

A STUDY TO EVALUATE THE PREVALENCE OF DIABETES MELLITUS, HYPERTENSION, AND DYSLIPIDEMIA IN PATIENTS WITH ACUTE STROKE, MYOCARDIAL INFARCTION AND/OR PERIPHERAL VASCULAR DISEASE

Jeny Samuel^{*a}, Sneha Joy^a, Rhema Maria Punnoose^a, Sherin Jose^a, Sujith Kumar S^c and Bobby Johns. G^b

^a Department of Pharmacy Practice, St. Joseph's College of Pharmacy, Cherthala, Kerala-688524, India

^b Department of Pharmaceutics, St. Joseph's College of Pharmacy, Cherthala, Kerala-688524, India

^c Head of the Department & Senior Consultant, Department of Cardiology, Lourdes Hospital, Kochi, Kerala-682012, India

* Corresponding Author

ABSTRACT

Cardiovascular diseases (CVDs) are responsible for many deaths around the world. Risk factors for these diseases include co-morbidities such as high blood pressure (HBP), diabetes mellitus (DM) and dyslipidemia (DLP). These risk factors should be properly diagnosed so as to prevent and control the complications like stroke, Myocardial infarction and peripheral vascular disease. Proper medication management and patient compliance are important for preventing and treating these diseases. Thereby improving patient's overall health and quality of life. The need for clinical pharmacist is increasing in the health care system for educating patient. about their diseases and its management by improving patient compliance

The Objectives were to analyze the prevalence of DM, HTN, and DLP in patients with Acute Stroke, MI and/or Peripheral vascular disease, to assess gender and age distribution of cardiovascular risk factors and events, to evaluate the cardiovascular risks in different age categories of male and female patients respectively and to study the effect of clinical pharmacist initiated patient tele counseling on medication adherence and knowledge of the patients. The study was conducted at a tertiary care Hospital, located at Kerala ,India. For a period of six month from November 2020 to May 2021, by taking retrospective data of five year period (2016 - 2020).The demographic details, laboratory details and treatment details were collected from the hospital files and recorded in predefined patient profile form.The prevalence of DM, HTN, and DLP in cardiac patients (with acute stroke / MI / peripheral vascular disease) was evaluated in the study. The study also assessed the age-category and the gender-group more susceptible in showing high incidence rates of DM / HTN / DLP or a comorbidity of the three. Assessment of patient's knowledge concerning their disease condition and proper medication use, via tele – counselling was also focused in the study aiming at imparting patient – level education and improving post – level medication adherence.Patient tele counselling including additional information on disease, risk factors, dietary modification, importance of medication adherence and side effects of medicines to be looked out for were provided.Using prospective data, the knowledge of patients on the three domains namely knowledge, attitude and practice was assessed using specially pre designed and validated Knowledge Attitude Practice (KAP) questionnaires. The baseline scores for the questionnaires were obtained from all the patients via tele communication and the final score were obtained using the same questionnaire.From the study, it was understood that HTN, DM were the most common cardiovascular risk factor in stroke, PVD and MI .The risk factors were mostly seen in males. In people of age category below 65 HTN, DM, DLP were more prevalent. In people of age category above 65 years the most common CV risk factors were HTN and DM. Through tele - counselling , the patients knowledge, attitude, practice and adherence were assessed and improved.

The study also emphasized the role of clinical pharmacist in educating and improving the patient compliance thereby improving quality of life.

Keywords: Cardiovascular diseases, Hypertension, DLP, DM, Stroke, peripheral vascular disease acute myocardial infarction.

Introduction

Cardiovascular diseases (CVDs) have now surpassed cancer as the main cause of death in India. CVD is responsible for one-quarter of all deaths. Ischemic heart disease and stroke are the leading causes, accounting for more than 80% of CVD fatalities. Premature mortality in terms of years of life lost due to CVD increased by 59% in India, from 23.2 million in 1990 to 37 million in 2010. (2010). Despite regional differences in the prevalence of cardiovascular risk factors, CVD has emerged as the leading cause of death in all parts of India, including poorer states and rural areas. To combat the epidemic, strategies such as the formulation and effective implementation of evidence-based policy, the reinforcement of health systems, and an emphasis on prevention, early detection, and treatment using both conventional and innovative techniques are required. Several community-based studies are now being conducted to evaluate these techniques. (1) According to age-standardized estimates from the Global Burden of Disease research (2010), CVD accounts for over a quarter (24.8 percent) of all fatalities in India. India has a higher age-standardized CVD mortality rate of 272 per 100 000 people than the global average of 235 per 100 000 population (1). However, there is a significant information vacuum, particularly about the causes of death in rural India. (1)

Indians are known to have the highest incidence of coronary artery disease (CAD), and traditional risk factors do not explain this elevated risk. CVDs were responsible for 281% of total fatalities and 141% of total disability-adjusted life years (DALYs) in India in 2016, compared to 152% and 69%, respectively, in 1990. 3 CVD rates vary greatly across India, with Kerala, Punjab, and Tamil Nadu having the highest rates. Furthermore, these states have the greatest frequency of excessive cholesterol and blood pressure. India currently has the highest prevalence of acute coronary syndrome and ST-elevation myocardial infarction (MI). Among other CVDs, hypertensive heart disease is a serious issue in India, accounting for 261,694 fatalities in 2013. (an increase of 138 percent in comparison with 1990.

Diabetes is a well-known risk factor for cardiovascular disease (CVD). When compared to non-diabetic persons, those with type 2 diabetes mellitus have a greater cardiovascular morbidity and mortality and are disproportionately impacted by CVD. Diabetes doubles or quadruples the risk of coronary heart disease (CHD). Diabetes patients are more likely to develop atherosclerotic vascular disease in the heart and other vascularized regions. Diabetes raises the risk of myocardial infarction by hastening atherosclerosis development, altering the lipid profile, and facilitating the production of atherosclerotic plaque. Diabetes reduces people's life expectancy by almost eight years owing to higher mortality. Coronary artery disease is responsible for more than 80% of all diabetes fatalities and 75% of all hospitalizations

Both systolic and diastolic hypertension raise the risk of a myocardial infarction, and the higher the blood pressure, the higher the risk. It is a key risk factor for atherosclerosis in coronary blood arteries, which can lead to a heart attack or myocardial infarction. The two conditions, hypertension and myocardial infarction, are inextricably connected. Hypertension is much worse for the heart in old age, accounting for at least 70% of all heart disease. Several processes can account for hypertensive individuals' higher coronary risk. Hypertension hastens the progression of atheroma, increases shear stress on plaques, has an unfavourable functional effect on the coronary circulation, and affects endothelial function and sympathetic tone regulation. Controlling hypertension via rigorous adherence to correct medication and the implementation of lifestyle changes greatly reduces the risk of myocardial infarction.

In acute myocardial infarction, advanced age is related with higher mortality. It is unknown what mechanism causes growing age to have such a significant impact on mortality. People aged 65 and over account for around 80% of all heart disease fatalities.

Materials and methods

Study Site:

The study was conducted at a tertiary care Hospital, located at Kerala, India.

Study period:

A six month study from November 2020 to May 2021, was conducted taking retrospective data of five year period (2016 - 2020).

Study design:

- An ambispective study was conducted in cardiology department of the hospital, at Ernakulam.,Kerala, India.
- This study analyzed a sample of patients admitted to the hospital between a period of 2016 - 2020 with acute stroke / MI / peripheral vascular disease, irrespective of gender and of different age groups.

The demographic details, laboratory details and treatment details were collected from the hospital files and recorded in predefined patient profile form.

- The prevalence of DM, HTN, and DLP in cardiac patients (with acute stroke / MI / peripheral vascular disease) was evaluated in the study. The study also assessed the age-category and the gender-group more susceptible in showing high incidence rates of DM / HTN / DLP or a comorbidity of the three.
- Assessment of patient's knowledge concerning their disease condition and proper medication use, via tele – counselling was also focused in the study aiming at imparting patient – level education and improving post – level medication adherence.
- Patient tele counselling including additional information on disease, risk factors, dietary modification, importance of medication adherence and side effects of medicines to be looked out for were provided.

- Using prospective data, the knowledge of patients on the three domains namely knowledge, attitude and practice was assessed using specially pre designed and validated Knowledge Attitude Practice (KAP) questionnaires.
- The baseline scores for the questionnaires were obtained from all the patients via tele communication and the final score was obtained using the same questionnaire.

Sample Size

The sample size was calculated and a total of 117 patients were included in the retrospective study and 60 patients were selected for prospective study.

Inclusion criteria:

- Patients diagnosed with acute stroke, myocardial infarction and/or peripheral vascular disease.

Exclusion criteria:

- Cases in which all relevant data was not available were excluded.

Data collection method

- Hospital mediware software system.
- Specially designed patient data collection form.
- Medical records
- Knowledge Attitude Practice (KAP) questionnaire.

Descriptive statistics

The collected data were analysed using Microsoft Excel and represented in graphical format using bar graphs and pie chart . The mean and standard deviation were calculated using statistical calculators. Data analysis was carried out using the statistical software SPSS. The paired sample t test was employed to determine the significance of the study results.

Results and discussions

A total of 117 patients were analyzed in the retrospective part of the study, which comprised of 72 males and 45 females, who were randomly selected. For prospective study, 60 patients were taken for assessing the role of clinical pharmacist in improving patient compliance

In the retrospective part of the study, it was observed that out of the 44 patients who had stroke, 34(77.3%) had hypertension and 10(22.7%) did not have hypertension.

A study was conducted by Pathak A et.al in the period of 2012 to 2014 also showed that prevalence of HTN in stroke patients was 65%. A similar result was observed in our study.

Table 1 Prevalence of HTN in Stroke

		Stroke		Total
		YES	NO	
HTN	YES	34 (77.27%)	44 (60.3%)	78 (66.7%)
	NO	10 (22.72%)	29 (39.7%)	39 (33.3%)
	Total	44 (100%)	73 (100%)	117 (100%)

Out of 44 patients with stroke, 31 patients (70.5%) had Diabetes Mellitus and 13 (29.5%) patients did not had DM. A study conducted by Kande V Mallikarjuna Rao et al, showed that 31.8% of stroke patients were diabetic.

Table 2 Prevalence of DM in Stroke

		Stroke		Total
		YES	NO	
DM	YES	31 (70.45%)	48(65.75%)	79(67.52%)
	No	13(29.54%)	25(34.24%)	38(32.47%)
	TOTAL	44(100%)	73(100%)	117(100%)

Out of 44 patients with stroke, 12(27.3%) patients had dyslipidemia and 32(72.7%) did not have Dyslipidemia. From a study conducted by R.Behrouz et al, 36.8% of stroke patients were dyslipidemic. A similar result was observed in our study too.

Out of 20 patients with PVD, 13 (65.0%) had Hypertension and 7(35.0%) did not have Hypertension. A study conducted by Denis L Clement et al, showed that 55% of the patients with PVD had HTN.

Out of 20 patients with PVD 15 patients (75%) had DM and 5(25%) did not had DM.

Out of 20 patients with PVD, 4 patients (20.0%) were dyslipidemic and 16 patients (80.0%) were non-dyslipidemic.

Prevalence of hypertension in MI

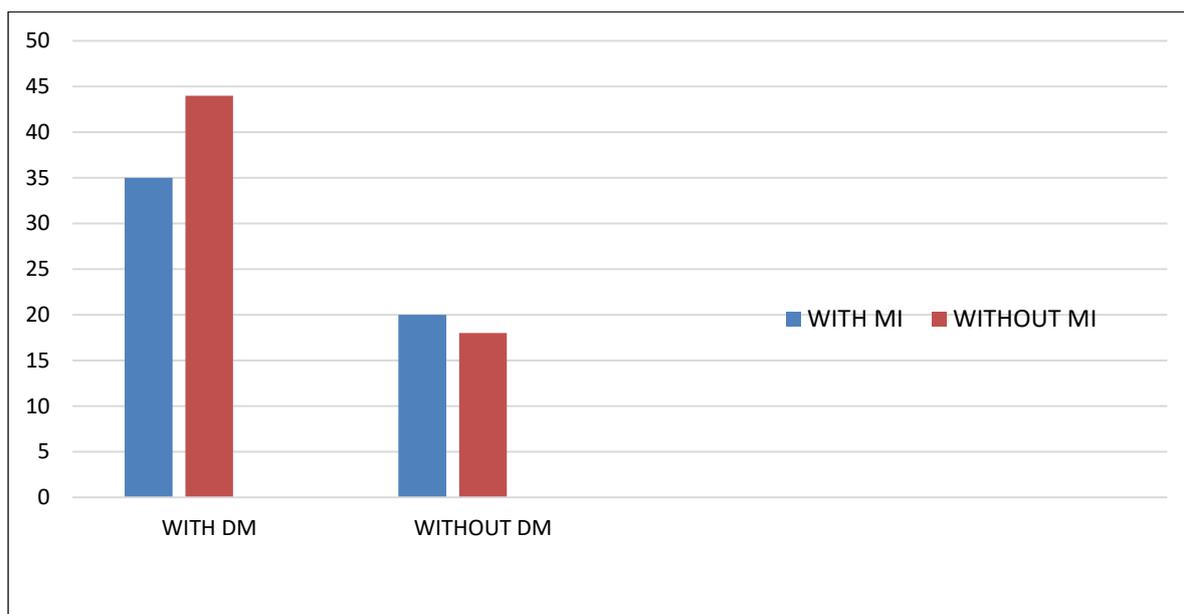
From 55 patients with MI, 33 (60.0%) had hypertension and 22 patients (40.0%) did not had hypertension. Out of 62 patients without MI, 17 (27.4%) were non hypertensive and 45(72.6%) were hypertensive. A study conducted by Mohammad Parvaiz Farshoi et al, showed that 49.8% of MI patients had HTN.

Table 3 Prevalence of HTN in MI

HTN		MI		TOTAL
		YES	NO	
	YES	33(60%)	45(72.58%)	78(66.66%)
	No	22(40%)	17(27.41%)	39(33.33%)
	Total	55(100%)	62(100%)	117(100%)

Total of 55 patients with MI ,35 (63.6%) were diabetic and 20(36.4%) were non diabetic .From 62 patients without MI 44(71.0%) were diabetic and 18(29.0%) were non diabetic.A study conducted by Laladendu Mohanty et.al showed that out of 104 patients with stroke 59 (56.7%) had no diabetes and 29(27.9%) were having diabetes.

Prevalence of DM in MI Fig.1



From 55 patients who had MI, 19 patients (34.5%) had dyslipidemia and 36(65.5%) did not have dyslipidemia. Out of 62 patients without MI, 14(22.6%) had dyslipidemia and 48 patients (77.4%) did not have dyslipidemia. A study conducted in 2018 by Sahadeb Prasad Dhungana etal showed that 48.6% of MI patients were having DLP.

Age and gender distribution of cardiovascular events

In the age category of greater than 65years, 29.51 % were males and 19.65% were females. When considering the age group of less than or equal to 65 years, males were of 31.62 % and females were of 18.80%.

HTN, DM, DLP (14) was the most prevalent CV risk factor observed in age category below 65 years of age. HTN, DM was the most prevalent risk factor seen in age category more than 65 years of age.

Table 4 Prevalence of HTN/DM/DLP in different age categories

	HTN	DLP	DM	HTN,DLP	HTN,DM	DLP,DM	HTN,DM.DLP	NO HTN/DM/DIP	Total
≤65 Year	8	2	12	1	11	2	14	9	59
>65 Year	8	0	5	1	22	0	13	9	58
Total	16	2	17	2	33	2	27	18	117

HTN and DM as a comorbidity was the most incident risk factor seen in both males and females.

Impact of tele counselling on knowledge, attitude and practice of hypersensitive patients The prospective analysis was done with 60 patients.

Pretest knowledge level was 7.53 ± 1.546 , which was improved to 8.62 ± 0.904 in the post test. The mean change in the knowledge was 1.09, which was found to be significant with $p < 0.001$.

Table 5 Mean, standard deviation and t value of knowledge

Test	Mean	SD	N	Diff. between mean	t value	df	Significance (p value)
Pre –test knowledge assessment	7.53	1.546	60	1.09	7.464	59	<0.001
Post-test Knowledge Assessment	8.62	0.904					

Pre-test attitude level was 3.92 ± 2.901 , which was improved to 6.25 ± 1.590 in the post-test. The mean change in the attitude was 2.33, which was found to be significant with $p < 0.001$.

Table 6 Mean, standard deviation and t value of attitude

Test	Mean	SD	N	Diff. between mean	t value	df	Significance (p value)
Pre –test attitude assessment	3.92	2.901	60	2.33	7.128	59	<0.001
Post-test attitude Assessment	6.25	1.590					

The pre-test practice level was 3.45 ± 0.723 , which was improved to 3.78 ± 0.415 in the post-test. The mean change in the practice was 0.33, which was found to be significant with $p < 0.001$.

A study was conducted by Juna Ann Thomas et al in the period of 2015-16 reported that knowledge, attitude and practice of patients improved after patient counselling.

Table 7 Mean, standard deviation and t value of practice

Test	Mean	SD	N	Diff. between mean	t value	df	Significance (p value)
Pre –test practice assessment	3.45	0.723	60	0.33	4.294	59	<0.001
Post-test practice Assessment	3.78	0.415					

Statistical analysis of medication adherence

The pre-test medication adherence level was 7.25 ± 1.398 , which was improved to 8.23 ± 1.320 in the post-test. The mean change in the medication adherence was 0.98, which was found to be significant with $p < 0.001$.

Table 8 Mean, standard deviation and t value of adherence

Test	Mean	SD	N	Diff. between mean	t value	df	Significance (p value)
Pre –test adherence assessment	7.25	1.398	60	0.98	6.668	59	<0.001
Post-test adherence Assessment	8.23	1.320					

Conclusion

From our study, we came to understand that HTN, DM and DLP were the most common cardiovascular risk factor in stroke, PVD and MI. The risk factors were mostly seen in males. In people of age category above 65 years the most common CV risk factors that were HTN and DM. Through tele -counselling which was conducted in the study, the patients knowledge, attitude, practice and adherence were improved. The study also emphasizes the role of clinical pharmacist in educating and improving the patient compliance thereby improving quality of life.

Acknowledgement

The authors are thankful to the Management of Lourdes Hospital, Kochi, Kerala, India for providing necessary facilities to carry out this research work.

Conflicts of interest the authors declare that there are no conflicts of interest.

References:

1. DeAntonio JH, Leichtle SW, Hobgood S, Boomer L, Aboutanos M, Mangino MJ, Wijesinghe DS, Jayaraman S. Medication reconciliation and patient safety in trauma: applicability of existing strategies. *Journal of Surgical Research*. 2020 Feb 1;246:482-9.
2. Chung C, Gauthier V, Marques-Tavares F, Hindlet P, Cohen A, Fernandez C, Antignac M. Medication reconciliation: predictors of risk of unintentional medication discrepancies in the cardiology department. *Archives of cardiovascular diseases*. 2019 Feb 1;112(2):104-12.
3. Kern E, Dingae MB, Langmack EL, Juarez C, Cott G, Meadows SK. Measuring to improve medication reconciliation in a large subspecialty outpatient practice. *The Joint Commission Journal on Quality and Patient Safety*. 2017 May 1;43(5):212-23.
4. American Pharmacists Association, American Society of Health-System Pharmacists. Improving care transitions: optimizing medication reconciliation. *Journal of the American Pharmacists Association*. 2012 Jul 1;52(4):e43-52.
5. Milone AS, Philbrick AM, Harris IM, Fallert CJ. Medication reconciliation by clinical pharmacists in an outpatient family medicine clinic. *Journal of the American Pharmacists Association*. 2014 Mar 1;54(2):181-7.
6. Caroff DA, Bittermann T, Leonard CE, Gibson GA, Myers JS. A medical resident–pharmacist collaboration improves the rate of medication reconciliation verification at discharge. *The Joint Commission Journal on Quality and Patient Safety*. 2015 Oct 1;41(10):457-61.
7. Persell SD, Bailey SC, Tang J, Davis TC, Wolf MS. Medication reconciliation and hypertension control. *The American journal of medicine*. 2010 Feb 1;123(2):182-e9.
8. Grissinger MC. Omission of High-Alert Medications: A Hidden Danger. *AJN The American Journal of Nursing*. 2017 Jul 1;117(7):66-70.
9. Green CJ, Du-Pre P, Elahi N, Dunckley P, McIntyre AS. Omission after admission: failure in prescribed medications being given to inpatients. *Clinical medicine*. 2009 Dec;9(6):515.
10. Chiarelli MT, Antoniazzi S, Cortesi L, Pasina L, Novella A, Venturini F, Nobili A, Mannucci PM, ad hoc Deprescribing Study Group. Pharmacist-driven medication recognition/reconciliation in older medical patients. *European journal of internal medicine*. 2021 Jan 1;83:39-44.
11. Contin T, Campos LB, Toffoli-Kadri MC, de Matos VT. Medication Reconciliation during Admission at University Hospital. *Global Journal of Health Science*. 2021;13(1):1-.
12. Condren M, Bowling S, Hall B, Woslager M, Shipman A, McIntosh H. Medication reconciliation across care transitions in the pediatric medical home. *The Joint Commission Journal on Quality and Patient Safety*. 2019 Aug 1;45(8):536-42.
13. Chung C, Gauthier V, Marques-Tavares F, Hindlet P, Cohen A, Fernandez C, Antignac M. Medication reconciliation: predictors of risk of unintentional medication discrepancies in the cardiology department. *Archives of cardiovascular diseases*. 2019 Feb 1;112(2):104-12.
14. Tamiru A, Edessa D, Sisay M, Mengistu G. Magnitude and factors associated with medication discrepancies identified through medication reconciliation at care transitions of a tertiary hospital in eastern Ethiopia. *BMC research notes*. 2018 Dec;11(1):1-7.
15. Van Der Luit CD, De Jong IR, Ebbens MM, Euser S, Verweij SL, Van Den Bemt PM, Lutikhuis HM, Becker ML. Frequency of occurrence of medication discrepancies and associated risk factors in cases of acute hospital admission. *Pharmacy Practice (Granada)*. 2018 Dec;16(4).
16. Mazhar F, Akram S, Al-Osaimi YA, Haider N. Medication reconciliation errors in a tertiary care hospital in Saudi Arabia: admission discrepancies and risk factors. *Pharmacy Practice (Granada)*. 2017 Mar;15(1).
17. Kraus SK, Sen S, Murphy M, Pontiggia L. Impact of a pharmacy technician-centered medication reconciliation program on medication discrepancies and implementation of recommendations. *Pharmacy Practice (Granada)*. 2017 Jun;15(2).

18. Stockton KR, Wickham ME, Lai S, Badke K, Dahri K, Villanyi D, Ho V, Hohl CM. Incidence of clinically relevant medication errors in the era of electronically prepopulated medication reconciliation forms: a retrospective chart review. *CMAJ open*. 2017 Apr;5(2):E345.
19. Al-Rashoud I, Al-Ammari M, Al-Jadhey H, Alkatheri A, Poff G, Aldebasi T, AbuRuz S, Al-Bekairy A. Medication discrepancies identified during medication reconciliation among medical patients at a tertiary care hospital. *Saudi Pharmaceutical Journal: SPJ*. 2017 Nov;25(7):1082.
20. Khansa SA, Mukhtar A, Abduljawad M, Aseeri M. Impact of Medication Reconciliation upon Discharge on Reducing Medication Errors. *J Pharmacovigil*. 2016;4(222):2.
21. Patel N, Desai M, Shah S, Patel P, Gandhi A. A study of medication errors in a tertiary care hospital. *Perspectives in clinical research*. 2016 Oct;7(4):168.
22. Ashjian E, Salamin LB, Eschenburg K, Kraft S, Mackler E. Evaluation of outpatient medication reconciliation involving student pharmacists at a comprehensive cancer center. *Journal of the American Pharmacists Association*. 2015 Sep 1;55(5):540-5.
23. Poornima P, Reshma P, Ramakrishnan TV, Rani NV, Devi GS, Seshadri RS. Medication reconciliation and medication error prevention in an emergency department of a tertiary care hospital. *Journal of Young Pharmacists*. 2015 Jul 1;7(3):241.
24. Leguelinel-Blache G, Arnaud F, Bouvet S, Dubois F, Castelli C, Roux-Marson C, Ray V, Sotto A, Kinowski JM. Impact of admission medication reconciliation performed by clinical pharmacists on medication safety. *European journal of internal medicine*. 2014 Nov 1;25(9):808.
25. Climente-Martí M, García-Mañón ER, Artero-Mora A, Jiménez-Torres NV. Potential risk of medication discrepancies and reconciliation errors at admission and discharge from an inpatient medical service. *Annals of Pharmacotherapy*. 2010 Nov;44(11):1747-54.
26. Unroe KT, Pfeifferberger T, Riegelhaupt S, Jastrzemski J, Likhnygina Y, Colón-Emeric C. Inpatient medication reconciliation at admission and discharge: a retrospective cohort study of age and other risk factors for medication discrepancies. *The American journal of geriatric pharmacotherapy*. 2010 Apr 1;8(2):115-26.
27. Gleason KM, McDaniel MR, Feinglass J, Baker DW, Lindquist L, Liss D, Noskin GA. Results of the Medications at Transitions and Clinical Handoffs (MATCH) study: an analysis of medication reconciliation errors and risk factors at hospital admission. *Journal of general internal medicine*. 2010 May 1;25(5):441-7.
28. Hellström LM, Bondesson Å, Höglund P, Eriksson T. Errors in medication history at hospital admission: prevalence and predicting factors. *BMC clinical pharmacology*. 2012 Dec;12(1):1-9.
29. Doerper S, Godet J, Alexandra JF, Allenet B, Andres E, Bedouch P, Desbuquois AC, Develay-Rambourg A, Bauge-Faraldi O, Gendarme S, Gourieux B. Development and multi-centre evaluation of a method for assessing the severity of potential harm of medication reconciliation errors at hospital admission in elderly. *European journal of internal medicine*. 2015 Sep 1;26(7):491-7.
30. Sotelo E, Nunemacher C, Holland CR, Rhodes LA, Marciniak MW. Analysis of provider-generated revenue and impact on medication reconciliation from a pharmacist-led chronic care management service. *Journal of the American Pharmacists Association*. 2021 Mar 2.
31. Van der Gaag S, Janssen MJ, Wessemius H, Siegert CE, Karapinar-Çarkit F. An evaluation of medication reconciliation at an outpatient internal medicines clinic. *European journal of internal medicine*. 2017 Oct 1;44:e32-4.