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Adherence to the Standard Treatment Guidelines in managing patients with hypertension at Chiawelo Community Health Centre, Gauteng, South Africa

Dawduth, Nikkeeta

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Adherence to the Standard Treatment Guidelines in managing patients with hypertension at Chiawelo Community Health Centre, Gauteng, South Africa

Dr Nikkeeta DAWDUTH
Student Number: 301746

A research report submitted as a publishable article to the
Faculty of Health Sciences,
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in partial fulfilment of the requirements for the degree of
MMed: Family Medicine

Primary Supervisor:
Dr Michele TORLUTTER
MBChB (UCT), MMED(SU), DA, DMH, DipHIVMx, DipObst(SA)
Department of Family Medicine
University of Witwatersrand, Johannesburg

Johannesburg, 2022

Declaration

I, Nikkeeta DAWDUTH hereby declare that this research is my own unaided work, except where due acknowledgement for assistance received has been made. It is being submitted for the degree of Master of Family Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted previously for any other degree or examination at this or any other University.

Signed ..... (Signature of candidate)

Dr N. DAWDUTH

Date: 19th April 2022

Signed ..... (Signature of primary supervisor)

Dr M. TORLUTTER

Date: 19th April 2022

II Dedication

I would like to dedicate this work to:
Almighty God.
my wonderful husband,
Clinton
and
my beautiful family,
Benny, Reasha and Sasheen,
for their unwavering support and encouragement
throughout the time I was preparing
this research reports.

III Acknowledgements

I would like to thank all my lecturers at Wits University. My sincere gratitude to my research supervisor, Dr M. TORLUTTER, Department of Family Medicine, University of the Witwatersrand, Johannesburg for her invaluable mentoring and guidance, feedback and patience, as well as her encouragement during the completion of my programme.

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VI Nomenclature

ACE-I	**:**	Angiotensin Converting Enzyme Inhibitor
ARB	**:**	Angiotensin Receptor Blocker
CCP	**:**	Chiawelo Community Practice
CHC	**:**	Community health Centre
CHW	**:**	Community Health Worker
COPC	**:**	Community Orientated Primary Care
EDL	**:**	Essential Drug List
NCD	:	Non communicable disease
STG	**:**	Standard Treatment Guideline
RAS	**:**	Renin Angiotensin System
QI	**:**	Quality Improvement
QIP	**:**	Quality Improvement Project
WBOT	**:**	Ward based outreach team
WHO	**:**	World Health Organisation

Article for submission

Adherence to the Standard Treatment Guidelines in managing patients with hypertension at Chiawelo Community Health Centre, Gauteng, South Africa

An article submitted according to the style guide and requirements of the African Journal of Primary Health Care & Family Medicine (PHCFM).

Authors

Dawduth Nikkeeta (1), Torlutter Michele (2)

[1,2] Department of Family Medicine, University of Witwatersrand, Johannesburg

Corresponding author: nikkeeta@gmail.com

Adherence to the Standard Treatment Guidelines in the management of patients with hypertension at Chiawelo Community Health Centre, Gauteng, South Africa

Abstract:

Background: Hypertension is a highly prevalent chronic disease, causing significant morbidity and mortality and is poorly managed and controlled in primary care, with only 24.5 to 56% of patients being controlled[1,2].

Aim: The aim of the study was to determine health care worker adherence to the Standard Treatment Guidelines in managing hypertensive patients in primary care.

Methods: The study was conducted at Chiawelo Community Practice Johannesburg. A retrospective file review was done on 261 hypertensive patients and information extracted to determine whether health care workers performed correct baseline tests at diagnosis; correct investigations were done on ongoing basis; lifestyle modification was addressed; and correct pharmacological therapy was prescribed and titrated. Data analysis included descriptive statistics and bivariate analysis.

Results: A total of 77% of participants were female and 23% were male of which 80.5% participants had co-morbidities. Patients were treated by a doctor in 97% of cases; 84.3% by clinical associate, and 0.6% by a nurse only over time. Baseline findings recorded in the file at diagnosis were: weight 65.9%, height 73.2%, potassium 32.2%, BMI 50.2%, abdominal circumference 51.7%, and urine dipsticks 47.9%. Vitals and investigations recorded in the file: BP 99.6%, weight 19.5%, blood glucose 86.6%, creatinine 95.4%, eGFR 94.3% and urine protein 3.4%. Lifestyle modification was recorded for 23.7% and medication adherence was checked and recorded for 36.4% of patients. The correct antihypertensive medications were prescribed in 96.5% of patients but titrated correctly in only 73.5% of patients. 52.8% of patients were controlled on treatment.

Conclusion: Adherence to guidelines by health care workers was suboptimal and several aspects of care warrants quality improvement processes.

Keywords:

Adherence; Hypertension; Health care workers; Standard treatment guidelines (STGs); South Africa; Retrospective cross sectional

Introduction

Hypertension is a chronic non-communicable disease (NCD) that is highly prevalent worldwide. Globally the World Health Organisation (WHO) estimates that there are 1.4 billion people living with hypertension, but only 42% of people have been diagnosed and receive treatment.[3,4] The highest prevalence of hypertension is found in lower- to middle-income countries according to a systematic review by Mills et al[5] looking at global disparities of hypertension prevalence and control.[5] The prevalence of hypertension in sub-Saharan Africa is estimated to be 38% by WHO, however this remains largely unknown due to poor availability of data.[4] The South African Hypertension Practice Guideline in 2017 estimated that 30.4% of the population has hypertension.[7] According to the South African National Health and Nutrition Examination Survey (SANHANES) of 2012 and the South African Demographic and Health Survey (DHS) of 2016, the prevalence of hypertension has increased from 38.4% in 2012 to 48.2% in 2016 with the average age of patients being 46.8 and 47.9 respectively.[8] There is a higher ratio of hypertension in females 46% to males 44%. Thus, hypertension is a highly common NCD affecting the South African population. [8]

The cause of hypertension is primarily idiopathic related to a genetic predisposition in patients, however rare secondary organic causes of hypertension also occur.[10] Hypertension causes significant morbidity and mortality, with complications such as stroke and coronary artery disease.[3,4,5,7,] Globally over 60% of cardiovascular disease is caused by hypertension, and the WHO estimates that hypertension caused 9.4 million deaths. [3,4,5]

In 2016/2017 Statistics South Africa reported that cerebral vascular disease and ischemic heart disease ranked 3rd and 4th as leading causes of death in South Africa, with hypertension an important underlying cause of these diseases.[11] In Gauteng, NCDs accounted for the deaths of 46% of females and 40% of males between the ages of 25-54 years, according to the 2016/2017 District Health Barometer (DHB).[11] Therefore, it is important that health care workers detect hypertension early though

effective screening and diagnosis, appropriate provision of pharmacological treatment, monitoring of treatment, and the use of non-pharmacological interventions such as lifestyle modification.[8] Emphasis on counselling by health care workers for modifiable lifestyle factors such as a healthy diet low in polyunsaturated fat and sugar, moderate regular exercise of 150 minutes per week, a reduction in alcohol consumption, and cessation of smoking can reduce cardiovascular complications and assist with control of hypertension.[3,8]

South Africa has one of the highest inequality indexes in the world post-apartheid.[8,12] It faces substantial challenges in providing high quality universal health coverage to all citizens with most patients being treated in a poorly resourced public health sector.[8,12] First line care for these patients is at district Primary Health Care (PHC) and Community Health Centre (CHC) clinics, where the bulk of patients with hypertension and other chronic diseases are managed. [12] Patients requiring more specialized care are referred to district, regional and tertiary hospitals. However, access to these higher levels of care is often limited.[8,12] Thus, patient management occurs primarily in a PHC setting that has significant resource limitations and system deficiencies which affects the quality of patient care. Such deficiencies may include drug stockouts, limited laboratory investigations, under-staffing, and lack of equipment such as ophthalmoscopes and ECG machines. [8,12,16]

In 1996, the National Drug Policy (NDP) was created and implemented in South Africa.[16] This included creating the Standard Treatment Guidelines (STG) and Essential Drug List (EDL).[13,16] The STGs' have 'PHC level' guidelines as well as 'Adult and Paediatric Hospital level' guidelines that aim to provide standardized medical treatment at different levels of care. [13,15,16] It allows essential drugs to be available at each health care level in a financially cost effective way.[16] The STG guidelines are designed specifically to assist PHC nurses working at clinics to effectively treat most patients independently, where there is a scarcity of doctors or specialist care.[13,15,16] The PHC STG hypertension chapter is based on the South African Hypertension Guidelines.[7,11,14,16] The guidelines used at the time of this study were the 2018 PHC STG guidelines.

In South Africa, it is estimated that only 24.5% to 56% of hypertensive patients are controlled.[1,2] The management of hypertensive patients may be influenced by several factors.[8,] A South African study conducted in Cape Town by Parker et al called, 'Health practitioners state of knowledge and challenges to effective management of hypertension at primary level', found numerous challenges that attributed to poor patient management.[17] Patient related factors such as poverty, lack of education, unemployment, poor drug adherence, and poor clinic attendance worsened disease burden and outcomes.[17] Health care worker related factors included lack of knowledge and poor use of the hypertensive guidelines which directly affected patient treatment, monitoring, and outcomes.[17] System related factors such as lack of resources including medical equipment, onsite laboratory services and drug availability and stockouts affected the ease of investigative work up and the prompt management of patients.[8,17] Other system related factors included the lack of booking systems, poor patient flow in clinics, inadequate staffing with high patient loads resulting in burnout of health care workers.[17] As a result of these conditions, health care worker difficulties become amplified with little time for a comprehensive bio-psycho-social approach during consultations, and limited opportunity for counselling and behaviour modification for lifestyle factors to improve control and prevent complications.[17]

In a study by Daniels et al[18] called, 'Ambivalence of primary health care professionals towards the South African Guidelines of hypertension', interviews with nurses and doctors were conducted to assess their attitudes towards using guidelines for the treatment of patients with hypertension and diabetes. It concluded that nurses recognized the importance of guidelines to assist them with treating patients, whereas doctors preferred individualized care and felt that guidelines could not be used in the treatment of complicated patients.[18] They also often did not apply management appropriately to resource constrained local settings.[18] In a study conducted by Ernst[19] in Pretoria, researchers assessed the knowledge of doctors working in private and public institutions in treating complicated hypertensive patients that had target organ damage. It was found that only 50% of doctors knew which pharmacological agent was most beneficial for their patient. Thus, this indicates poor knowledge of pharmacological therapy for a common NCD affecting patient care.

In summary, hypertension is a highly prevalent and poorly controlled NCD in South Africa, with poor adherence by health care workers to the national hypertension guidelines.[18,19,20] Various factors may affect the management of hypertensive patients as described above, however the aim of this study was to specifically assess adherence of health care workers to the 2018 STGs for hypertension at Chiawelo Community Practice (CCP), including the provision of correct antihypertensive treatment, monitoring, adherence and lifestyle modification.

RESEARCH DESIGN AND METHODS

Study design

The study design was a descriptive retrospective cross-sectional study.

Aims and Objectives

To assess the compliance of clinic-based health care workers (nurses, clinical associates, and doctors), to the 2018 hypertension STGs.

The specific objectives were:

- to measure adherence of health care workers to completing and recording correct bedside and laboratory investigations at baseline diagnosis of hypertension and the ongoing monitoring of hypertensive patients.
- to assess if lifestyle modification advice was recorded in the patient's file.
- to assess if correct drugs were prescribed and titrated according to clinical response; and
- to assess if medication adherence was recorded in the file

Study setting

The study was conducted at Chiawelo CHC in Soweto, Johannesburg. This CHC is located in a densely populated peri-urban area. It serves ward 11, which includes

Chiawelo (population: 13104) and Klipspruit (population: 10 464). It also provides services to ward 12 (population: 27 300), ward 15 (population: 26784), and ward 19 (population: 28 668).[21] The community is primarily disadvantaged, with an average household income of R4900.[21] Most people live in Reconstruction and Development Programme (RDP) government housing and have access to sanitation and electricity. Population statistics indicate high levels of unemployment at 39.2%, with 22.9% of people relying on social grants in the area. 37.4% of households are female headed, and there is a large geriatric population of 35%.[21]

Chiawelo CHC is a 24-hour clinic and offers a wide range of services including acute and chronic primary care, mental health, maternity care, paediatric care, and dental services. Patients requiring a higher level of care are referred to Bheki Mlangeni District Hospital or Chris Hani Baragwanath Tertiary Hospital. Our study took place in a section of the clinic called the CCP that serves ward 11. This area is run by a family physician and follows the ideals of a community practice, and serves a particular population at risk. It has a filing system and booking system that attempts to include the whole family. It mainly provides chronic care services, and also actively engages in community oriented primary care (COPC).[21] The clinic is staffed by two family physicians, a clinical associate practitioner, a family medicine registrar, two interns, four enrolled nurses, one PHC nurse and a filing administration clerk.

Study population and sampling strategy

The study population was the 1393 hypertensive patients that Chiawelo CCP treats per month. Included in the study were the records of patients 18 years and older, who had been diagnosed with primary idiopathic hypertension at the CCP, and had been monitored and treated by the health care workers at the CCP for at least a year. Patient files that met the inclusion criteria had data collected for the past three consecutive visits, to allow for trends in patient management and control to emerge. Files were sampled and data collected consecutively from the archive until the sample size was reached.

Patient files were excluded if gross information was missing such as baseline tests and lab investigations done at diagnosis, or where pages were missing and the file was incomplete. Patient files where secondary causes of hypertension was diagnosed,

or where end organ damage such as heart failure or renal failure was present were excluded. These patients often require individualized treatment beyond the scope of the basic PHC STGs for hypertension. Pregnant patients with gestational hypertension or pre-eclampsia were also excluded from the study.

The sample size was calculated using Cochran's Formula from a sample size calculator in Microsoft Excel.[39] This is used for categorical data. A sample of 261 participants was calculated from a population proportion of 1393 hypertensive patients attending the CCP from ward 11. A confidence interval of 95% was used to describe where the true population mean should lie.

The Cochrane formular for calculating the required sample size is

$$n_0 = \frac{z^2 \times p \times (1-p)}{E^2}$$

Which has the following components where No is the needed sample size, Z is the value for the 95% confidence interval is 1,96, P is the expected hypertensive population proportion of 30% or 0.3, and E is the margin of error of 5% or 0.05.[39]

Research tool and data collection:

The design of the data collection tool was based on the requirements of the 2020 STGs for hypertension with slight modification to context in line with the specific objectives of the study. The tool also collected information on basic demographics of the patient, and the co-morbidities. It records whether beside examinations and investigations were performed correctly at initial diagnosis or not, if ongoing annual investigations had been performed or not, and whether lifestyle modification was part of the care plan or not. It also recorded if pharmacological treatment was correctly prescribed and titrated as required, by health care workers over time; and whether adherence to treatment was reported in the patient's file or not.

Data was collected over a three-month period from September 2020 to November 2020, by the principal investigator. A filing clerk provided the researcher with files on specific days. The clinical notes were assessed and data recorded on the data collection tool. Clinical information was obtained from the chronic care sheet

(Appendix VII) which was a flow chart kept inside each patient file: This included information such as blood pressure readings, anthropometric measurements, urine dipsticks, blood glucose and baseline and annual blood tests were performed. Further data was collected from the clinical notes including if the clinician had recorded counselling on lifestyle modification (such as dietary changes, incorporation of exercise, smoking cessation and reduction in alcohol consumption) and adherence to treatment. Drug charts were assessed to determine if correct drugs were prescribed and titrated over three consecutive visits, and if control was achieved.

In order to maintain confidentiality and prevent resampling a research number was allocated to each patient file, inscribed on the inner page of the folder. The research number was also recorded on the data collection instrument. No patient names were used.

All collected data was transcribed in the data collection tool and then were entered onto a Microsoft Excel spreadsheet. The hard copies were stored under lock and key by the principal investigator, and excel spreadsheets were password protected in Google Drive and only available to the researcher and supervisor. The information collected will be kept protected for a period of five years after publication to maintain confidentiality and maintain research integrity.

Data analysis:

A Bio-statistician at the University of the Witwatersrand, Johannesburg assisted with data analysis.

Age distribution was presented as a continuous variable using mean and standard deviation. Gender was categorised as male and female and presented in frequencies and percentages.

Bedside examination and tests, investigations, lifestyle modification and pharmacological management were recorded as either having been performed (yes/1) or not having been performed (no/0).

The binomial test was used to determine if a significant proportion of the participants either did or did not have their baseline tests, laboratory investigations, lifestyle

counselling, drug therapy given and intensification of treatment therapy performed and recorded. Under the null hypothesis it is assumed that equal proportions (50%) did/ did not have these functions performed. A significant result (indicating unequal proportions) is achieved if $p<0.05$.

Ethical considerations

All ethical standards for medical research involving human subjects were considered for this research, upholding the principles of the World Medical Association's Declaration of Helsinki. There was no conflict of interest with sponsors and participants, with freedom to publish the research results. Permission was received to conduct the research at Chiawelo CHC by the Chief Medical Officer (CMO) and head operational manager. The study was approved by the Human Research Ethics Committee (HREC) of the University of the Witwatersrand, Johannesburg (clearance certificate number: M200221). It was also approved by the National Human Resource Development Committee (NHRD Ref: GP_202105_016), and the District Research Council (DRC Ref: 2021-05-002).

Confidentiality was maintained by assigning a unique research number to each file as already described. The data collection sheets were stored under lock and key by the principal investigator, and spreadsheets were password protected in Google Drive. The information collected will be kept protected for a period of five years post publication to maintain confidentiality and research integrity.

All information from the collected data instrument was then transcribed into a Microsoft Excel spreadsheet. The data collection sheets were stored under lock and key by the principal investigator, and spreadsheets were password protected in Google Drive that is only available to the researcher and supervisor. The information collected will be kept protected for a period of five years post publication.

RESULTS:

A total of 261 patient's files were sampled and included in the analysis.

The mean age of patients in the study was 60 years with a standard deviation of 13.219 (Table 1). The majority of patients were female (201, 77%) and 210 (80.5%) of them had co-morbid diseases such as Diabetes Mellitus, HIV, Osteoarthritis and Gout (Table 2).

Over a period of three consecutive visits 255 (97.7%) and 220 (84.3%) patients were consulted by a doctor and by a clinical associate respectively. In this study the PHC nurse only consulted 1 (0.4%) patient, with her main responsibility to the Ward Based Outreach Team (WBOT) and managing the community health care workers. The enrolled nurses were responsible for vital signs, bedside tests, and phlebotomy.

Table 1: Demographic details (n=261)

Gender	**n**	**Percentage %**
Male	60	23
Female	201	77
Total	261	100
Mean	60.38	
Standard Deviation	13.219	
Age category	**n**	**Percentage %**
25–34	4	1.5
35–44	32	12.3
45–54	46	17.6
55–64	82	31.4
65–74	57	21.8
>74	40	15.3

Table 2: Co-morbid conditions per age group (n=261)

Age		**Co-morbidity**		**Pearson's chi-square**		
		Absent	**Present**			
Category	**n (%)**	**n (%)**		**χ^2**	**df**	**p-value**
25 – 34	4 (1.5)	2 (50)	2 (50)	7.010	5	0.220
35 – 44	32 (12.3)	6 (18.8)	26 (81.3)			
45 – 54	46 (17.6)	5 (10.9)	41 (89.1)			
55 – 64	82 (31.4)	21 (25.6)	61 (74.4)			
65 – 74	57 (21.8)	9 (15.8)	48 (84.2)			
>74	40 (15.3)	8 (20)	32 (80)			
Total	**261 (100)**	**51 (19.5)**	**210 (80.5)**			

Investigations performed at diagnosis:

The STG guidelines stipulate the baseline clinical examinations and investigations required when hypertension is first diagnosed (Figure 1). Weight and height were recorded at diagnosis 65.9% and 73.2% of the time respectively, which was statistically significant. Anthropometric measurements such as body mass index (BMI) and abdominal circumference, and routine urine dipsticks were performed in 47.9% of patients. Serum potassium was recorded in 32.2% of patients at baseline, which was significantly low.

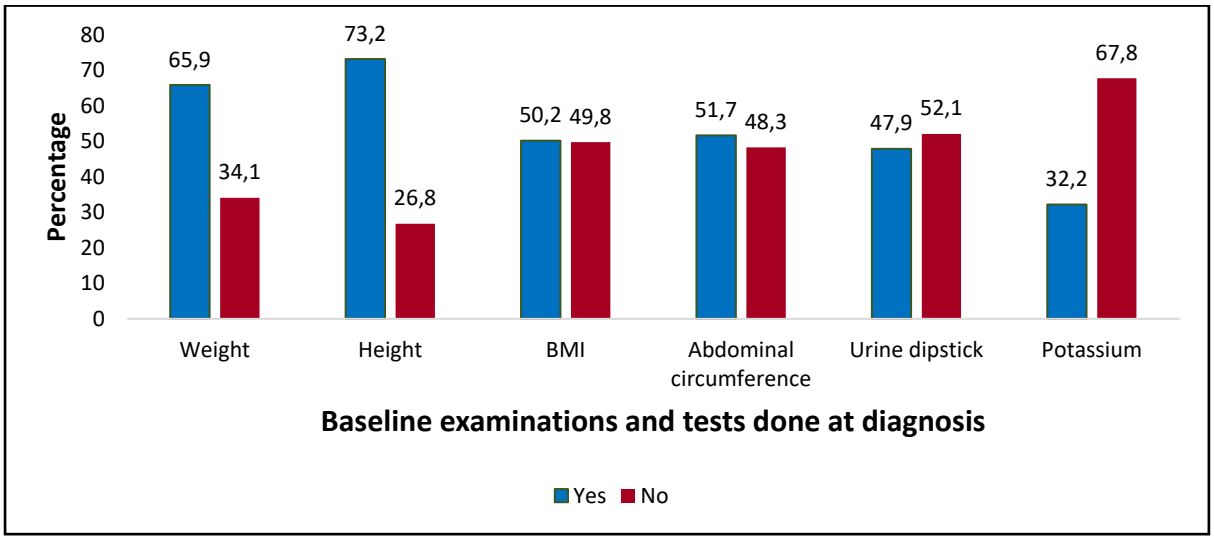


Figure 1: Baseline examinations and tests done at diagnosis of hypertension

Blood pressure and weight performed at each patient visit

Blood pressure (BP) and weight measurements are required at every visit for hypertensive patients according to the STGs. Blood pressure was recorded in 99.6% of the patients over three consecutive visits, while weight was recorded only 15.7%-24.9% of the time over the three consecutive visits (Table 1).

Table 3: Blood pressure and weight performed at each patient visit

Test	Visit	Frequency n (%)	n

		Yes	No	
Blood pressure	1	260(99.6)	1(0.4)	261
	2	260(99.6)	1(0.4)	261
	3	260(99.6)	1(0.4)	261
Weight	1	65(24.9)	196(75.1)	261
	2	47(18)	214(82.0)	261
	3	41(15.7)	220(84.3)	261

Annual investigations performed on hypertensive patients:

Annual blood tests and specific investigations are required for screening and ruling out complications in hypertensive patients (Table 4). Blood glucose was recorded in 86.6% of the patients, and renal function tests such as creatinine and eGFR were recorded in 95.4% and 94.3% of patients respectively. The annual bedside test looking for proteinuria was recorded in only 3.4% of patients.

Table 4: Annual bedside tests and investigations

Annual tests	Frequency n (%)		n
	Yes	No	
Blood glucose	226(86.6)	35(13.4)	261
Urine protein	9(3.4)	252(96.6)	261
Creatinine	249(95.4)	12(4.6)	261
eGFR	246(94.3)	15(5.4%)	261

Lifestyle modification at each visit

As part of ongoing management health care workers are required to provide advice on lifestyle modification which should be recorded in the patient folder. This was recorded only 19.2% to 27.2% of the time over three consecutive visits (Table 5).

Table 5: Lifestyle modification performed at each patient visit

Visit	Frequency n (%)		n
	Yes	No	
1	71(27.2)	190(72.8)	261
2	50(19.2)	211(80.8)	261

Life modification counselling	3	65(24.9)	196(75.1)	261

Pharmacological therapy at each patient visit, titration, adherence, and control

The provision of standardized pharmacological therapy in line with the STGs was assessed in this study (Table 6). We assessed if correct drug treatment was provided and if drugs were correctly titrated over time. In addition, it was checked if adherence was recorded in the patient folders (Table 6). Antihypertensive treatment was correctly prescribed in most patients (95.8%-97.3%) over three consecutive visits. Treatment was correctly titrated in 71.6% to 75.1% of patients for each of these visits. Health care workers recorded patient adherence to treatment in only 34.1% to 39.1% of patient folders.

Table 6: Pharmacological therapy at each patient visit, titration, and adherence

Test	Visit	Frequency n(%)		n
		Yes	No	
Correct drugs used	1	254(97.3)	7(2.7)	261
	2	252(96.6)	9(3.4)	261
	3	250(95.8)	11(4.2)	261
Correction Titration	1	196(75.1)	65(24.9)	261
	2	187(71.6)	74(28.4)	261
	3	193(73.9)	68(26.1)	261
Adherence checked	1	102(39.1)	159(60.9)	261
	2	89(34.1)	172(65.9)	261
	3	94(36.0)	167(64.0)	261

Table 7: Blood pressure control at each patient visit

Blood Pressure Controlled	Visit	Frequency (%)		n
		Yes	No	
< 140/90 mmHg	1	140(53.6%)	121(46.4%)	261
	2	130(49.8%)	131(50.2%)	261
	3	144(55.2%)	117(44.8%)	261

As a measure of BP control, analysis was done to determine if BP was <140/90mmHg at each visit (Table 7). BP was only controlled 49.8% to 55.2% of the time over three consecutive visits.

DISCUSSION:

The site chosen for this study differs from other CHC clinics in the public service. This is because the CCP which falls within the larger Chiawelo CHC strives to provide services to a population at risk, not only focusing on facility-based care but also community-oriented primary care (COPC).[21] This study found that most patients are attended by doctors (97%) and clinical associates (87%) in this setting. Due to pressure on staff numbers and the re-engineering of primary care to form WBOTS, nurses have taken on additional roles in the CCP. The PHC nurse is assigned as team leader to the community health workers allocated to the clinic. This takes PHC nurses away from their normal clinical duties and increases their administrative tasks.[21] Enrolled nurses in the clinic are mainly involved in taking vital signs and performing bedside tests, while clinical management of patients falls to the doctors and clinical associates. The level of involvement in clinical care by nurses varies in different CHCs across Johannesburg Metro. In this study we therefore were unable to differentiate if doctors, clinical associates, or nurses are better at adhering to the use of guidelines. This is an important consideration as it has been shown that different constituents of staff may implement guidelines differently, where guidelines are supposed to provide clinicians with a framework of agreed and accepted standardized care. In Kwazulu-Natal, South Africa, Sooruth et al[13] conducted an audit to assess the use of STGs by nurses. All 120 nurses used the STGs in their daily clinical practice and reported that they found value in the guidelines especially as there had been lack of training. A study conducted in the North-West province by Siko et al[20] showed that patients treated by nurses had better adherence to treatment and follow-up. In contrast, some studies have shown doctors as more reluctant to adopt guidelines, and more research is required to investigate the resistance or barriers doctors experience in using guidelines.[14,20] Given the above it would be worth exploring further the effectiveness of nurses in chronic care services, and consideration should be applied to how PHC nurses are used in the CCP setup.[21]

In our study setting it became apparent that despite guidelines being available, BP control remain poor. Every link in the services, along with the behaviours of health workers at the different service points needs to be reviewed. Our study demonstrated gaps in the measurement of anthropometric variables, bedside tests and implementation of clinical interventions necessary for BP control which may indicate the need for further training and other interventions at all levels. This is vitally important for managing NCDs - screening, diagnosis and prevention of complications such as obesity, renal disease and the assessment of a patient's cardiovascular risk.

As part of the routine in the clinic, patients have their vitals and side room tests done by an enrolled nurse before they are consulted by the clinician. In this study, it was demonstrated that measurements such as BP (99.6%) and glucose (86.6%) are done at every visit and at least annually. The nurse measured weight (65.9%) and height (73.2%) at baseline, but then was inconsistent for weight measurements at follow-up visits (19.5%). Routine urine dipstick was performed poorly at baseline (47.9%) and as an annual check (3.4%). A number of tests and measurements useful for the initial assessment and ongoing monitoring of patients with hypertension were not being done. Having this data available and written in the file before the patient is seen by the clinician is time saving in the clinic. The barriers to collecting and reporting these side room tests by the nurse needs to be investigated.

An area of poor performance is basic anthropometric measurements. Weight and height at baseline were not converted to BMI (50.2%). Moreover, BMI was not measured consistently over time, with weight being measured only 19.5% of the time at follow-up visits. Additionally, abdominal circumference was measured in only 51.7% of patients at baseline. When compared with similar studies locally, a study in the North-West province of South Africa by Adedeji et al[22] demonstrated that BMI was recorded for only 3.1% of patients and abdominal circumference for 3.3% of patients. In comparison a study by AL-Gelban et al[23] further afield in Saudi Arabia demonstrated that over 90% of their patients had BMI assessments performed. Anthropometric measurements are vitally important to assess cardiovascular risk in patients. It has been shown that weight reduction of 5-10 % improves hypertension and general CVS risk.[38] Weight management along with other measures in the Framingham risk score are important for prevention, and also inform the need for additional drug management with aspirin and statins. Anthropometric measurements should be simple and quick

to conduct. Various health system and health care worker factors would need to be explored to explain the low performance. Some known issues are lack of basic equipment such as a tape measure, lack of access to Wi-Fi precluding the use of online tools such as BMI calculators, time pressure, lack of clarity on roles in the clinic, poor engagement with guidelines, and the need for more skills audits amongst staff.

Finger prick blood glucose tests (86.6%) were performed regularly as part of annual screening. This is an easy and available test that is done as part of routine care and screening for diabetes, a commonly associated condition in this setting. This is important as we know the diagnosis of diabetes and hypertension is frequently missed, which is in part a failure of our screening programs.,[4,5]

Another area that performed poorly in this setting is insufficient screening for proteinuria using urine dipsticks. This is a cost-effective easy side room test to perform and detects early renal disease. It is a superior option compared to 24-hour urine collection in patients in this setting. A systematic review and meta-analysis conducted by Geneen et al[26] compared the accuracy of spot urine Protein-Creatine Ratio (PCR) to the gold standard of 24-hour urine PCR. It was found that spot urine PCR in 28 studies had a high sensitivity of 91% and specificity of 89% at a level of 30mg/mmol (n=3577). The use of this point of care investigation is therefore accurate and appropriate in outpatient settings. The detection of proteinuria is important because it indicates the need for drug treatment with Renin-Angiotensin-Converting-Enzyme-Inhibitors (ACE-I) or Angiotensin Receptor Blockers (ARBS) to slow renal damage, and as part of cardiovascular risk stratification. The LIFE study, a RCT conducted in Denmark by Wachtell et al[27] on 8206 patients, found that the albuminuria rate was directly correlated with left ventricular hypertrophy. This was independent of other risk factors such as smoking, age and non-communicable diseases such as hypertension and diabetes. In patients with LVH, every 10-fold increase in urine albumin creatinine ratio (UACR) results in an increase of end point cardiovascular mortality by 84.5% (CI 59.4-214) and stroke by 49.3%(CI30.3-71.0). ACE-I and ARBS are superior in reducing proteinuria in hypertensive patients in comparison with other antihypertensive drugs, and improve renal function and reduce cardiovascular risk.[28,29] In our study, patients were tested for proteinuria 47.9% of the time at baseline, and only 3.4% of the time as an annual check. Other local studies had similar findings. In a study conducted in Cape Town, South Africa by Moosa et al[25] compared two CHCs

and found that urine dipsticks tests were being performed on average 54.7% of the time. Early detection of proteinuria is a vital screening and diagnostic test that is necessary of optimal drug and clinical management. Further assessment in the clinic will be required to explore why it is not being done consistently in the CCP.

Other renal function tests such as annual blood test for Creatinine and eGFR are done more regularly (95%) and are ordered by the clinician. This finding is similar to the Saudi Arabian study conducted by Al-Gelban et al,[23] that tested Creatinine in 88% of patients. Chronic Kidney Disease is primarily caused by NCDS such as hypertension and Diabetes Mellitus and is a growing complication. The need for Renal replacement therapy through dialysis is increasing.[23] Early detection of renal disease and correct management is an important component of care in hypertensive patients and should be a continued practice at CCP.

The chronic care model is a systematic approach used in primary care to ensure the comprehensive care of patients with chronic diseases. The '5 C approach' includes assessing the patient for any new complaints, compliance to medication, control of the chronic condition, complications resulting from the chronic condition, and the management of any co-morbidities which are contributing to the chronic condition or also requiring management.[33] This chronic care framework puts into application many of the data points required in the guidelines for hypertension management.[33] In addition consultation approaches such as STOTT's tasks are useful to cover all aspects of a holistic consultation. This includes managing the presenting complaint, help seeking behaviour, ongoing management of co-morbid conditions, and prevention and health promotion.[33] These useful frameworks assist clinicians to deliver comprehensive care, and if conducted well should cover all aspects of care required in the hypertension guidelines.

In our study we assessed if lifestyle modification as part of disease management and prevention was being recorded. Lifestyle modification has been found to reduce systolic blood pressure levels by 3 to 11mmHg.[23,25] Our study found that lifestyle modification was only recorded in 23.7% of patient files. This record does not mean that a casual conversation did not take place between the clinician and the patient, but that there simply may be no record of the conversation. It also does not provide any

proof of the quality and effectiveness of lifestyle modification provided. Our study findings correlate with a local study done by Adedeji et al[22] in the North-West province. They assessed different aspects of lifestyle modification and found that it was generally poorly advised by healthcare workers in less than 50% of patients.[22] In a questionnaire conducted by Parker et al[20] in Cape Town, 100% of the physicians interviewed understood the importance of lifestyle modification but only 50% of doctors counselled patients on lifestyle modification. In international settings, such as Cyprus, this appears to be less of a gap, where a study conducted by Theodorou et al[34] found that 60.5% of patients received correct advice to adopt lifestyle changes and this was before committing patients to lifelong antihypertensive therapy. In the South African setting, a complex mix of systems factors, health care worker factors, and patient factors may be affecting the provision of lifestyle counselling. Two important issues not investigated in this study are the time constraints on consulting patients, and the lack of skills amongst clinicians in delivering effective brief motivational interviewing. We know that this is a complex topic as behavioural change is not easy for most people, is often cyclical, and that counselling does not automatically equate to better outcomes.[33] Other factors also come into play such as economic hardship for patients, cultural norms, poor literacy and language barriers, and lack of follow-up of patients in the system. Further research is required to assess the impact of providing advice on lifestyle modification and disease outcomes, and how this gap in services affects improving the modifiable aspects of hypertension disease.[20]

Our study also assessed if: medications were correctly prescribed during the consultation; titration of medication occurred according to clinical response; patients were being checked for adherence to medications; and BP control was being achieved through these measures. These all-form part of the '5 C approach'.[33] Healthy lifestyle interventions as already discussed along with antihypertensive medication is required to reduce the risk of microvascular and macrovascular complications including coronary artery disease and cerebrovascular accident. The hypertension guidelines provide a standardized step wise approach to prescribing antihypertensive drug therapy. This study demonstrated that correct pharmacological drugs were prescribed 96.5% of the time. Therapy was titrated correctly in 73.5% of patients based on their BP trends over three consecutive visits. However, only 36.4% of clinicians documented if patients were adherent to their antihypertensive treatment. It was also

apparent in the study that adherence was only checked and recorded by the clinician when the patient's BP was extremely uncontrolled. It is known from international studies that only around 50% of patients are adherent to their chronic medications; however, there is a paucity of research literature on this in the South African context.[1,2,3,4] Only 52.8% of patients achieved BP control over three consecutive visits in this study. So, despite the correct prescription and titration of drugs hypertension is still poorly controlled in this setting, the national target for blood pressure control in most cases being less than 140/90mmHg[7]. Adherence may be a major contributing factor, along with lack of access to single pill combinations. Other causes for resistant hypertension would need to be explored. This study focused on idiopathic uncomplicated hypertension. The situation for patients with more complicated disease may be even worse.

A study done by Ernst et al[19] in Pretoria, South Africa showed that only 56% of doctors in both private and public practice prescribed the correct antihypertensives in complicated patients with co-morbidities such as ischemic heart disease, congestive heart failure, and renal insufficiency. Correct drug use, timely investigation, and referral of drug resistant and complicated patients, and emphasis on adherence is required to improve poor hypertension outcomes. Several factors may be contributing to treatment inertia by clinicians. A study by Parker et al[20] in Cape Town, South Africa described that physicians may be accepting higher BP readings in patients. In another similar Swedish survey, Midlöv et al[35] showed that physicians accepted much higher BPs greater than 160/90mmHg before initiating patients on antihypertensives.

The control of hypertension in this study (52.8%) falls within similar ranges as the rest of South Africa (24.5% to 56%). [1,2] Several areas have been highlighted in this study where guidelines were inadequately adhered to, contributing to poor hypertension outcomes. There is a complex interplay between health system related factors, health care worker factors and patient factors. This study highlighted where bedside tests and investigations, counselling on lifestyle modification, up-titration of drugs for uncontrolled hypertension, and adherence counselling can be improved.

LIMITATIONS

This study focused on one area in a CHC clinic in Soweto, which has unique characteristics and may not be transferable to other clinics. The sample size was calculated using Cochrane's formular, however it is noted as a limitation that the population proportion of 30% percent was used instead of the population proportion of adherence to the hypertension guidelines. This resulted in a lower sample size being needed of 240. However, the researchers sample size was used in excess of 80% resulting in a large size of 261 which highlighted a meaningful result. The study relied solely on records in the files. There were a number of areas that may be biased due to the questionable accuracy and quality of clinical records. It is difficult to determine if BP recordings were accurate as this relies on the calibration of electronic sphygmomanometers, positioning of the patient, and use of correct cuff sizes that are often unavailable. This may result in incorrectly recorded BP control. Since records are often poorly kept, it was difficult to evaluate the true rate of lifestyle modification provided and the quality thereof. It was also difficult to assess if adherence counselling was really done and the manner and effectiveness in which it was done from the records alone. Most patients were elderly with 80.5% having co-morbidities in the study. Due to the time frame of the study, data were collected during the peak of the COVID-19 pandemic in 2020 which may have influenced findings. This includes reduced access to PHC services especially routine chronic care. Clinic visits may have been limited and shortened, with reduced time for counselling and discussions regarding adherence to medications. Strengths of this study included that it was affordable and the researcher conducted the study at her own cost. The data collection was done over a short period, and multiple variables were investigated. The topic of hypertension and adherence of health care workers to PHC guidelines is relevant and important to the South African and it is intended that this research be used as a foundation for the improved management of hypertensive patients.

CONCLUSION AND RECOMMENDATIONS:

Hypertension is a condition that requires prioritization in view of its global prevalence, associated morbidity and mortality, and its general poor management in primary care. Healthcare workers' adherence to the STG for hypertension in the Chiawelo CCP is

poor and highlight gaps in several aspects of care for patients with hypertension. There is a need to strengthen clinical governance activities including healthcare worker's training on the NCD service package and the implementation of quality improvement processes on hypertension in the study. The continued capacity building and training of staff members that emphasises screening, counselling skills for health promotion and disease prevention, and the proper use of hypertension guidelines are essential components in improving the quality of care and management of hypertensive patients.

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	:	Department of Health Chiawelo Community Practice
Sr Mvula:		For permission to conduct the research study.

Competing interests

The authors declare that that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Authors' contributions

The leading author of this study is Nikkeeta Dawduth (N.D), who played a pivotal role in framing and developing the content. The invaluable guidance and oversight were provided by Michele Torlutter (M.T.), who functioned as the primary supervisor throughout the process.

All contributing authors had an active role in refining the work, providing feedback on multiple drafts to ensure the highest quality. Their collective approval of the final version underscores the collaborative effort that went into this research and approved the final version to be published.

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Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Disclaimer

The views expressed in the submitted article are my own and not an official position of the institution

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APPENDICES

Appendix I: **Data collection Tool**

Data collection tool:						
Demographic Data:						
Research Number:						
Age:						
Gender:						
Doctor/ Nurse/ Clinical Associate:						
Date of Diagnosis of hypertension:						
Number Months on treatment:						
Number of times patient seen						
Visit Number						
Baseline Tests Done on Diagnosis	YES		NO			
Urine Dipstick: Proteinuria or Haematuria						
Weight:						
Height:						
BMI:						
Abdominal Circumference:						
Serum K:						
Annual Tests						
Blood glucose:						
Urine Protein:						
Creatine:						
EGFR						
Visit	1st		2nd		3rd	
Blood pressure						
Weight						
Lifestyle Modification counselling	YES	NO	YES	NO	YES	NO
BP Controlled						
Pharmacological Therapy at 1 year						
Drug Used	YES	NO	YES	NO	YES	NO
Correct drugs used Appropriate drugs used as per the STG's						
Correction titration of medication Drugs titrated appropriately according to response						
Any co-morbidities Adherence checked before escalating medications						
Selection of drugs appropriate with compelling indications (co-morbidities, pregnancy, race)						
Any comorbidities						
Additional comments:						

1

2

3

4

5

Appendix II: **Consent forms**

Consent form

Name of Researcher: Dr Nikkeeta Dawduth

Email: nikkeeta@gmail.com

Cell-phone number: 0722911389

Name of Supervisor: Dr Michelle Torlutter

Purpose of the study: Masters in Family Medicine at the University of Witwatersrand

Name of Study:

A retrospective audit of Health Care Worker adherence to the Standard Treatment Guidelines in managing hypertensive patients at Chiawelo Community Health Centre, in Gauteng, South Africa

Consent:

I, DR. YAVA KALULA SENIOR CLINICIAN the ~~Clinical manager~~ of Chiawelo Community Health Centre hereby give permission to Dr Nikkeeta Dawduth to conduct the above study at Chiawelo Community Health Centre after she has received ethics waiver and approval from the JHB Metro District.

I have received a copy of the research protocol and I am aware that this is a retrospective file audit with no harm to patients

Name of facility manager: DR. Y. KALULA

Signature:

Date: 03/07/2020

Name of Researcher: Dr Nikkeeta Dawduth

Email: nikkeeta@gmail.com

Cell-phone number: 0722911389

Name of Supervisor: Dr Michelle Torlutter

Purpose of the study: Masters in Family Medicine at the University of Witwatersrand

Name of Study:

A retrospective audit of Health Care Worker adherence to the Standard Treatment Guidelines in managing hypertensive patients at Chiawelo Community Health Centre, in Gauteng, South Africa

Consent:

I, Sylvia Mvula the Facility manager of Chiawelo Community Health Centre hereby give permission to Dr Nikkeeta Dawduth to conduct the above study at Chiawelo Community Health Centre after she has received ethics waiver and approval from the JHB Metro District.

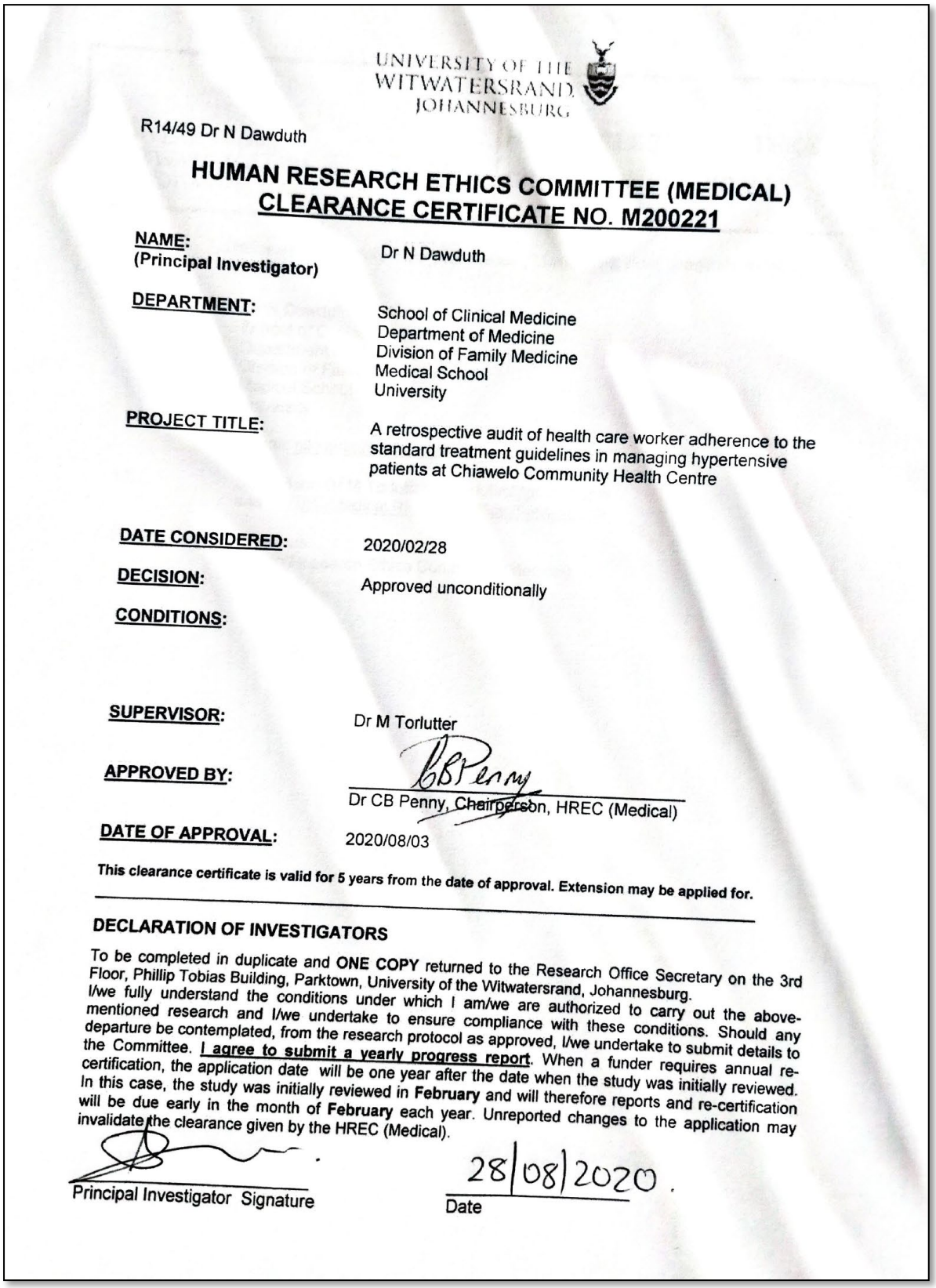
I have received a copy of the research protocol and I am aware that this is a retrospective file audit with no harm to patients

Name of facility manager: Sylvia Mvula

Signature: Mvula

Date: 29/06/20

Appendix III: **Ethical Clearance Certificate**



UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Dr N Dawduth

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200221

NAME: (Principal Investigator) Dr N Dawduth

DEPARTMENT: School of Clinical Medicine
Department of Medicine
Division of Family Medicine
Medical School
University

PROJECT TITLE: A retrospective audit of health care worker adherence to the standard treatment guidelines in managing hypertensive patients at Chiawelo Community Health Centre

DATE CONSIDERED: 2020/02/28

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR: Dr M Torlutter

APPROVED BY: CB Penny
Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: 2020/08/03

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **February** and will therefore reports and re-certification will be due early in the month of **February** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

28/08/2020
Date

Appendix IV: **Provincial and district permissions**

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

Research Committee of
Johannesburg Health District

Enquiries: Ms. Busisiwe Sikhosana
Tel: 011 694 3909
Email :Busisiwe.Sikhosana@gauteng.gov.za
Hillbrow CHC: Administration Building,
Cnr Smith Str. & Klein Street
Private Bag X21, Johannesburg,
South Africa, 2017

31st May 2021

P O BOX 76123
MARBLE RAY
DURBAN
4035

Email: nikkeeta@gmail.com

Dear: Dr Nikkeeta Dawduth

TITLE: ***A retrospective audit of healthcare wrker adherence to the standard treatment guidelines in managing hypertensive patients at chiawelo community health centre in gauteng south africa***

DRC Ref: 2021-05-002

NHRD Ref no: GP_202105_016

OFFICIAL APPROVAL

The Johannesburg Health District Research Committee (DRC) has reviewed your application. This letter serves as approval to access the Districts Health facilities (mentioned below) for the above research.

The following conditions must be observed:

- The facilities in which the research will be conducted are: CHIAWELO CHC
- These facilities will be visited from: 31/05/2021 to 31/05/2022
- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit an annual progress report to the District Research Committee.
- Your supervisor and the University of the Witwatersrand will ensure that these reports are being submitted timeously to the District Research Committee.

- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.
- You will liaise with the manager/s before initiating the study.

Contact	Sub District	Sub District Manager/ Area Manager	Contact No.	Cell phone
	ABCEF	Ms Lombuso Matlala	011 440 1259	082 307 0267
X	D	Ms Maria Mazibuko	011 674 1200	082 781 9919
	G	Mr Peter Mathole	011 213 9603	072 483 6839
	CoJ A	Ms Nelly Shongwe	011 237 8010	082 467 9276
	CoJ B	Ms Zanozuko Mbane	011 718 9656	082 551 5804
	CoJ C	Mr Tebogo Motsepe	011 761 0200	084 655 5420
	CoJ D	Ms Busi Phiri	011 986 0164	082 467 9316
	CoJ E	Mr Vusi Mazibuko	011 582 1504	082 464 9547
	CoJ F	Mr M Monyamane	011 681 8130	082 467 9423
	CoJ G	Ms Olga Kruger	011 211 8936	083 286 0388

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above. Please feel free to contact us, if you have any further queries.

On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

Prof S. Moosa
Chairperson: District Research Committee
Johannesburg Health District
Date: 31st May 2021

Mrs M.L Morewane
Chief Director
Johannesburg Health District
Date: 31/05/2021

1

Appendix V: **Research approval**

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

Research Committee of
Johannesburg Health District

Enquiries: Ms. Busisiwe Sikhosana
Tel: 011 694 3909
Email :Busisiwe.Sikhosana@gauteng.gov.za
Hillbrow CHC: Administration Building,
Cnr Smith Str. & Klein Street
Private Bag X21, Johannesburg,
South Africa, 2017

31st May 2021

180 Sunnyside Road
Lyndhurst
Lyndhurst 2192
2192

Email: 69194610@mylifeunisa.ac.za

Dear: Ms Ntsibeng Mukwena

TITLE: ***Readiness assessment for the implementation of the National Health Insurance scheme at a hospital in Johannesburg.***

DRC Ref: 2021-02-021

NHRD Ref no: GP_202102_059

OFFICIAL APPROVAL

The Johannesburg Health District Research Committee (DRC) has reviewed your application. This letter serves as approval to access the Districts Health facilities (mentioned below) for the above research.

The following conditions must be observed:

- The facilities in which the research will be conducted are: EDENVALE HOSPITAL
- These facilities will be visited from: 31/05/2021 to 31/05/2022
- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit an annual progress report to the District Research Committee.
- Your supervisor and the University of South Africa will ensure that these reports are being submitted timeously to the District Research Committee.

- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.
- You will liaise with the manager/s before initiating the study.

Contact	Sub District	Sub District Manager/ Area Manager	Contact No.	Cell phone
	ABCEF	Ms Lombuso Matlala	011 440 1259	082 307 0267
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	CoJ C	Mr Tebogo Motsepe	011 761 0200	084 655 5420
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	CoJ E	Mr Vusi Mazibuko	011 582 1504	082 464 9547
	CoJ F	Mr M Monyamane	011 681 8130	082 467 9423
	CoJ G	Ms Olga Kruger	011 211 8936	083 286 0388
X	Edenvale	Mr Z G Zitha	011 321 6228	082 749 3123

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above. Please feel free to contact us, if you have any further queries.

On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

Prof S. Moosa
Chairperson: District Research Committee
Johannesburg Health District
Date: 31st May 2021

Mrs M.L Morewane
Chief Director
Johannesburg Health District
Date: 31/05/2021

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Appendix VI: **PROOF-READER'S LETTER**

P.O. box 885
HOUGHTON
2041
meyer.fe576@gmail.com

April 19th, 2022

ENGLISH PROOF-READING/EDITING

To Whom It May Concern

The journal article entitled, 'A retrospective audit on adherence to the Standard Treatment Guidelines in managing patients with hypertension at Chiawelo Community Health Centre, Gauteng, South Africa' to be submitted by Dr N. DAWDUTH et al has been proof-read and edited for proper English language, syntax, grammar, punctuation, British/SA spelling and overall style by F.E. MEYER. As requested, document formatting was applied to the journal article according to the guidelines of African Journal of Primary Healthcare and Family Medicine (AOSIS) at https://phcfm.org/index.php/phcfm/pages/view/submission-guidelines#part_1. The 37 references were checked according to the Vancouver referencing style as per the journal's author guidelines. The research content and/or the authors' intentions were not altered during the process.

Blue highlighting will require the corresponding author's attention. The date on the footnote on this page corresponds with that of the attached proof-read and edited sections of the journal article. Any further proof-reading or editing required by the author(s), due to changes or amendments to this journal article will be accompanied by an updated covering page and will replace this covering page.

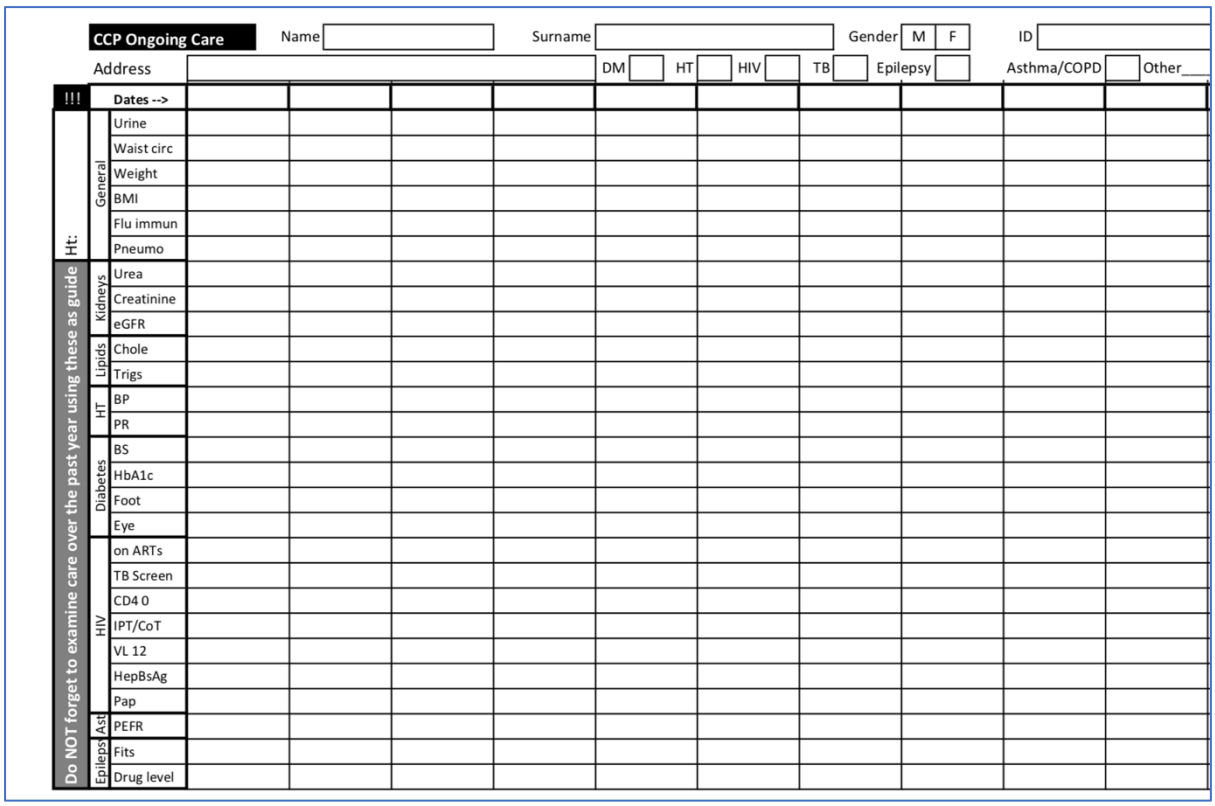
F.E. Meyer

F.E. MEYER
B.A. (UNISA)

Footnote: Proof reader's/Editor's covering page

Edited journal article ***2022/04/19*** ***DAWD/03***

Appendix VII: **Chronic care sheet at CCP**



CCP Ongoing Care Name ____ Surname ____ Gender M F ID ____

Address ____ DM ☐ HT ☐ HIV ☐ TB ☐ Epilepsy ☐ Asthma/COPD ☐ Other___

!!!		Dates -->										
Ht:	General	Urine										
		Waist circ										
		Weight										
		BMI										
		Flu immun										
		Pneumo										
Do NOT forget to examine care over the past year using these as guide	Kidneys	Urea										
		Creatinine										
		eGFR										
	Lipids	Chole										
		Trigs										
	HT	BP										
		PR										
	Diabetes	BS										
		HbA1c										
		Foot										
		Eye										
	HIV	on ARTs										
		TB Screen										
		CD4 0										
		IPT/CoT										
		VL 12										
		HepBsAg										
		Pap										
	Ast	PEFR										
	Epileps	Fits										
		Drug level										

Appendix VIII: **Turnitin Report**

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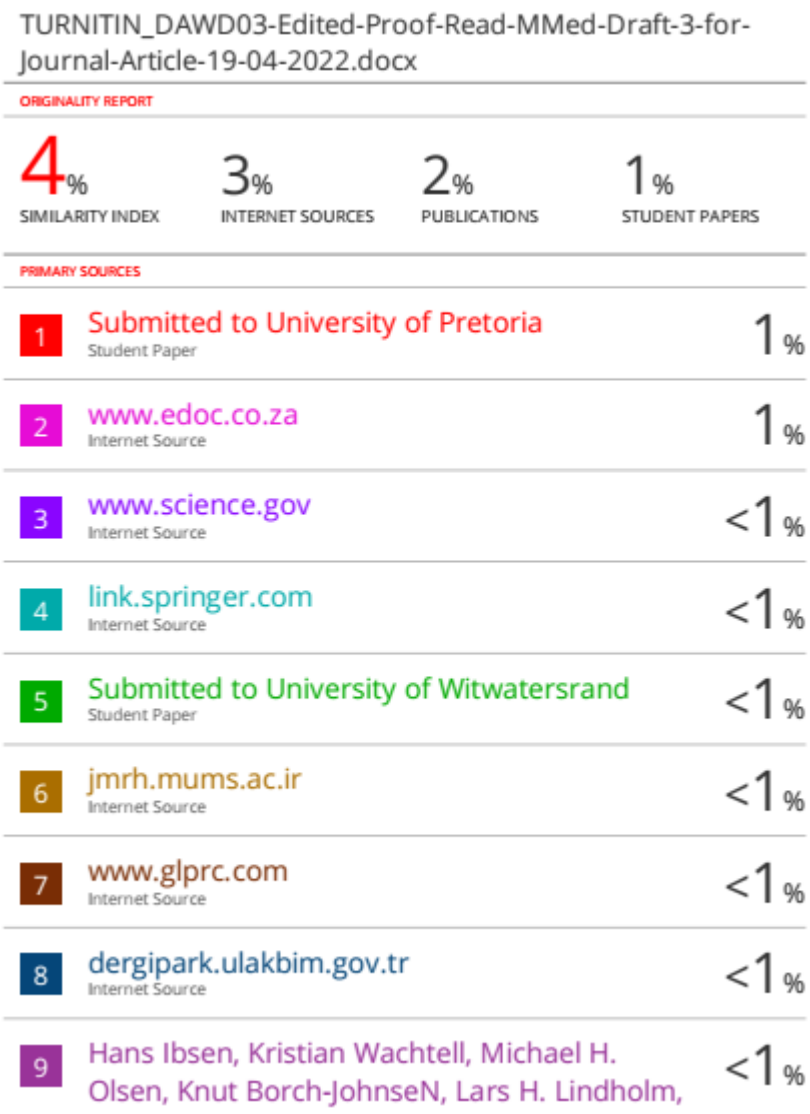
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Abstract:

Keywords:

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