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2016-02-15
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CARDIOVASCULAR MEDICATION RECONCILIATION IN HYPERTENSIVE DIABETIC OUTPATIENTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg. This work is done in fulfilment of the requirements for the degree Master of Medicine in Internal Medicine.

Johannesburg 2015

DECLARATION

I, Zaheer Laher, declare that this work is my own work, unaided except where guidance was required by my supervisor. I declare that I have not submitted this work previously for any degree or examination at this or any other University. I submit this work to the Faculty of Health Sciences, University of the Witwatersrand, for the degree Master of Medicine in Internal Medicine.

Zaheer Laher

Signed on day of 2015

PREFACE

My interest in medication reconciliation was sparked by the interest I developed during my endocrine rotation as a registrar in the department of Internal Medicine. Sitting in the clinic and consulting numerous patients, the problems with their medication soon became apparent. After discussion with my consultants I embarked on this journey to see how significant this problem actually was in our clinic. I read extensively around the subject and it soon became evident that this study needed to be done in South African context. My intention is not to place blame, if any could be attached anywhere, but rather to highlight any problem areas where we need improvement in our setting.

ABSTRACT

Background

Medication reconciliation is the process of creating accurate lists of a patient's medication and comparing them to the treating physician's script, finding factors that influence adherence.

Objectives

To determine any discordance between actual medication diabetic hypertensive patients at the specialist endocrine outpatient department at CHBH are taking and those on the physician's script, and to determine factors linked to poor adherence.

Results

The mean age of the patients was 60 years, and female majority of 73%. Fifty nine percent of patients had a maximum of primary school education and 17% had no schooling.

Majority of drugs were taken incorrectly, attributed to stock issues, patient error and use of generic medication. Gender, age and whether the doctor routinely tells the patient of any adjustments showed no association.

Conclusion

Poor adherence was attributed to the patient's poor knowledge of the medications. Adherence to the dosage of drugs was shown to be dependent on a patient's level of education.

Acknowledgements

I would like to extend my sincerest gratitude to:

My Supervisor and mentor Dr Sindeep Bhana. For helping me formulate my question and who worked through the difficult times with me to pass my proposal and to present this work.

The department of Endocrinology at Chris Hani Baragwanath Academic Hospital for allowing me the opportunity to use the diabetic clinic as a platform for this work.

All the participants who took part out of choice. The response was overwhelming and my thanks to all of them for complying and spending the extra time with me in the clinic.

Lastly to my wife Amal for putting up with me during my pursuit of this degree.

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LIST OF ABBREVIATIONS

CHBAH= Chris Hani Baragwanath Academic Hospital

SPSS=Statistical Product and Service Solutions

CEO= chief executive officer

Chapter 1 Background Literature Review and Critique

1.1 Hypertension

1.1.1 **Prevalence and complications**

Hypertension is an important worldwide health challenge. Worldwide the prevalence in adults aged 20 or more is approximately 26%[1]. In sub-Saharan Africa the estimated prevalence in 2005 was around 40 million individuals[1]. Although accurate measures in the South African population is still unknown, increasing urbanization is leading to higher rates of hypertension[2]. The projection by 2025 is that approximately 75 million people in sub-Saharan Africa will have hypertension [2].

Epidemiologic research have established that hypertension is a common and important contributor to all of the major cardiovascular diseases, including coronary disease, stroke, peripheral artery disease, renal disease, and heart failure[3]. Hypertension is rarely found in isolation, with more than 80% of hypertensive patients having other risk factors for ill health such as glucose intolerance, obesity, left ventricular hypertrophy and dyslipidemia[3].

1.1.2. **Economic Aspect**

Internationally there is evidence to suggest that good antihypertensive control would lead to significant reduction in annual cost of treatment[4, 5]. Not only was this true to antihypertensive care but also to treatment of other chronic ailments such as diabetes, asthma, heart failure, hypercholesterolemia and depression[5]. There are no studies in antihypertensive use in sub-Saharan Africa that look at the direct economic benefit of good compliance and control of blood pressures. A study by Gaziano et al, showed a

possible saving to the economy of approximately $500 million over 10 years, postulated on the background change of the current guidelines to treat patients with higher cardiovascular risk profiles. There was no reference in this study to note cost benefit with current guidelines and better adherence[5].

1.1.3. **Background**

About one in four patients do not adhere to prescribed drug therapy[6,14,15]. This is critical as the consequence of poor adherence has been linked to a negative outcome and impacts on overall mortality[6]. Not only is this due to primary patient error, but also due to system errors within the hospital, such as in prescription and in the dispensing of drugs[7]. Approximately half of the patients found in the analysis of Coleman et al, where categorized as system associated discrepancies leading to poor drug compliance[6, 8]. Thus the problem is a multi-faceted one which requires significant efforts from both patient and provider communities.

With the wider development of multiple generic antihypertensive agents many patients have been taking the generic as well as the original drug causing further complications[9]. This has pushed the onus back onto the patient to understand what medication they should be taking. Generic equivalent drugs though cheaper, have now brought compliance issues significantly back into context[9].

One of the key factors pertaining to compliance is the health literacy of the community[10, 11]. Most patients do not know the full range of the drugs that they are taking and many of the compliance issues stem back to the consultation itself[9,10,12].

Physicians need to take extra time to counsel patients on each new drug, its original and generic names, and the side effects of the drugs. It is far too common that physicians do not instruct patients properly on how to take medication in a detailed manner[12].

Medication reconciliation is a key process which allows further development into strategies to help maintain better levels of compliance in an ambulatory setting[10, 13]. It is a process that should be applied especially where there are higher rates of perceived medical errors and poor patient compliance.

The Chris Hani Baragwanath Academic Hospital (CHBAH) services a large area. The specialist endocrine out-patient clinic services approximately 11000 patient visits yearly of which a high proportion has hypertension. After doing a thorough literature review, it has been documented (mainly in the first world) that there are barriers to compliance in patients. The concern for me is how prevalent are the same issues in a South African context.

No medication reconciliation has been done previously in South Africa. I aim to document the prevalence of medication discrepancies and determine whether health literacy plays as important role in compliance.

The value of such a study will be to possibly empower patients to further understand their illness. It would also possibly serve patients in keeping their same treatments irrespective of their changes in medical seeking behaviour. The value to doctors may be immense as it may well elucidate underlying problems in compliance and hence

treatment failures. The diabetic patient group was chosen as a basis as these patients already have a good education level and proven compliance to their insulin regimens.

1.2. **Objectives**

i. To determine the level of concordance between the prescribed medications to the actual medications patients are taking at the out-patient department of the specialist endocrine and diabetic clinic at CHBAH

ii. To determine how accurately the patient is following their script

iii. To determine the relationship between level of education and patient compliance.

iv. To determine the prevalence of patients overdosing on their antihypertensive agents due to concurrent generic and original tablet use.

1.3. **Aims**

To determine the level of adherence to antihypertensive medication and to determine any barriers to adherence.

Chapter 2: Patients and Methods

2.1 Study Design

The study was a prospective study which involved one on one patient interviews combined with medical record abstraction.

If a patient took at least one or more wrong dosage of a drug, they were classified as taking the wrong dosage of drugs. The same applies with the frequency of taking the drugs.

2.2 Study Population and Sample

The study was conducted at the CHBAH. It was done in the endocrine and diabetic out-patient department. The CHBAH is the largest hospital in the Africa, occupying around 173 acres. The hospital has approximately 2900 beds. It is situated in the Soweto area of Johannesburg. I chose this setting as I am a registrar in Internal Medicine with an interest in Endocrinology.

Medication Reconciliation was performed on the first 100 selected patients meeting the inclusion and exclusion criteria by the principle investigator.

2.3 Inclusion and Exclusion Criteria

Hypertensive diabetic patients on ≥ 2 anti-hypertensive agents and those older than 18 years old were included, as long as they attended the out-patient Endocrine and diabetic clinic at CHBAH. The following was used as exclusion criteria:

- Patient is not willing to consent to participation in the study;
- Previously documented poor compliance to clinic follow up.

2.4 Ethical and Legal Consideration

Ethical clearance was granted by the Human Research Ethics Committee (Appendix A) of the University of the Witwatersrand. Permission for the research at CHBAH was granted by the CEO and Head of Internal Medicine at CHBAH (clearance certificate no. M130833)

2.5 Statistical Analysis

After data collection, the data was captured in excel and later exported to SPSS (originally, Statistical Package for the Social Sciences) and now called 'Statistical Product and Service Solutions' for analysis. SPSS is a computer program which is used to carry out a wide variety of statistical analysis easily [25].

Descriptive statistics such as frequency distributions, cross tabulations, mean and standard deviation were used to summarise the data. Chi-square test of association was used to assess whether there was any association between categorical variables. In the application of the chi-square test, the expected values for each cell should not be less than 5. In cases where the sample size is small like in this research resulting in expected frequencies of less than 5, the Fisher's Exact Test was used. A Fisher's exact test is very useful in analysing contingency tables with both small and large sample. All the chi-square tests were conducted at 5% significance level[25].

Pie charts were used to present a pictorial view of the frequencies. A pie chart displays data as a percentage of the whole, they are visually appealing but they are best for few categories. In cases where there were more categories the bar graphs were used especially for prescribed drugs. A histogram was used to illustrate the age distribution of the respondents [25].

Independent sample t-test was used to compare two means of two independent random samples. The samples are independent in the sense that they are drawn from different populations and each element of one sample is not matched with its corresponding element of the other sample. Independent samples t-test was used to compare independent samples such as male and female[25].

Chapter 3 Results

3.1 Patient Demographic Information

3.1.1 Gender

The sample was made up of 100 patients, 73% of which were females.

3.1.2 Race

Majority of the patients (90%) were Blacks, 7% were Coloured, 2% Indians and 1% White.

3.1.3 Age

The average age of the patients was 60 years, with the youngest patient being 36 years old and the oldest was 81 years old.

The Histogram below illustrates the age distribution of the patients.

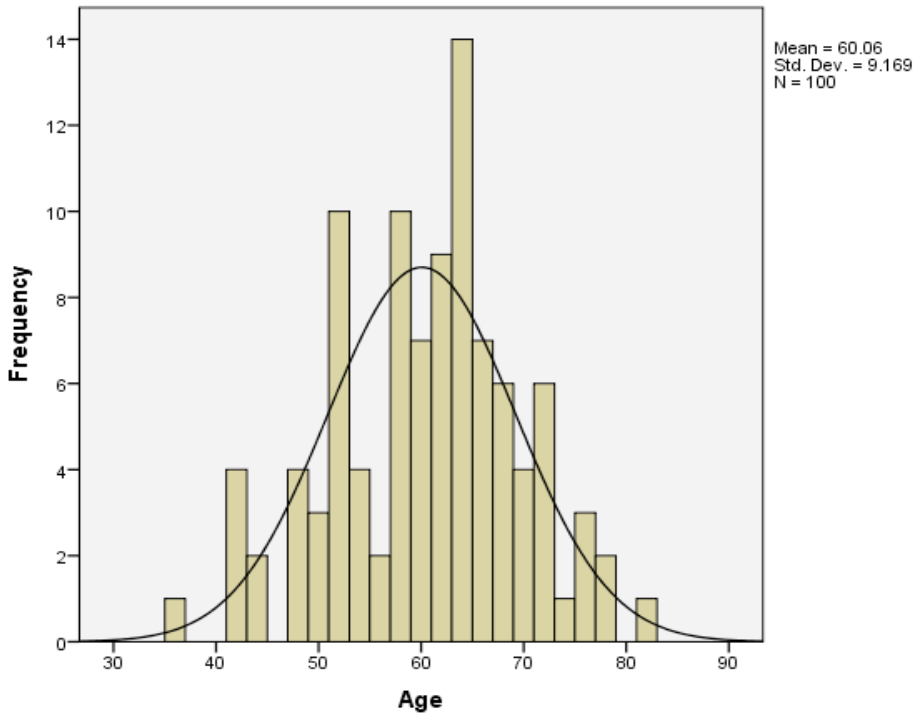

Figure 1: Age Distribution

3.1.4 Highest level of education

More than half of the respondents (59%) had primary education as their highest level of education, 22% had high school, 2% had university or college education. Seventeen percent had no schooling at all.

3.2 Knowledge of anti-hypertensive medication names

Only 16% of the patients indicated that they knew all their anti-hypertensive medications' names, 83% did not know any anti-hypertensive medication names.

3.3 Treatment dosage knowledge

As with the anti-hypertensive medications' names, a very small proportion of the patients (10%) knew all anti-hypertensive medication dosages.

3.4 Doctors communication with patients

Patients were asked if the doctors and pharmacists routinely told them when doses were adjusted or if new tablets were commenced. Almost two thirds of the patients (64%) indicated that the doctors and pharmacists do not inform them, 34% confirmed that their doctors inform them of changes and the other 2% did not answer the question.

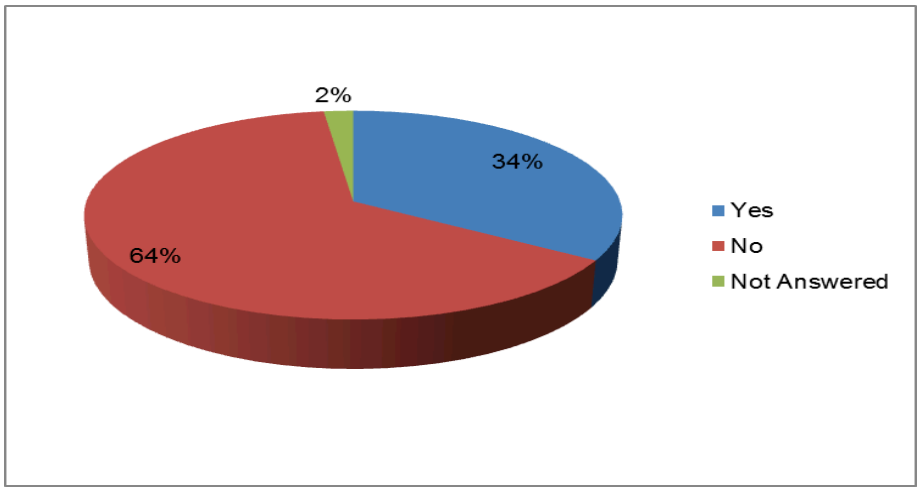

Figure 2: Figure documenting if doctors/pharmacists routinely tell patients when doses will be adjusted or if new tablets will commence

3.5 Drugs prescribed to patients

The bar graph below shows the types of drugs prescribed by the doctors. The most commonly prescribed drug is Aspirin which was prescribed to 92% of the patients, followed by Simvastatin which was prescribed to 80% of the patients. The rest of the drugs in descending order of frequency of prescription are shown in table 1.

3.6 Patients Taking Prescribed Dosage or Not

Table 1: Patients taking prescribed dosage or not

Drug	**n**	**Taking Correct Dosage**
Aspirin	92	71%
Simvastatin	80	70%
Enalapril	47	87%
Nifedipine	47	38%
Hydrochlorothiazide	37	76%
Indapamide	37	76%
Amlodopine	33	61%
Perindopril	33	73%
Doxazocin	26	73%
Atenolol	24	79%
Furosemide	17	94%
Carvedilol	9	78%
Spiranolactone	8	75%
Telmisartan	8	75%
Verapamil	3	100%
Atorvastatin	2	50%
Digoxin	1	100%
Methyldopa	1	100%

3.7 Reasons for not taking the prescribed dosage

The most common reason for not taking the prescribed dosage is because the prescribed drug will be out of stock, followed by patient error and then generic error.

Table 2: Reasons for not taking the prescribed dosage

		Reasons for not taking the prescribed dosage						
Drug	**Taking Wrong Dosage**	**Out of Stock**	**Patient Error**	**Generic Error - overdose**	**Pharmacy Error**	**Replacement**	**Side Effects**	**Stopped 2/12 prev**
Aspirin	27	85%	11%					
Simvastatin	24	96%	4%					
Enalapril	6	17%	67%	17%				
Nifedipine	29	7%		83%	7%		3%	
Hydrochlorothiazide	9	11%	33%		44%	11%		
Indapamide	9	78%	11%	11%				
Amlodopine	13	38%	15%	38%				
Perindopril	9	11%	33%	44%				11%
Doxazocin	7	43%	29%	29%				
Atenolol	5	20%	40%	40%				
Furosemide	1		100%					
Carvedilol	2	50%	0%	50%				
Spiranolactone	2	50%	50%	0%				
Telmisartan	2	100%						
Atorvastatin	1	100%						

3.8 Patients Taking Drugs at the Prescribed Frequency or Not

Table 3: Frequency of patient taking drug correctly

Drug	n	Correct Frequency
Aspirin	92	71%
Simvastatin	80	73%
Enalapril	47	72%
Nifedipine	47	89%
Hydrochlorothiazide	37	81%
Indapamide	37	81%
Amlodopine	33	82%
Perindopril	33	91%
Doxazocin	26	88%
Atenolol	24	96%
Furosemide	17	82%
Carvedilol	9	100%
Spiranolactone	8	88%
Telmisartan	8	75%
Verapamil	3	100%
Atorvastatin	2	50%
Digoxin	1	100%
Methyldopa	1	100%

The most common reason for not taking the drugs at the prescribed frequency is because the prescribed drug will be out of stock, followed by patient error and pharmacy error.

Table 4: Reason for not taking the drugs at prescribed frequency

	Reason for not taking the drugs at prescribed frequency							
Drug	**Wrong Frequency**	**Out of Stock**	**Patient Error**	**Generic Error**	**Pharmacy Error**	**Replacement**	**Side Effects**	**Stopped 2/12 prev**
Aspirin	27	85%	7%					
Simvastatin	22	100%						
Enalapril	13	8%	92%					
Nifedipine	5	40%			40%		20%	
Hydrochlorothiazide	7	14%	14%		43%	14%		
Indapamide	7	100%						
Amlodopine	6	83%		17%				
Drug	**Wrong Frequency**	**Out of Stock**	**Patient Error**	**Generic Error**	**Pharmacy Error**	**Replacement**	**Side Effects**	**Stopped 2/12 prev**
Perindopril	3	33%	33%	33%				33%
Doxazocin	3	67%						
Atenolol	1	100%						
Furosemide	3		100%					
Spiranolactone	1	100%						
Telmisartan	2	100%						
Atorvastatin	1	100%						

3.9 Taking prescribed dosage

More than half of the patients (55%) were taking the wrong dosage for at least one drug and the other 45% were taking the correct dosage on all the prescribed drugs. The pie chart below shows whether the patients were adhering to the prescribed frequency of drug taking.

Almost three quarters of the patients (74%) were taking all their drugs at the prescribed frequency whilst the other 26% were deviating from the prescribed frequencies.

3.10 Dosage adherence correlated to gender

Table 5: Table to show dosage adherence correlation to patient's gender

Crosstab					
			Dosage		Total
			Wrong Dosage	Correct Dosage	
Gender	Male	Count	10	14	24
		% within Gender	41.7%	58.3%	100.0%
	Female	Count	44	29	73
		% within Gender	60.3%	39.7%	100.0%
Total		Count	54	43	97
		% within Gender	55.7%	44.3%	100.0%

Chi-Square Tests			
	Value	df	P-Value
Pearson Chi-Square	2.534[a]	1	0.111
N of Valid Cases	97		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.64.			

Although there is a slightly higher proportion of women who take the wrong dosage of drugs (60.3%) compared to 41.7% for male patients, the difference is not statistically significant.

3.11 Frequency adherence correlated to gender

Table 6: Table to show frequency adherence correlation to patient's gender

Crosstab					
			Frequency		Total
			Wrong Frequency	Correct Frequency	
Gender	Male	Count	5	19	24
		% within Gender	20.8%	79.2%	100.0%
	Female	Count	20	53	73
		% within Gender	27.4%	72.6%	100.0%
Total		Count	25	72	97
		% within Gender	25.8%	74.2%	100.0%

Chi-Square Tests			
	Value	df	P-Value
Pearson Chi-Square	.407[a]	1	0.524
N of Valid Cases	97		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.19.			

There were no significant difference between male and female patients in terms of sticking to the prescribed frequency of taking drugs (p-value = 0.524 > 0.05 the significance level).

3.12 Dosage adherence correlated to patient's age

Table 7: Table to show dosage adherence correlation to patient's age

Group Statistics					Independent Samples Test	
Dosage		n	Mean Age	Std. Deviation	t	P-Value
Age	Correct Dosage	45	60.42	9.776	0.356	0.723
	Wrong Dosage	55	59.76	8.722		

The patients taking the correct dosages on all their medication were on average 60.42 years old and those taking the at least one dosage wrong were on average 59.76 years old. The mean ages were not statistically different (p-value =0.723 > 0.05, the significance level).

3.13 Frequency adherence correlated to patient's age

Table 8: Table to show frequency adherence correlation to patient's age

Group Statistics					Independent Samples Test	
Frequency		n	Mean Age	Std. Deviation	t	P-Value
Age	Correct Frequency	74	60.04	9.050	-0.036	0.972
	Wrong Frequency	26	60.12	9.684		

The patients taking drugs at the prescribed frequency on all their medication were on average 60.04 years old while those taking the at least one of their prescribed drug at a wrong frequency were on average 60.12 years old. The mean ages were not statistically different (p-value =0.972 > 0.05, the significance level).

3.14 Dosage adherence correlated to patient's level of education

Table 9: Table to show dosage adherence correlation to patient's level of education

			Correct Dosage		Total
			Wrong Dosage	Correct Dosage	
Highest Level of Education	No schooling	Count	13	4	17
		% within Highest Level of Education	76.5%	23.5%	100.0%
	Primary school	Count	33	26	59
		% within Highest Level of Education	55.9%	44.1%	100.0%
	High School and higher	Count	9	15	24
		% within Highest Level of Education	37.5%	62.5%	100.0%
Total		Count	55	45	100
		% within Highest Level of Education	55.0%	45.0%	100.0%

Chi-Square Tests

	Value	df	P-Value
Pearson Chi-Square	6.157[a]	2	.046
N of Valid Cases	100		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.65.

The patients that do not have any schooling at all had the highest proportion taking wrong dosages of drugs (76.5%) compared to 55.9% for the patients with primary education and 37.5% for patients with at least high school education. The p-value of the Chi-square test is less than 0.05 (p-value = 0.046). It is concluded that there is an association between highest level of education and a patient's ability to take the prescribed dosage of a drug. It can be noted that the higher the level of education the better the ability to take the correct dosage of drugs.

3.15 Frequency adherence correlated to patient's level of education

Table 10: Table to show frequency adherence correlation to patient's level of education

			Frequency		Total
			Wrong	Correct	
Highest Level of Education	No schooling	Count	7	10	17
		% within Highest Level of Education	41.2%	58.8%	100.0%
	Primary school	Count	15	44	59
		% within Highest Level of Education	25.4%	74.6%	100.0%
	High School and higher	Count	4	20	24
		% within Highest Level of Education	16.7%	83.3%	100.0%
Total		Count	26	74	100
		% within Highest Level of Education	26.0%	74.0%	100.0%

Chi-Square Tests

	Value	df	P-Value	Exact Sig. (2-sided)
Pearson Chi-Square	3.132[a]	2	.209	.218
Fisher's Exact Test	3.019			.230
N of Valid Cases	100			

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.42.

The results shows that the there is no association between taking drugs at the prescribed frequency and a patient's highest level of education (p-value of the Fisher's Exact Test was greater than 0.05 (p-value = 0.230). The Fisher's Exact Test is used instead of the Pearson chi-square because one of the cells in the cross tabulation has an expected value less than 5 and thus the normal chi-square will produce biased results.

3.16 Dosage adherence correlated to whether the doctor routinely tells the patient if the doses are adjusted

Table 11: Table to show dosage adherence correlation to whether the doctor routinely tells the patient if the doses are adjusted

			Dosage		Total
			Wrong	Correct	
Doctors routinely tell patients when doses will be adjusted or if new tablets will commence	Yes	Count	15	19	34
		% within Doctors routinely tell	44.1%	55.9%	100.0%
	No	Count	39	25	64
		% within Doctors routinely tell	60.9%	39.1%	100.0%
Total		Count	54	44	98
		% within Doctors routinely tell	55.1%	44.9%	100.0%

Chi-Square Tests

	Value	Df	P-Value
Pearson Chi-Square	2.539[a]	1	0.111
N of Valid Cases	98		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.27.

The results reveals that there is no association between taking the correct dosage of drugs and whether the doctor routinely tells the patient if the doses are adjusted (p-value =0.111> 0.05, the significance level).

3.17 Frequency adherence correlated to whether the doctor routinely tells the patient if the doses are adjusted

Table 12: Table to show frequency adherence correlation to whether the doctor routinely tells the patient if the doses are adjusted

			Frequency		Total
			Wrong Frequency	Correct Frequency	
Doctors routinely tell patients when doses will be adjusted or if new tablets will commence	Yes	Count	6	28	34
		% within Doctors routinely tell	17.6%	82.4%	100.0%
	No	Count	19	45	64
		% within Doctors routinely tell	29.7%	70.3%	100.0%
Total		Count	25	73	98
		% within Doctors routinely tell	25.5%	74.5%	100.0%

Chi-Square Tests

	Value	df	P-Value
Pearson Chi-Square	1.694[a]	1	0.193
N of Valid Cases	98		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.67.

The results reveals that there is no association between taking drugs at the prescribed frequency and the doctor routinely telling the patient if the doses or frequency are adjusted or not (p-value =0.193 > 0.05, the significance level).

Chapter 4 Discussion

4.1 Discussion

The treatment of hypertension is essential to decrease the risk of cardiac failure, preserve renal function, decrease incidence of dementia and to prevent blindness in diabetic patients[16,17,18]. However adherence to treatment has been a major drawback to longevity and quality of life [19]. Despite effective treatment regimens for the control of hypertension poor adherence remains an issue. Anywhere between 20-70 percent non adherence to therapy has been documented [20].

The statistical conclusion showed that the ability to take the prescribed dosage of drugs is only dependent on a patient's highest level of education. Gender, age or whether the doctor routinely tells the patient if the doses are adjusted showed no correlation to compliance.

Our data concurs with existing literatures that have shown high levels of poor compliance. Furthermore our study has aimed to highlight the causative factors for this as is highlighted in the discussion below.

The ability to take the prescribed dosage of drugs is dependent on a patient's highest level of education. This was shown in our study where the higher the level of education of the patient, the higher the likelihood of adherence.

The ability to take the prescribed dosage has nothing to do with gender, age and whether the doctor routinely tells the patient if the doses are adjusted or not. Our study could not show any causal relationship with these variables.

There are huge problems with regards to stock levels of medication that accounts for poor adherence.

Nifedipine is the most prescribed antihypertensive medication. Overwhelmingly there is poor adherence to correct dosage of this drug. The major factor related to the poor dosage compliance is different generic suppliers.

An overwhelming concern highlighted in this study is the overdosing of most antihypertensive drugs. Furthermore in the groups of drugs where overdosing is occurring, it was evident that it is the same group where multiple generics are on tender. Nifedipine is the most common example of overdosing of an antihypertensive agent as a result of generic use of medication. Due to the various names of this calcium channel blocker some patients were taking up to three times the maximum dose. Multiple suppliers of generic drugs are leading to worsening adherence with regards to dosage.

There is a lack of effective doctor-patient discussion prior to dose adjustments, although this was proven to be statistically insignificant when matched to compliance. Sixty four percent of patients in the study believed that doctors and pharmacists are providing inadequate explanations to dosage changes on their scripts. The literature has differing opinions on this matter with some studies showing relevance to compliance from the doctor/pharmacist to patient interaction[23].

Our study found statistically significant rates of poor compliance linked to the level of education This may impact the patients understanding and perception of their illness[21].

Our patients in this study mainly come from poor socioeconomic backgrounds, poor literacy levels and a high level of unemployment, all of which have been mentioned as risk factors for poor adherence[22].

Inadequate medication stocks have been shown to further worsen adherence. Due to our patient's background of poverty they are generally unable to afford buying medication 'out of pocket' which leads to further non-compliance. Many medications are out of stock at any given time. This shows that there is indeed more than just the doctor-patient interplay that needs to be addressed. There are inherent problems in the health care system at large which need to be addressed, so that adequate levels of stock may stop adding to poor adherence.

Multiple generic tablets leads to confusion amongst patients and this contributes to poor adherence and the possibility for drug-drug interaction. A high number of generics are available for the more widely used medications in the study and wherever generics were available patients adherence levels dropped and the errors in their medication reconciliation increased.

Our setting is one where the patients are from a disadvantaged background where we have shown in this study a high level of poor adherence. We have also shown the large number of errors in taking prescribed medications. It becomes imperative for the health service providers, i.e. government, doctors and pharmacists to make it as simple as possible for patients to improve compliance. My recommendation would be for nationwide review of generic suppliers, longer tenders to be granted and maybe force

companies tendering to comply with providing drugs in similar packaging of the same drugs. Furthermore I would suggest focused groups for patients to learn about their treatment and reasons for their medication.

Limitations of this study must be kept in mind when taking the discussion into cognisance. Not all the specific generic medication names were found, as there were constantly changing suppliers to the hospitals pharmacy. The pharmacy could not guarantee which tender would provide the drugs to the hospital on a monthly basis. This meant a review of the potential generic drugs (by name) was not ascertained in this study. Another limitation is the sample size.

4.2 Recommended future research

The scope of medication reconciliation is vast and the above study does leave room for further studies in this field. A thorough interrogation of level of literacy needs to be explored in relation to adherence. Medication reconciliation would be applicable in any other speciality to further understand if these problems are not just isolated to this department and hospital.

I would suggest tracing the causes of poor stock levels of medications. The overall number of out of stock medication is concerning for the patients who in the most part do not understand their treatment strategies.

Treatment turbulence is another concept that needs to be addressed in our setting. Our patients often see a different physician at every visit and hence variations in prescriptions for the patients may exist. This needs to be audited for as a possible cause of poor adherence.

Further issues involving polypharmacy and adverse events in the elderly need to be assessed for at our hospital.

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