regimens, incomplete explanation of benefits and side effects, lack of recognition of a patient's lifestyle, cost of medications etc^[12,13]. Medication adherence to therapy is more likely when a patient understands his/her illness and is involved in the treatment decision making. Patients have more confidence in their prescriber and pharmacist if they are properly counseled regarding the potential adverse effects and ways to deal if such effects occur.

However, Polypharmacy may be unavoidable in most chronic conditions which require multiple medications for proper treatment^[13,14]. The comorbidities of diabetes commonly include hypertension, dyslipidemia, depression and coagulopathies, each of which may require one or more drugs for adequate

control. Add to this, other conditions that often accompany diabetes, include hypothyroidism, heart failure and osteoporosis. Thus, the total number of possible medications needed becomes significant.

In the home-dwelling elderly, the predictors of increasing Polypharmacy are age, the use of many drugs, and the use of drugs (especially hypnotics/sedatives) without clear indication, cardiovascular diseases, diabetes, and abdominal symptoms. In over 4-year follow-up, almost 20% of the home-dwelling elderly developed Polypharmacy^[9]. Forty per cent of the home-nursed elderly with Polypharmacy had depressive symptoms and sleeping disorders, and Polypharmacy was connected with impaired cognition^[15].

In 1995–96, every third (39%) Finnish drug user aged 75 years or over had Polypharmacy (≥ 5 prescription drugs)^[16]. In the United Kingdom, every third (30%) home-dwelling person over 74 years of age used three or more prescribed drugs^[3]. Their proportion in Denmark was 60% among 75-year-old persons, and 34% took 5 or more drugs^[17].

Causes of Polypharmacy are due to multiple prescribers, aging population, complex drug therapies, psychosocial contributions and adverse drug reactions that may be interpreted as new medical conditions^[14].

The incidence of chronic conditions increases as the population ages. Patients with a chronic disease often see specialists in addition to their primary care providers. Each of these providers may prescribe medications, adding to a growing list of drugs on a patient's profile. All too often, patient's drug lists are not regularly monitored for potential problems. There is a stronger tendency for drugs to be added to a patient's regimen than for drugs to be discontinued. Adding new treatments may make a previously used medication redundant. The continuous addition of drugs over time, without periodic re-evaluation of the drug regimen, is one of the major contributors to the development of Polypharmacy.

The variety of expert panel recommendations, clinical practice guidelines and other national standards for medical treatments has grown exponentially. Sadly, clinical practice guidelines rarely address the treatment

of patients with three or more chronic diseases, which complicates the treatment therapy further.

Patients and their families often demand medications and frequently ignore explanations about why drug therapy may not be in their best interests due to wrong perceptions that taking more types of medications will help them recover faster. This drives demand from patients or their families for additional treatment.

Adverse drug reactions to existing treatments may be misinterpreted as new medical conditions requiring treatment with additional medical or surgical intervention ^[14]. For example, edema caused by a thiazolidinedione might be mistaken as a sign of new-onset heart failure or as a worsening of pre-existing heart failure. This may lead to the addition of a diuretic if the root cause of the edema is not determined.

Polypharmacy causes a risk of adverse effects, toxic reactions, and drug interactions ^[5,17,18]. Polypharmacy is a risk factor for falls ^[19], which may cause fractures and other injuries and constitute a risk for hospitalization. Studies have shown that the hospital admissions of 12% to 42% of elderly patients were due to adverse drug reactions ^[18-22], and every fourth admitted person had a severe reaction related to drugs ^[18]. Elderly patients with drug-induced illness had an average of 6.3 drugs compared to 3.8 drugs per elderly patient admitted for other reasons ^[20]. Clinically significant interactions have been found in up to 15% of the home-dwelling elderly with Polypharmacy ^[5].

METHODOLOGY

This observational, retrospective study was conducted for a period of 3 months from February 2009 – March 2009. All Patients with discharge medications above the age of 60 years were included for this study. Patients who were not discharged, those who do not have discharge medications and those patients who died in the hospital were not included in our study. The patients were selected randomly and their medical profile was used to document the required data using a well designed data collection form with the prior approval from the involved hospital authorities.

For this study, data was collected from patients who were admitted into the following hospitals –

Hospital Sultan Abdul Halim, Sungai Petani; Hospital Sultanah Bahiyah, Alor Setar; and Hospital Kulim for a period of three months between February 2009 and April 2009. Data were recorded from the patients' medical profile with the approval from the involved hospitals.

Overall, we managed to collect data from 91 patients (55 patients < 65 years; 19 patients 65-75 years; and 17 patients 76 years or more). Data recorded included socio-demographic characteristics, type of ward, past medical and medication history, allergies, diagnosis at admission and the medications prescribed at discharge.

Variables specifically considered in this study were age, gender, ethnicity and type of ward. Furthermore, age-related chronic conditions {hypertension, diabetes mellitus, cardiac diseases, chronic obstructive pulmonary disease (COPD), renal insufficiency} were also considered as potential correlates.

We used contingency tables to compare the demographic and clinical characteristics of patients grouped to whether they had less than 6 drugs, or 6 and more drugs prescribed at discharge. We then built multivariable logistic regression model to evaluate the individual association with the major Polypharmacy of the characteristics whose prevalence was different between the two groups.

The effects of hospitalization on the number of prescribed drugs in the sample of patients identified by the most prevalent mean diseases were also investigated by comparing the number of drugs taken before admission and prescribed at discharge. Wilcoxon's signed rank test was used in this analysis because data were not normally distributed.

To verify whether inappropriate prescribing could contribute to increase the number of prescribed drugs at discharge, we also investigated the prevalence of selected clinical conditions in patients having cardiac drugs (includes nitrates, anti-thrombolytics and digoxin), diuretics, antihypertensives (alpha and beta blockers, calcium channel blockers, angiotensin converting enzyme (ACE) inhibitors or Angiotensin Receptor Blocker (ARB), inhaled bronchodilators, Lipid lowering agents

(statins), Analgesics (mainly aspirin), oral hypoglycemic agents, antibiotics and vitamins prescribed before admission or at discharge. The indications we considered in the analysis were angina pectoris, myocardial infarction, atrial fibrillation or congestive cardiac failure for cardiac drugs; hypertension, renal insufficiency or heart failure for diuretics; hypertension for antihypertensive; COPD or asthma for inhaled bronchodilators; hyperlipidemia or hypercholesterolemia for lipid lowering agents (statins); general pain for analgesic; diabetes mellitus for oral hypoglycemic agents; infections for antibiotics; adjuvants for vitamins.

RESULTS

A total of 91 patients were enrolled into this study from the government hospitals of Kedah state, Malaysia. The patient's prescription for Polypharmacy on admission and discharge from the geriatric and general medicine wards were taken for this study. The number of patients taking more than 6 drugs before admission (past medication) was 29 (31.9%). On discharge, the outcome was present in 80 (87.9%) patients i.e. 80 patients were having Polypharmacy on discharge prescription from the hospital.

Demographic and clinical characteristics of patients were divided according to the number of drugs prescribed at discharge as shown in Table 1. Patients having more than 6 drugs prescribed were slightly older and more frequently male than patients having prescribed less than 6 drugs.

Characteristics	Number of drugs at discharge				
	< 6	(%)	≥ 6	(%)	P
Age:					<0.001
< 65	15.0	62.5	40.0	59.7	
65 – 75	6.0	25.0	13.0	19.4	
≥ 76	3.0	12.5	14.0	20.9	
Gender:					0.057
Male	19.0	76.0	45.0	68.0	
Female	6.0	24.0	21.0	32.0	
Race:					0.026
Malay	19.0	76.0	50.0	75.8	
Chinese	5.0	20.0	13.0	19.7	
Indian	1.0	04.0	3.0	04.5	
Ward:					0.016
Geriatrics	12	48.0	33	50.0	
Medicine	13	52.0	33	50.0	
Diagnosis:					
Cardiac diseases	13.0	52.0	48.0	72.7	<0.001
COPD	6.0	24.0	17.0	25.8	0.008
Diabetes Mellitus	4.0	16.0	28.0	42.4	<0.001
Hypertension	8.0	32.0	37.0	52.0	<0.001
Renal insufficiency	1.0	08.0	10.0	15.1	0.075
Pneumonia	2.0	08.0	5.0	07.6	0.125
Blood disorders	4.0	12.0	8.0	16.1	0.103
GIT problems	2.0	08.0	4.0	06.0	0.175

It was also noted that the Malayee population (race) were found to have more of Polypharmacy at discharge (76% < 6 drugs and 75.8% ≥ 6 drugs) when

compared to the Chinese (20% < 6 drugs and 19.7% ≥ 6 drugs) and the Indians (4% < 6 drugs and 4.5% ≥ 6 drugs). However the turnout for this study is too low (n=91).

Having more than 4 diagnoses (Co-morbidity) was more frequent among those taking multiple drugs, such as congestive heart failure, coronary artery disease, hypertension, diabetes mellitus, peripheral vascular disease, Chronic Obstructive Pulmonary Disease, and renal insufficiency. Finally, the greater the

number of drugs taken at home, the greater the number of drugs prescribed at discharge. Table -1 show the demographic and clinical characteristics of patients divided according to the number of drugs prescribed at discharged prescription (Table 1).

Table 1: Demographic and clinical characteristics of patients divided according to the number of drugs prescribed at discharge					
Characteristics	Number of drugs at discharge				
	< 6	(%)	≥ 6	(%)	P
Age:					<0.001
< 65	15.0	62.5	40.0	59.7	
65 – 75	6.0	25.0	13.0	19.4	
≥ 76	3.0	12.5	14.0	20.9	
Gender:					0.057
Male	19.0	76.0	45.0	68.0	
Female	6.0	24.0	21.0	32.0	
Race:					0.026
Malay	19.0	76.0	50.0	75.8	
Chinese	5.0	20.0	13.0	19.7	
Indian	1.0	04.0	3.0	04.5	
Ward:					0.016
Geriatrics	12	48.0	33	50.0	
Medicine	13	52.0	33	50.0	
Diagnosis:					
Cardiac diseases	13.0	52.0	48.0	72.7	<0.001
COPD	6.0	24.0	17.0	25.8	0.008
Diabetes Mellitus	4.0	16.0	28.0	42.4	<0.001
Hypertension	8.0	32.0	37.0	52.0	<0.001
Renal insufficiency	1.0	08.0	10.0	15.1	0.075
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Blood disorders	4.0	12.0	8.0	16.1	0.103
GIT problems	2.0	08.0	4.0	06.0	0.175

Multivariable logistic regression model showed that age per sex was not significantly associated with the outcome. Polypharmacy prior to admission, cumulative co-morbidity, diabetes mellitus, congestive heart failure, Chronic Obstructive Pulmonary Disease (COPD) and

hypertension were the significant correlates of the number of drugs prescribed at discharge and renal insufficiency, pneumonia, blood disorders and GIT associated problems were the non-significant correlates of the number of prescribed drugs at discharge (Table 2).

Table 2: Summary logistic regression model of selected variables to having 6 drugs or more prescribed at discharge		
Characteristics	Odds Ratio	95% Confidence Interval
Age:		
< 65	1.0	
65 – 75	0.81	0.26 – 2.53
≥ 76	1.75	0.44 – 6.96

Gender: Males	0.68	0.24 – 1.94		
Ward: Geriatrics	1.08	0.43 – 2.72		
Ethnicity: Malay Chinese Indian	0.99 0.98 1.14	0.34 – 2.90 0.31 – 3.11 0.11 – 11.53		
Diagnosis: Cardiac diseases COPD Diabetes Mellitus Hypertension Renal insufficiency Blood disorders GIT problems Pneumonia	2.46 1.10 3.87 2.71 4.29 0.72 0.74 0.94	0.95 – 6.39 0.38 – 3.21 1.19 – 12.53 1.03 – 7.16 0.52 – 35.37 0.20 – 2.66 0.13 – 4.33 0.17 – 5.20		
Effects of patients on hospitalization and number of drugs prescribed in the population studied with most frequent disease groups				
	Number of drugs Median (interquartile range)		Z	P
	Before admission	At Discharge		
All Patients (n = 91)	3.0 (0.0-6.0)	7.0 (5.0-8.0)	- 6.8	P < 0.001
Cardiac diseases (n = 31) (31%)	5.0 (0.0-7.0)	7.0 (6.0-8.0)	- 3.6	P < 0.001
Hypertension (n = 15) (16%)	5.0 (1.0-8.0)	8.0 (6.0-10.0)	-1.8	P < 0.001
Diabetes mellitus (n = 15) (16%)	4.0 (0.0-7.0)	8.0 (5.0-10.0)	-2.4	P < 0.001
COPD (n = 11) (12%)	2.0 (0.0-8.0)	8.0 (5.0-10.0)	-2.0	P < 0.001

In patients treated with cardiac drugs, the prevalence of recognized indications ranged from 24.3% (at home) to 75.7% (at discharge prescription). In patients treated with diuretics ranged from 30.4% (at home) to 69.9% (at discharge). Meanwhile, in patients with antihypertensive drugs ranged from 39.7% (at home) to 60.3% (at discharge). Inhaled bronchodilators, ranged from the 40% (at home) to 60% (at discharge). In patients taking lipid lowering drugs, it ranges from

36.8% (at home) to 63.2% (discharge prescription) where as analgesics ranged from 42.9% (at home) to 57.1% (at discharge). Oral hypoglycemic agents ranged from 1% (at home) to 98.2% (at discharge). Those patients taking antibiotic ranged from 34.5% (at home) to 65.5% (at discharge). Lastly, patients taking vitamins ranged from 25.4% (at home) to 74.6% (at discharge) (Figure 1).

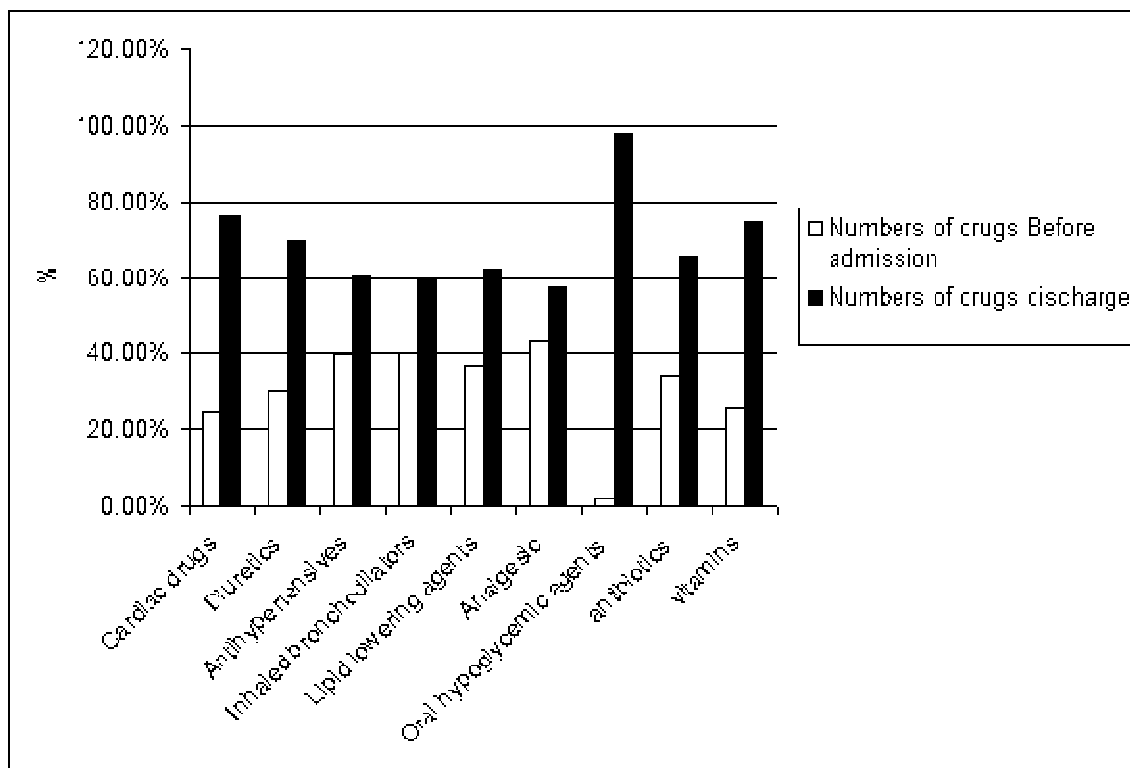


Figure 1: Prevalence of correct indications in patients having cardiac drugs including nitrates, antithrombotics and digoxin (angina pectoris, myocardial infarction, atrial fibrillation or congestive cardiac failure), diuretics (hypertension, renal insufficiency or heart failure), antihypertensives including alpha and beta blockers, calcium channel blockers, angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blocker (ARB) (hypertension), inhaled bronchodilators (chronic obstructive pulmonary disease or asthma), lipid lowering agents (hyperlipidemia or hypercholesterolemia), analgesics (general pain), oral hypoglycemic agents (diabetes mellitus), antibiotics (infections) or vitamins (adjuvants) prescribed at home and at discharge, respectively.

DISCUSSION

The study reveals that age alone does not contribute to the risk of increased number of drugs being prescribed for patients or Polypharmacy. The physiology of normal aging and pharmacokinetics (*i.e.*, renal and hepatic metabolism, distribution volume) and pharmacodynamics (*i.e.*, receptor site response)

changes explain a portion of the adverse drug reactions observed in the elderly. Nevertheless, the majority of these reactions are probably explained by the co morbidity and polyopathy often associated with aging [23, 24]. Our study reveals that the number of medication before admission is lesser, most of the times, compared to the discharge medication.

Chronic diseases mainly for diseases such as diabetes, renal insufficiency and cardiovascular disorders, usually contributes to Polypharmacy [25]. These diseases contribute to secondary disease which increases the amount of drugs being prescribed to the patients. Furthermore, if the patient is elderly, then the risk of getting Polypharmacy is even higher [9]. The major problem with Polypharmacy is adverse drug reactions. In this study it is indicated that the drugs which are prescribed in addition were claimed to counteract the adverse effects of the drug that was initially prescribed for the diagnosed disease.

Through the study, it can be observed that the increased number of drugs is mainly due to the multiple diseases. Polypharmacy cannot be avoided in poly patho-physiological conditions as the patients require

intensive drug treatment. The increased number of discharged medication reveals that after the admission to hospital, the patients are diagnosed with new diseases/illness and requires additional drugs. The prescribing trend in hospitals for discharged patients mostly seems to be Polypharmacy prescription mostly due to the comorbid conditions in the geriatric patients which can lead to other pathological conditions including depression, dementia, confusion, intolerance and forgetfulness in the patients. Polypharmacy risk rose especially with the increased prevalence of diseases of advancing age (diabetes mellitus, heart failure, arterial hypertension, and cerebrovascular diseases).

Limitations for our study deserve consideration. New diagnoses made during the stay might justify the increased drug prescription at discharge with regard to previous home therapy. The data for the oral hypoglycemic agents were showing some alarming results. This is due to the unavailability of almost half of the patients past medication history. The calculated value only shows the number of drugs. Even though the patient is knowingly having diabetes but the past medication history is not available to show the actual drugs usage, then obviously the number of drugs before the admission will be lower compared to discharge medication. Lack of data and inadequate sample size (n=91) also contributes to non significant results in certain categories.

CONCLUSION

In conclusion, a trend is evident towards increasing drug prescription to the elderly discharged patients from general medicine and geriatrics wards. While we cannot clarify the mechanisms underlying this phenomenon, the risks related to polypharmacy in the elderly will never be sufficiently emphasized. Polypharmacy costs additional money, encourages drug dependency, and also leads to non-compliance due to complexity of the medication regimes. It could result in essential drugs not being taken while unnecessary drugs are consumed. Therefore, the increasing numbers of medications in inpatients indicate the need for the careful re-evaluation of pharmacotherapy during the stay in hospital.

Interventions should be promoted to identify the determinants and to assess the quality of this prescribing practice. Furthermore, the general practitioner, who ultimately decides which therapy his/her patient will follow, should critically evaluate the discharge prescription and, if needed, discuss with the senior physicians and the clinical pharmacist to over rule any drug – drug interactions, possible adverse reactions in the prescription.

Further studies are required in the prescribing trends of the physicians to hospital discharge patients to liquefy the Polypharmacy for the general patient population. Health care practitioners have a societal obligation to simplify approaches and curb excessive prescribing of drugs while honoring their commitment to improving health, curing, mitigating, or preventing disease. The systematic review of drug therapy by multidisciplinary teams of health care professionals, including pharmacists, is fundamental to improving drug safety and reducing Polypharmacy.

Finally, while evidence based guidelines are continuously produced to improve the treatment of known diseases, guidelines should also be implemented to provide the operational framework of the approach to the elderly and frail patient.

ACKNOWLEDGEMENT

The authors are thankful to hospital director and the Chief pharmacist for giving permission to access the patients profile to collect the data. The authors are also thankful to the dean, faculty of pharmacy and the AIMST Management for giving permission to carry out this work.

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