

RESEARCH ASSIGNMENT

In partial fulfilment of the MMed (Fam Med) degree at Stellenbosch University

PROJECT TITLE

Improving the quality of hypertension care at Cloetesville Community Day Centre (CDC): A quality improvement cycle

STUDENT:

Dr. Gavin Hendricks
Family Medicine Registrar



SUPERVISOR

Prof Bob Mash

Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work that I have not previously submitted; in its entirety or in part, at any university for a degree.

GD Hendricks

March 2015



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY
jou kennisvennoot • your knowledge partner

"Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that ethical approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: S.13/04/77.....)

Date: 25/11/15

Abstract

Background: Hypertension is one of the most common chronic diseases worldwide and is estimated to contribute 9% of all deaths in South Africa, where it is also the commonest condition seen in ambulatory primary care. Despite advances in treatment of this disease and clear guidelines, quality of care is still lacking.

Aim: To improve the quality of hypertension care by means of a Quality Improvement Cycle.

Setting: Cloetesville Community Day Centre, Stellenbosch, Western Cape

Methods: Two hundred folders were randomly selected and audited. Following this, interventions to improve clinical practice included training of nursing staff on taking blood pressure measurements accurately, teaching sessions on the latest evidence based hypertension guidelines and promoting standardised quality of care. A re audit was done one year later and the results compared.

Results: Fifty nine per cent were women with a mean age of 58 years. In both audits all of the structural target standards were met. During the re-audit only 3/12 process target standards were met, but there was a significant improvement ($p < 0.05$) in 9/12 criteria. Blood pressure control was achieved in 61% of patients showing a slight improvement from the baseline audit of 57%.

Conclusion: The quality improvement cycle demonstrated significant improvements in the process and outcome of care following relatively simple interventions and changes to clinical practice. It is recommended that the quality improvement process should continue with new interventions, be expanded to other health centres in this sub district and beyond and to other chronic diseases.

Introduction

Hypertension is one of the most common chronic diseases worldwide affecting about one billion people and is the commonest cardiovascular disease.¹ Hypertension was the foremost cause of death worldwide in 2008 and responsible for 14% of global mortality or about 7.5 million deaths.² The importance of hypertension was recognised by the World Health Organization (WHO) when they dedicated the 2013 World Health Day to hypertension.¹

The number of deaths attributable to hypertension is higher in low- (2.0 million) and middle-income countries (4.2 million), when compared to high-income countries (1.4 million), highlighting the higher burden in poorer regions. In Sub-Saharan Africa 25% of under-60 year mortality is attributed to hypertension, compared to only 7% in high-income countries.² Hypertension therefore is a major burden of disease in developed as well as developing countries like South Africa (SA), which is already burdened by tuberculosis and HIV.^{3, 4, 5, 6}

In South Africa hypertension is the leading reason to attend primary care and the most common diagnosis (as HIV and TB are treated in separate vertical programmes).⁷ In South Africa hypertension is also one of the leading causes of death, causing 9% of all deaths.⁸ An estimated 53 men and 78 women die in South Africa each day from the impact of hypertension.² The Medical Research Council (MRC) estimates that more than 6.3 million South Africans have blood pressure higher than 140/90 mm Hg and more than 3.2 million have blood pressure higher than 160/95 mm Hg, a level that is unacceptably high.⁹

In the Western Cape chronic diseases are a growing problem and currently cause the largest proportion of all deaths.¹⁰ Hypertension is the sixth leading cause of premature death in the Western Cape and one of the top ten causes of death in Stellenbosch, the setting for this study.¹⁰

It is estimated that the majority of cases of hypertension go undiagnosed and therefore untreated.³ Furthermore those patients treated for hypertension are often poorly controlled. This leads to a high complication rate with serious complications such as coronary artery disease (CAD), cardiac failure, chronic renal failure (CRF), cerebrovascular disease (CVAs), peripheral vascular disease and retinopathy.⁷ Studies have shown that high blood pressure (BP) accounts for 66% of CVAs and almost 50% of CAD.^{8, 11}

Hypertension is also ranked as the third highest cause of Disability-Adjusted Life Years globally.^{12, 13} Such impairment leads to a decrease in productivity and income, which has implications for maintaining poverty and inequality. It also has major financial implications in a country like South Africa where it is estimated that hypertension constituted 7.5% of the total health expenditure in recent years, which amounts to over 5 billion rand annually.^{14, 15, 16, 17}

Therefore the diagnosis and effective management of blood pressure is crucial. Along with pharmacological interventions, and irrespective of the level of hypertension, BP reduction by non-pharmacological means is equally important and always preferable.

Interventions that have proven effective include weight loss, modification of eating habits with increased fruit and vegetable and decreased saturated and total fat intake, reductions in salt and alcohol consumption, and increases in physical activity.^{12, 18}

Non pharmacological measures as well as medication can contribute to systolic blood pressure reduction. For example the Dietary Approaches to Stop Hypertension (DASH) low sodium diet reduces the SBP by 2-8 mmHg, and weight reduction of 10Kg can contribute to a reduction of 5-20mmHg.¹⁹ In South Africa obesity is associated with poorer control and interventions targeting diet and physical activity should be given the highest possible priority.²⁰

Furthermore there is evidence that treatment to specific targets can reduce morbidity and mortality.^{15, 19} Antihypertensive therapy when optimally prescribed is amongst the most effective means for lowering BP and is associated with a marked reduction in CVD morbidity and mortality related to stroke, heart attack, heart failure, and chronic kidney disease.²¹ In the short term, the most effective strategy to reduce the burden of hypertension is through use of simple medication.²² A reduction of 5-6 mmHg in diastolic pressure has shown to reduce the incidence of stroke by 40%, coronary events by 15% and heart failure by 50%.¹⁵

In South Africa, however, only 21% of men and 36% of women with hypertension are taking medication to reduce their blood pressure, while only 10% of men and 18% of women have their blood pressure levels reduced to the target that will minimise the risk to their hearts, brain and kidneys.⁹

Although there is a problem with under recognition and under treatment of hypertension in South Africa, there may also be a risk of inappropriate diagnosis (based on single poorly standardised readings) and over treatment of mild hypertension. A recent meta-analysis looking at the pharmacotherapy for mild hypertension (SBP 140-159mmHg or DBP 90-99mmHg) found that pharmacologic treatment of mild hypertension for up to five years does not reduce coronary events, stroke, or mortality compared with placebo.²³

It may therefore be better to focus on those with moderate-severe hypertension and a high overall cardiovascular disease risk score. Hypertension should not be seen in isolation from a person's overall CVD risk and tools have recently been developed in South Africa to quantify the 5-year risk of a cardiovascular event (based on a person's age, gender, blood pressure, smoking status, BMI and diagnosis of diabetes). In this approach hypertension is seen as a risk factor for cardiovascular disease, rather than a disease in itself. The early detection, treatment and control of hypertension are then central to the management of cardiovascular disease risk.²¹ Importantly also is that a systemic approach to total CVD risk estimation seems to result in better risk factor and in this case BP control.²⁴

Other aspects to keep in mind in CVD risk stratification and management include low dose aspirin (75 mg/day), which is recommended for secondary prevention of ischaemic heart disease and for primary prevention, in people over the age of 50 who have a 10 year risk of cardiovascular disease of $\geq 20\%$.²⁵ Statins are recommended for all people with high blood pressure complicated by cardiovascular disease, irrespective of baseline concentrations total cholesterol or low density lipoprotein (LDL)

cholesterol. Statins are also recommended for primary prevention in people with high blood pressure who have a 10 year risk of cardiovascular disease of $\geq 20\%$.²⁵

With a range of different treatment modalities available it is however important to note that there is a wide gap between the potential to control BP and the actual achievement of control. Barriers to optimal hypertension management include the healthcare service, the healthcare provider and the patient, indicating that a multifactorial approach is required to improve the outcome.¹⁸ It is clear from several systemic reviews that the answer to improving patient care for chronic diseases is in person centred management and not necessarily new therapies.²⁶ Hypertensive care may also be complicated by multi-morbidity and at least 40% of patients have another disease, typically diabetes, osteoarthritis, asthma or chronic obstructive pulmonary disease.²⁷ Such complexity is challenging for primary care nurses and also suggests a need to attend to more individualised goals in chronic care.^{27, 28}

Hypertension care is notoriously suboptimal as seen in the local Integrated Audit of Chronic Disease Management (IACDM), although slowly and gradually improving over time. Other local audits conducted over the past few years in the Cape Town area show that chronic disease care remains suboptimal.^{29, 30}

Studies have shown that quality improvement cycles (QIC) are an essential part of improving and maintaining an acceptable standard of care for chronic diseases.^{31, 32, 33} This has also been shown in audit of chronic diseases in our local setting.³⁴ In addition a meta-analysis of QICs for hypertension has shown a significant effect on hypertension control.³⁵

From my time working one day a week in the community day centre (CDC) it is clear that there are major shortcomings with regards to chronic care although this has never really been assessed. The guidelines are not followed and most patients seem to have uncontrolled blood pressure. There is also a need for better organisational systems in the facility and better communication between the CDC and the district hospital.

Although audits on hypertension care in the Western Cape have been done before, to the best knowledge of the researcher there has not been a study or QIC in this sub district. It is interesting to note that there are significant differences in quality of care for chronic diseases in health centres within the same province.³⁰ In 2009, the Provincial Government of the Western Cape (PGWC) developed the Adult Chronic Disease Management Policy which proposes regular clinical audits (using a specifically developed tool) to assess the quality of care delivered and the attainment of treatment goals.³⁶ The IACDM tool from the Department of Health in the Western Cape only examines 10 patient files per facility and does not always complete the cycle by reflecting on and changing clinical practice. Therefore this study will be more valid at the level of the facility and should have an impact on the local community and healthcare.

Aim

To improve the quality of hypertension care at Cloetesville Community Day Centre by means of a Quality Improvement Cycle.

Objectives

- To create target standards for hypertension care specific for Cloetesville Community Day Centre
- To perform a baseline audit of the quality of hypertension care
- To plan and implement change to improve the quality of hypertension care
- To re-evaluate the quality of care after the implemented changes.
- To make recommendations on hypertension care for the sub-district.

Methods

Study design

The WONCA Working Party on Quality in Family Medicine defines quality as “the best health outcomes that are possible, given available resources, and that are consistent with patient values and preferences”.³⁷ Medical Audit, also known as Clinical Audit and Quality Improvement (QI) Cycle, is the centre of the process of Continuous Quality Improvement (CQI). Quality of Care (QOC) is one of the pillars of Clinical Governance, the concept that refers to the accountability of a health care system for ensuring the correct standard of care provided to its patients.³⁸

The following definition of clinical (medical) audit is endorsed by the National Institute of Clinical Excellence (NICE), United Kingdom: “Clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Aspects of the structure, processes, and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated, changes are implemented at an individual, team, or service level and further monitoring is used to confirm improvement in healthcare delivery.”³⁹

The foreword of *Principles for Best Practice in Clinical Audit* (published by National Institute of Clinical Excellence, UK), provides an eloquent summary of the pivotal role of the medical audit:

“Clinical audit is at the heart of clinical governance.

- a) It provides the mechanisms for reviewing the quality of everyday care provided to patients with common conditions like hypertension, asthma or diabetes.

- b) It builds on a long history of doctors, nurses and other healthcare professionals reviewing case notes and seeking ways to serve their patients better.
- c) It addresses quality issues systematically and explicitly, providing reliable information.³⁹
- d) It can confirm the quality of clinical services and highlight the need for improvement.”

For clinical governance to be successful, health organisations must demonstrate: following features:

- a) An open and participative culture
- b) A commitment to quality that is shared by staff and managers
- c) A comprehensive programme of quality improvement systems.⁴⁰

With this in mind a quality improvement cycle took place between October 2012 and November 2013 following the usual steps listed below and shown in Figure 1 and also *Appendix 1*:

- Involving the practice/quality assurance team
- Agree criteria and set target standards
- Collecting and analyzing the relevant data
- Evaluating the information and planning change
- Implementing change
- Re audit

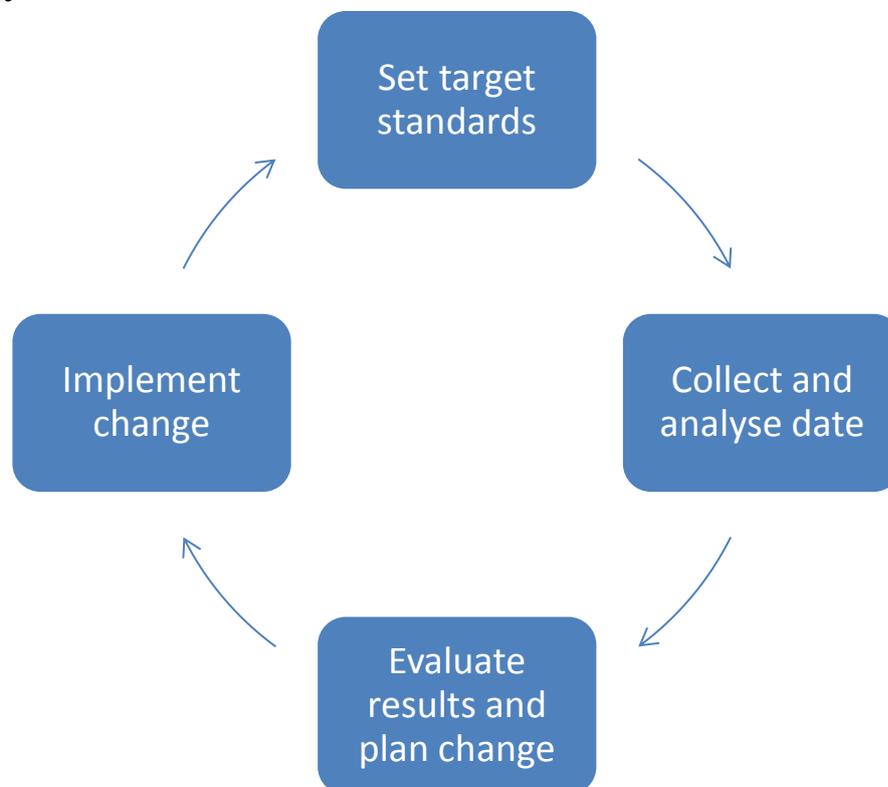


Figure 1: Quality improvement cycle

Setting

The QIC took place at Cloeteville Community Day Centre (CDC) in the Stellenbosch area of the Cape Winelands. Stellenbosch is a town in the Western Cape Province of South Africa. The Stellenbosch sub district as a whole has a population of approximately 156,000 according to Census data 2011⁴¹ although the local municipality estimates the current population to be 180,000 because many informal settlements were uncounted. The Cloeteville area comprises of about 25,000 people. The Stellenbosch sub-district has 10 community health centres with 6 mobile clinics and has Stellenbosch Hospital as its district hospital. On average the Cloeteville CDC sees 3,300 patients per month, but it is currently unclear how many of the headcount is for chronic disease and hypertension.

Cloeteville and its surrounding areas is a low to middle income area with a majority of Afrikaans speaking coloured people. The Cloeteville CDC has one permanent medical doctor since late 2012. Before 2012 there was no permanent medical doctor, but only visiting doctors who did sessions. It is clear from my time at this facility that before 2013 the chronic disease programme was not well done and the performance was substandard. The facility has an operational manager, 5 clinical nurse practitioners, 1 staff nurse, 1 assistant nurse and 3 clerks in total. It has a small pharmacy department within the facility. The facility also has access to a physiotherapist, occupational therapist, and dietician once a month as well as community based services. There is no health promoter currently in the facility. The Cloeteville CDC has a chronic disease champion or responsible person in charge that is responsible for the chronic care programme, but most of the nursing staff sees patients with chronic diseases, including hypertension, on a day to day basis. Currently stable or controlled hypertensive patients see the doctor annually and nursing staff twice a year.

Study population and sample size

The study population included patients with a diagnosis of hypertension who were 18 years or older and under the care of the Cloeteville CDC for a period of 6 months or more. Patients younger than 18 years, pregnant, less than 6 months on treatment or less than 6 months at the CDC were excluded.

The sample size needed for this study was calculated with the assistance of the Centre for Statistical Consultation. The required sample size was calculated according to a power calculation where the same sample of patients was compared before and after the change to clinical practice. A sample size of 200 patients was required to detect a 10% improvement in control of blood pressure (% of patients with systolic blood pressure <140) with a power of more than 90% and with a p value of 0.05. The calculation was based on blood pressure readings obtained during another study on a similar group of patients attending local health centres.

This study randomly selected 200 patient records of hypertensive patients at the onset of the study and then audited those specific patient records at baseline and after the implemented interventions 1-year later. The staff was not aware of which patients were included in the study. Six patients died during the study year before the second audit 2014. Therefore the sample size with paired data was reduced to 194. The sample however appeared to be adequately powered to detect significant differences in the re-audit.

Involving the practice team

Quality improvement is usually a team effort as ownership of the process by the people involved is more likely to lead to change in practice than when it is perceived as criticism by an outside researcher or individual. The researcher met with all staff members involved with chronic care at Cloetesville CDC. We formed an audit team that consisted of medical practitioners (the researcher and another doctor who works at clinic), the operational manager, nursing staff and pharmacist. The researcher practises once a week in the facility and has become involved in the clinical governance and quality assurance activities.

Development of target standards (criteria and performance levels)

The audit team formulated and agreed upon the criteria and performance levels to develop target standards. The team referred to the evidence based guidelines on hypertension developed by the Southern African Hypertension Society.¹⁵ The team also looked at the integrated audit of chronic disease management (IACDM) criteria⁴² (see *Appendix 2 and 3*) and audits performed in similar settings³⁰ and their own experience, when setting criteria and performance levels. The criteria were divided into three groups:

- Structural criteria e.g. infrastructure, equipment, medication, human resources
- Process criteria e.g. activities conducted during patient visits
- Patient outcome criteria e.g. control of BP

The structural criteria

The audit team decided on the following structural criteria:

- There is a functional and calibrated sphygmomanometer (BP machine) in each of the consultation and observation rooms.
- There is at least one small, medium and obese blood pressure cuff size available for the facility.
- There is one functional weighing scale
- There is one functional height scale
- There are evidence based hypertension guidelines in the facility
- There are investigation request forms in each consultation room
- There are specimen tubes for blood tests in each consultation and procedure room.
- There is a functional ECG machine at the facility
- There are specimen bottles for urine to screen for proteinuria in the facility
- There is a literate and illiterate Snellen/visual acuity chart in the facility
- All doctors' rooms have an ophthalmoscope and there are two additional mobile sets in the facility.
- All pharmaceutical agents for BP control (two different types of diuretics agents, beta blocker, angiotensin converting enzyme inhibitor (ACE-I), calcium channel blocker and alpha blocker) available in the facility.
- Eye drops for dilatation of pupils available in the facility.
- BMI wheels/ charts in all observation rooms and consultation rooms.

- Glucometer with testing strips in all the observation rooms.

Process criteria

The selected process criteria are listed in Table 2. This study did not assess eye screening for hypertension as it was not seen as a key indicator of quality and the audit team were not convinced that this would have a major impact on the quality of care for hypertension for this facility.

This audit also looked for evidence of any ECG performed and not just for the last year. The team were aware of the poor adherence to the guidelines, which requires annual ECGs or clinical assessment of left ventricular hypertrophy (LVH). However it was decided by the audit team to only perform an ECG in patients who were symptomatic since there was uncertainty as to whether it would make a major difference to overall care in a staff and time limited setting. The compromise was to aim for at least one baseline ECG for each hypertensive patient in the file. The doctors were also encouraged to assess for LVH clinically.

Lifestyle counselling for this study included any counselling by a health care worker in the facility on smoking cessation, dietary advice, alcohol use, physical activity, medication adherence or understanding hypertension.

Outcomes criteria

The outcome criteria are listed in Table 3. The average BP was recorded and was defined as $BP < 140/90$ or $< 130/80$ in those with DM, CVD, CRF. The average of the BP reading/s over a one year period was taken. Significant proteinuria for this study was defined as $>1+$ protein in the urine.

Target organ damage (TOD) noted in patient files was recorded from the problem list, previous notes and referral letters. This included IHD, CRF, CVA, LVH, retinopathy, and admissions for malignant hypertension.

Resistant BP for this study was defined as a hypertensive patient being on 4 or more antihypertensive drugs on maximum or full dosage and with the BP still uncontrolled.

Data collection

Administrative staff was instructed to randomly select 200 hypertensive patient files off the shelves for inclusion in the audit. This was necessary as there was no disease register to identify the patients, although patient files were colour coded for hypertension.

The first data collection occurred in November 2013. Data from the previous year in the medical records were captured onto an electronic data collection sheet in Microsoft Excel designed by the researcher. Patients who moved, were not seen for more than one year or transferred out were not considered and these files were discarded and new patient records were selected.

Structural criteria were assessed by inspection and reported as present or not present. Performance levels required total compliance with the criteria. The data for the structural criteria was obtained by two individuals using a checklist; one was the

researcher from the practice team and the other a doctor working at Stellenbosch hospital and therefore not involved in the CDC.

Data analysis

Descriptive statistics were used to report on the results at baseline and after 1-year using frequencies, percentages and 95% confidence intervals. Binary variables were summarized in frequency tables. McNemar's chi-squared test was used to compare paired data and statistical significance was set at $p < 0.05$. Stata, release 13 (StataCorp 2007) was used for data analysis.

Evaluating the information and planning change

The results of the audit were presented to the audit team for discussion and compared to the target standards. We then discussed, interpreted and decided on necessary changes to clinical practice.

Implementing change

The agreed changes to clinical practice and educational activities were implemented by the audit team over the study period with the help of the staff involved in chronic care.

The re-audit

Data collection, data analysis and interpretation were repeated 12 months after the initial audit on the same 200 patient records. This period allowed time for the changes to be implemented. The results from the two audits were compared to determine if there was a statistically significant improvement ($p < 0.05$) in each criteria and how many of the target standards were met before and after the intervention.

Ethical considerations

The dignity, human rights, safety and wellbeing of participants were assured. An approval to conduct the present study was obtained from the Health Research Ethics Committee of Stellenbosch University (S13/04/77) and Director of the Cape Wine lands district. This was a retrospective clinical audit therefore a "waiver of informed consent" was requested from the Stellenbosch Ethics Committee. The research aimed to improve patient outcomes and health in Cloeteville and its surrounding areas and was directly beneficial to the hypertensive patients attending the health centre. The risk of this study was negligible since it sought to improve adherence to current best practice and policy as defined in the accepted national guidelines for hypertension care in primary care. This study therefore had a favourable risk-benefit ratio. The information was collected by only using file numbers on the data schedule to protect patient confidentiality. The final results reflected general trends in hypertension care and did not refer to any particular individual.

Results

Study population

Out of the baseline sample of 200 participants, 119(59.0%) were female and 81(41.0%) were male with an average age of 58 years. Six patients died during the study period and could not be followed up, giving a death rate of 3.0%. It is important to note that 95 (48.0%) of the study population had co-morbid diabetes mellitus.

Comparing actual performance to the target standards

The results of the baseline and second audit for the structural criteria are given in Table 1. Out of the 14 criteria all met the target at baseline and in the second audit, which implies that the health centre had sufficient resources to provide the desired quality of care.

Table 1: Results of the audit of structural criteria

Criteria	Target performance	Audit 2012-2013	Audit 2013-2014
Health centre has a weight scale	Yes	Yes	Yes
Health centre has a tape measure	Yes	Yes	Yes
Health centre has a height measurement	Yes	Yes	Yes
BP monitors with three cuff sizes	Yes	Yes	Yes
Health centre has equipment for urinalysis	Yes	Yes	Yes
Health centre has snellen chart	Yes	Yes	Yes
Ophthalmoscope in each doctor's room	Yes	Yes	Yes
Each consultation room has BMI wheels/charts	Yes	Yes	Yes
Glucometer sticks	Yes	Yes	Yes
Eye drops for dilatation of fundi	Yes	Yes	Yes
Anti-hypertensive	Yes	Yes	Yes

drugs in health centre			
Health centre has hypertension guidelines	Yes	Yes	Yes
ECG machine in health centre	Yes	Yes	Yes
*Equipment for taking blood samples in health centre	Yes	Yes	Yes

*Includes laboratory forms, blood tubes, transport etc.

Table 2 shows the results of the process criteria. Although only 3 out of the 12 target standards were met on follow up, there was a significant improvement in performance in 9 out of 12 criteria. There was also a significant decrease in performance in 2 out of 12 as the percentage of patients with observation of weight and blood pressure decreased.

Table 2: Results of the audit of the process criteria

Criteria	Target %	Audit 2012-2013 N=200 n (%)	Audit 2013-2014 N=196 n (%)	Change in % (95% CI)	P value
Check sheet in each file	95	177 (90.3)	193 (98.5)	8.1 (3.8;12.5)	<0.001
Check sheet updated annually	90	131 (68.8)	171 (87.2)	20.4 (14.3;26.6)	<0.001
Weight during year	95	192 (97.9)	176 (89.8)	-8.0 (-12.5;-3.8)	<0.001
BMI recorded annually	80	120 (61.2)	157 (80.1)	18.0 (12.9;24.9)	<0.001
BP check at least twice a year	100	162 (82.6)	154 (78.6)	-4.0 (-7.4;-0.8)	0.007
Urinalysis at least once a year	100	160 (81.6)	181 (92.3)	10.0 (5.9;15.6)	<0.001
Creatinine annually	95	111 (56.6)	180 (91.8)	35.2 (28.0;42.4)	<0.001
Total cholesterol annually	90	106 (54)	178 (91)	36.7 (29.5;44.0)	<0.001
Counselling on lifestyle chances	90	87 (44.3)	196 (86.2)	41.8 (34.3;49.4)	<0.001

ECG at least once recorded in file	30	26 (13.3)	31 (15.8)	2.5 (-0.2;5.3)	0.063
Dietician referral at least once in file	30	14 (7.1)	20.0 (10.2)	3.0 (0.1;6.0)	0.031
Random glucose done annually	90	138 (70.4)	175 (89.2)	18.8 (12.7;25.1)	<0.001

Table 3 shows the results for the outcome criteria. Only 5 out of the 10 outcomes achieved the target standard at baseline and only 4 out of 10 on follow up. Although not significantly different the % of patients identified with TOD increased above the desired performance level at follow up, leading to the fall in number of criteria achieving the target. This could of course represent a better process of care, with better recognition of TOD, rather than an actual increase in the prevalence of TOD.

The percentage of patients controlled increased from 58% to 61%, which was statistically significant, although only a modest improvement. Two other outcomes improved significantly, namely the percentage of patients with a controlled total cholesterol and creatinine, whereas the percentage of patients with obesity significantly increased.

Table 3: Results of the audit of outcome criteria

Criteria	Target %	Audit 2012-2013 N=200 n (%)	Audit 2013-2014 N=196 n (%)	Change in % (95% CI)	P values
Average BP < 140/90 or < 130/80mmHg in DM,CVD,CRF	90	113 (57.6)	119 (60.7)	3.0 (0.1;6.0)	0.03
Proven target organ damage/hypertension related complications in folder	<15	29 (14.7)	42 (21.4)	6.6 (-2.0;15.3)	0.11
Cholesterol <5 mmol/L	80	41 (20.9)	90 (45.9)	25 (18.4;31.6)	<0.001
Creatinine <120mmol/L	90	100 (51.0)	167 (85.2)	34.0 (27.0;41.3)	<0.001
Resistant BP	<20	8.0 (4.0)	14 (7.1)	3 (-2.1;8.2)	0.20
BMI <30kg/m²	<40	72 (60.0)	62 (51.6)	-8.3(-14.1;-2.6)	0.002
Proteinuria	<10	29 (14.8)	19 (9.7)	-5.1(-12.5;2.3)	0.15
Prevalence of	<10	21	28	3.5(-2.9;9.9)	0.24

hypertensive heart disease		(10.5)	(14.0)		
Prevalence of chronic kidney disease	<5	9.0 (4.5)	8.0 (4.0)	-0.5(-4.8;3.8)	0.79
Prevalence of strokes	<5	8.0 (4.0)	10 (5.0)	1(-3.7;5.7)	0.63

Note that the BMI<30 was calculated with a total out of 120 since only 120 BMI measurements were done.

Changes to clinical practice

Interventions included patient flow and procedural aspects of care and educational presentations, which focused on the problem areas identified by the first audit and the audit team's experience.

In terms of patient flow the team looked at making changes to the appointment system as it was not effective. Appointments with the doctor were rather controlled on a computer booking programme and dates for the pharmacy were given on the patient's booking card. The technique of how BPs measurements was addressed in the audit since as mentioned before that accurate BP measurement is important since as noted earlier BP measurements when high has a significant risk for cardiovascular disease.

Training activities focused on the procedure for measuring blood pressure using a standardised protocol as stipulated in *Appendix 4*.

Educational presentations focused on the evidence based hypertension guidelines and promoting standards of care. Teaching was done by the researcher by means of small group sessions and occurred twice during the year.

The researcher reinforced use of the chronic disease management (CDM) flow sheet that had previously been developed by the province as shown in *Appendix 5*. The flow sheet records the process of care on one sheet of paper and therefore improves continuity of information and prompts the healthcare worker to perform any missing activities, such as routine screening tests. In the past there were a flow sheet for every chronic disease which meant more paper work and staff members was less likely to use the tool. The new flow sheet was modified to have one sheet for all chronic diseases, which was well received. There was a group discussion with the staff on recording what gets done, note keeping and the importance of documenting chronic disease management for quality care.

The researcher also had a small group discussion with the staff regarding counselling on lifestyle modification looking at diet, exercise, smoking and alcohol abuse. The documentation of counselling was also reinforced.

Although the structural aspects where in place the instruments such as the BP machines and weight scales were calibrated and requisition forms kept on record as proof.

Discussion

Summary of key findings

The structural criteria met all the target standards and this is mostly likely due to the IACDM audit having been conducted annually over the last few years. The health centre therefore had all the essential resources to offer a high quality of care. Overall the process of care improved in terms of better recording of information and increased monitoring of patients for complications (urinalysis, creatinine, and total cholesterol), risk factors (BMI) and co-morbidity (diabetes). It was encouraging seeing an increase in patient education and counselling activities. The percentage of patients achieving a controlled BP was 61% and this is just slightly higher than the results of the IACDM for the whole province at 56%.⁴²

The slight improvement in blood pressure control in this study is supported by other studies where improving the technical quality of care was an effective strategy for improving blood pressure control and was achieved by relatively simple interventions within quality improvement cycles.⁴³ Key changes to clinical practice that appeared to be responsible for these improvements were improvement in the patient flow in the facility, teaching on hypertension guidelines and the technique of BP measurements.

Although the recording of weight decreased, the calculation of BMI, which is a more accurate measurement of overweight and obesity, increased. The recording of ECGs was not given much priority or attention and there was little attempt made to clinically identify LVH. Although referrals to the dietician increased slightly the dietician was more focused on people with diabetes and was also absent for a large part of the year. The measurement of creatinine and cholesterol improved together as blood was taken for both at the same time and the need to do this was reinforced in teaching. There may have been some reluctance to repeat these tests annually when they had previously been normal due to the cost and questions regarding the value of repeated measurements.

This facility also started a central dispensing units (CDU)/ pre pack system for chronic diseases. This CDU were introduced in April 2014 of the study year and is currently working well. Another change in the system of care for the facility was the switching to the electronic scripts (JAC online system) for the prescription of patients, which started in August 2014 of the study year. All these changes to the system were well received and should have led to better patient care, less time spent in the clinics and more time for medical practitioners to consult patients. It is however the researchers view that these changes to practice did not have a major impact on the results of this study and quality of care for hypertension since they were introduced very late in the study year. However it is expected to enhance quality of care in the future.

The audit also found that 48% of hypertensive patients had co-morbid DM, which is higher than the 18% reported nationally in primary care.²⁷ This higher figure may be due to better recognition of diabetes in our setting, but also to higher prevalence rates in this peri-urban community.⁴⁴

Discussion of the findings in relation to literature and policy

The benefit of having the flow sheet is that it is the first thing you see when opening the file and makes you actively assess the patient's progress.^{45, 46} Counselling on diet, exercise, alcohol abuse and smoking was better documented when the flow sheets was used. In general there was better recording of and access to information when the flow sheet was used.

This audit illustrates the need for better lifestyle and behaviour change counselling when looking at the high BMI, DM status and number of people with high total cholesterol levels. Although patient education and counselling improved there is uncertainty with regards to the quality and type of counselling on behaviour change that was offered. The Seventh report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure (JNC7) suggests that health care providers give insufficient attention to health education. Recent local studies have shown that primary care providers are poorly trained in counselling, experience many barriers and have limited knowledge of lifestyle modification.⁴⁷ Major reviews of the research on lifestyle interventions show that brief behaviour change counselling by health care providers can be effective in changing non communicable diseases (NCD) risk behaviours and improving self-management among patients with existing chronic conditions.^{48, 49} The Chronic Disease Initiative for Africa has recommended an approach that provides structured and comprehensive group education, that is supported by patient education materials and ad hoc brief behaviour change counselling from primary care providers. Despite the improved frequency of counselling in this study the staff should look at assessing the quality of such counselling and the need for a more comprehensive approach.

The South African government's recent national strategic plan to control the NCD epidemic (Department of National Health, 2012) places a strong emphasis on the need to improve the detection, early intervention and management of NCD lifestyle related risk factors, particularly at the level of primary health care. This includes a focus on strengthening the capacity of health service staff to provide brief counselling on the main lifestyle risk factors for NCDs.

The reasons for failing to improve BP control should be further explored and addressed. The overall control of BP, which was still only 61% in this study, does not necessarily only reflect poor health care, but also patient factors such as non-adherence, low education, socio economic factors and possibly secondary causes for hypertension. It is however important to look at the interaction of patients with the facility and health workers. Other reasons for non-adherence to consider are side effects that discourage patients from taking medication; poor understanding of the condition or medication so that, for example, patients only take medication when they experience symptoms attributed to hypertension; lack of support by family members; or difficulty in obtaining antihypertensive medication.⁵⁰ Many of these factors are modifiable by healthcare that is more patient-centred with adequate education and counselling. These issues, which are more difficult to measure than technical tasks, should maybe be assessed more in future audits.

Cardiovascular risk factors, such as blood cholesterol, were still uncontrolled with less than 50% of the study group achieving the target. This is on the background of many patients being on statins or lipid lowering drugs. This indicates a further need for patient education and counselling to enhance behaviour change and adherence.

Patients with resistant hypertension should be referred to a secondary level facility according to the SA hypertension guidelines. However this is not always possible in this setting with scarce resources and over loaded specialist services. Many of these patients though actually have problems with understanding, motivation, adherence, side effects and other factors which do not necessarily need a referral, but more patient-centred care, education and counselling.

Some of the criteria measured were similar in both audits such as weight done and documentation of counselling. There was a clear improvement in annual bloods done with Creatinine and total cholesterol improving from 70% and 60% to 92% and 91% respectively. There was some improvement in the total cholesterol <5 with unchanged results for Creatinine. There was an improvement in BMI measured and documented but it's important to note that the IACDM looked at BMI <25 with this study looking at measurements <30 kg/m².

The random glucose done for the 2012-2013 IACDM was 40% with this study showing results of 90%, a significant improvement since as mentioned previously this has important health implications. Co-morbid DM was not measured with the IACDM. The IACDM had a BP control of 60% which is unchanged for this study.

Target organ damage, urinalysis and valuable CDM clinic record flow sheet was not assessed in the IACDM. This could be considered and possibly added for the IACDM audit.

Limitations

It is important to note that although lifestyle changes such as counselling on behaviour change might have been done if it is not recorded then this will not reflect in the audit. Also the assessment of the amount of target organ damage and hospital admissions for hypertension related complications may potentially not be as accurate they might not have been recorded.

A significant change that occurred at the time of the start of the initial audit in 2013 was the transfer out of patients to other facilities who were not from the drainage area of Cloeteville. Cloeteville CDC used to drain a larger area and was responsible for several other programmes in this sub district. The transfer out of patient to clinics nearer to them would have impacted on the operations for this facility. The researcher is of the opinion that this did not significantly influence the findings of this study. These patients might possibly even have better hypertension care if they attend a medical facility closer to home since it would be easier to attend clinic and likely lead to better continuity of care.

Several of the patient outcomes were also dependent on the process of care and were difficult to measure if few patients had the test or may appear to have deteriorated when improved process of care led to better recognition of the problem.

Recommendations

This QIC gave us a real sense of the quality of care for this health centre. There were some aspects addressed in this cycle that could be further explored and some areas that was not included in this cycle that should be looked at in future cycles.

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skilful execution; it represents the wise choice of many alternatives.”–William A Foster.⁵¹ Importantly, this audit forms part of a continuous process which necessitates the commitment and buy-in of key stakeholders: the public/patients, the clinical personnel and the health system management. This study recommends patient representation in the audit team with future cycles.

Primary healthcare (PHC) is the foundation of SA healthcare with hypertension being one of the most common non communicable diseases (NCDs) which is mostly managed by nurses. Thus future training and guidelines should adequately address hypertension and the complexity inherent in this consultations.¹³ This includes being more patient-centred with skills in brief behaviour change counselling and assessment of overall CVD risk.⁵² Greater involvement of doctors in managing more complicated patients with multi morbidity should also be considered.

Although counselling for lifestyle changes improved there remains a further need for emphasising the non-pharmacological treatment modalities and exploration of the type and quality of counselling. The approach to patient education and counselling needs to be revisited. Such interventions involve measures at a macro level which create enabling environments for healthy lifestyles through policy and legislation, and interventions at an individual level which promote behaviour change. It is here, that health care providers have a vital role to play in encouraging and supporting their patients or clients to make and maintain healthier lifestyle choices.⁵³ This also requires a multidisciplinary approach with health promotion programmes, group education and adherence support programmes.

Better communication and co-ordination of care is needed between the health centre and the referral hospitals to ensure that investigations and management plans are shared and resources are not wasted through duplication. This could possibly be assessed with future cycles.

The concept of measuring and responding to the absolute CVD risk is another important aspect not fully evaluated in this study.

This assessment could lead to primary and secondary prevention of CVD, which in our setting would include a statin and aspirin. More emphasise and teaching on total CVD risk assessment and management should be considered with future cycles. A non-laboratory based CVD risk score for use in SA has been developed.⁵⁴

This study did not assess the prescription charts, drug book and drug choices. An important consideration and possible outcome to measure in future QIC could be assessing the amount of side effects to treatment. The researcher also picked up many improper and inappropriate prescriptions.

As discussed above future cycles should attempt to measure the quality of patient education and counselling and the capability of staff to deliver this.

Urine testing for proteinuria was done in most hypertension patients at the clinic but this audit gives no information on the clinical response to proteinuria. Angiotensin-converting enzyme (ACE) inhibitors and angiotensin-II receptor antagonists preferentially lower intra-glomerular pressure and reduce proteinuria. Ample evidence shows that these agents are more effective than other anti-hypertensive drugs in preventing the progression of kidney disease.⁵⁵ The same argument holds true for abnormal blood results, such as high cholesterol levels. Investigations are only useful if they lead to changes in the management plans that benefit patients. This concept has been called clinical inertia where a health worker acknowledges an abnormal result or uncontrolled BP, but fails to make changes that would lead to improvement of care. Clinical inertia has been shown to be a major contributor to poor BP control.⁵⁶ Clinical inertia should be measured and addressed in future cycles.

Conclusion

An audit team created target standards for structural, process and outcome criteria related to the quality of care for hypertension. A baseline audit revealed that the health centre had the essential resources needed to provide quality care. Despite this only one of the twelve process target standards were met at baseline and this increased to three criteria on follow up. Blood pressure control rose from 58% of patients at baseline to 61% at follow up. The audit team made changes to clinical practice that included improvements to the appointment system, more standardised BP measurement and teaching staff about the latest guidelines. Future audits should focus more on the quality of patient education and counselling, co-ordination of care with the referral hospitals, use of CVD risk scores, degree of clinical inertia, and rational prescribing.

It is recommended that the quality improvement process should continue with new interventions, be expanded to other health centres in this sub district and beyond and to other chronic conditions.

Acknowledgements

I would like to acknowledge and extend my gratitude to the following persons who have made the completion of this project possible:

1. First all to God for making everything possible.
2. To Prof Bob Mash. My supervisor for all his valuable suggestions and guidance.
3. To the audit team for making this project possible.
4. To the clinic staff for their support
5. Centre for Statistical Consultation (CSC), Department of Statistics and Actuarial Sciences, University of Stellenbosch

Competing interests

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

References

- 1 World Health Organization. World Health Report 2002: reducing risks, promoting healthy life style [document online]. c2002 [cited 2010 Mar 13]. Available from: <http://www.who.int/whr/2002/en/2002flierANG.pdf>
- 2 World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: World Health Organization;2009.
- 3 Ahmed T, Shidhani A, Bhageiva K, Rizvi S. An Audit of hypertension at University Health Centre in Oman. *Oman Med J* 2011 July 26(4):248-252
- 4 Steyn K. Hypertension in South Africa. *Chronic disease of lifestyle in South Africa since 1995-2005*. Chapter8:80-96
- 5 Thorogood M, Connor MD, Hunt Gland Tollman SM. Understanding and Managing hypertension in an African Sub District. A multidisciplinary approach. *Sund J Public Health suppl* 2007 Aug 69:52-59
- 6 There is a significant burden from hypertension in South Africa, J *Hypertens*. 2012 Nov; 30(11):2098-104. doi:10.1097/HJH.0b013e328357c018.
- 7 Rayner B. Hypertension: detection and management in South Africa. *Nephron ClinPract*.2010; 116:c269-c273.
- 8 Norman R, Gaziano T, Laubscher R, Steyn K, Bradshaw D. Estimating the burden of disease attributable to high blood pressure in South Africa in 2000. *S Afr Med J* August 2007, Vol. 97, No.8:692-698
- 9 Steyn K, Gaziano T, Bradshaw D, et al. Hypertension in South African adults: results from the Demographic and Health Report 1998. *J Hypertens* 2001; 19:1717-1725.
- 10 Groenewald P, Berteler M, Bradshaw D, Coetzee D, Cornelius K, Daniels J, Evans J, Jacobs C, Neethling I, Msemburi W, Matzopoulos R, Naledi T, Shand L, Thompson V, Vismer M. *Western Cape Mortality Profile 2010*. Cape Town: South African Medical Research Council, 2013. ISBN: 978-1-920618-11-7
- 11 Lawes CM, Van der Hoorn S, Law MR, Elliott P, MacMahon S, Rodgers A. High blood pressure. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors*. Geneva: World Health Organization, 2004:281-390.
- 12 Kearney PM, Whelton M, Reynolds K, et al. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005;355:217-223.

- 13 Mash B, Fairall L, Adejayan O, Ikpefan O, Kumari J, et al. (2012) A Morbidity Survey of South African Primary Care. PLoS ONE 7(3): e32358.doi:10.1371/journal.pone.0032358
- 14 Gaziano TA. Economic burden and the cost- effectiveness of treatment of cardiovascular disease in Africa. *Heart* 2008;94:140-144
- 15 Seedat YK, Rayner BL. South African Hypertension Guidelines 2011. *S Afr Med J* January 2012, Vol102, No1 (1):57-84
- 16 Pestana JAX, Steyn K, Leiman A, Hartzenberg GM. The direct and indirect costs of cardiovascular disease in South Africa. *S Afr Med J* 1996;86:679- 684
- 17 Dougherty J, McIntyre D, Bloom G. Value for money in South African health care: findings of a review of health expenditure and finance. *Cent Afr J Med* 1996;42:21-24.
- 18 Summary of the 2007 European Society of Hypertension (ESH) and European Society of Cardiology (ESC) guidelines for the management of arterial hypertension. *Vascular health and risk management*. 2007;3(6):783-95
- 19 Chobanian AV; Barkris G L; Black HR; Cushman WC; Green L A ;Izzo JL et al. The national high blood pressure education program coordinating committee.JNC7: complete report. Seventh report of the joint national committee on prevention, detection and treatment of high blood pressure. Available from www.nhlbi.nih.gov/guidelines/hypertension/(Accessed 11 May 2011)
- 20 Hasumi T, Jacobsen KH. Hypertension in South African adults: results of a nationwide survey.
- 21 World Health Organization. Global status report on non-communicable diseases 2010. Geneva: World Health Org; 2011
- 22 Lim S, Gaziano T, Gakidou E, et al. Prevention of cardiovascular disease in high-risk individuals in low and middle income countries: health effects and costs. *Lancet* 2007;370:2054-62.
- 23 Diao D, Wright JM, Cundiff DK, Gueyffier F. Pharmacotherapy for mild hypertension. *Cochrane Database Syst Rev*. 2012; (8):CD006742
- 24 Cooney MT, Dudina A, D'Agostino R, Graham IM. Cardiovascular risk-estimation systems in primary prevention: Do they differ? Do they make a difference? Can we see the future? *Circulation* 2010;122(3):300-310.
<http://dx.doi.org/10.1161/circulationaha.109.852756>
- 25 Joint British Societies' consensus recommendations for the prevention of cardiovascular disease (JBS3). *Heart* 2014; 100:ii 1-ii67 doi:10.1136/heartjnl-2014305693

- 26 Norris SL, Nichols PJ, Caspersen CJ, Glasgow RE, Engelgau MM, Jack L et al. The effectiveness of disease and case management for people with diabetes. A systemic review. *Am J Prev Med* 2002;22(4S):15- 29
- 27 Lalkhen, Hoosain; Mash, Robert. Multimorbidity in non-communicable diseases in South African primary healthcare. *South African Medical Journal*, [S.l.], v. 105, n. 2, p. 134-138, Jan. 2015.
- 28 De Maeseneer J, Boeckxstaens P. James Mackenzie Lecture 2011: Multimorbidity, goal-oriented care. And equity. *Br J Gen Pract* 2012; 62(600):e522-e524. <http://dx.doi.org/10.3399/bjgp12X652553>
- 29 Steyn K, Levitt N, Patel M, Fourie J, Gwebushe N, et al. (2008) Hypertension and diabetes: Poor care for patients at community health centers. *S Afr Med J* 98: 618–622 [PubMed]
- 30 Rayner B, Blockman M, Baines D, Trinder Y. A Survey of hypertensive practices at two Community Health Centre's in Cape Town. *SAMJ* April 2007, Vol 97, No4 280-284
- 31 Califf RM. A Cycle of Quality as a model for improving health outcomes in the treatment of hypertension. *European Heart Journal Suppl* (2007) 9 (suppl B) B8-B12
- 32 Salman GF. Continuous Quality Improvement in rural Health Clinics. *J Gen Intern Med* (2005) 20(9): 862-865
- 33 Shortell SM, Bennet CL, Bycle GR. Assessing the impact of continuous quality improvement on clinical practice. What it will take to accelerate progress. *Milbank Q* 1998; 76(4): 593-624; 510
- 34 Govender I, Ehrlich R, Vuuren U, de Vries E et al. Clinical audit of diabetes management can improve the quality of care in a resource-limited primary care setting. *International Journal for quality in Health Care* 2012; volume 24, number 6: pp. 612–618 10.1093/intqhc/mzs063. Advance access publication: 31 October 2012
- 35 Walsh JM, McDonald KM et al. Quality Improvement Strategies for Hypertension Management. A Systematic Review, *Medical Care*, Volume 44, Number 7, July 2006
- 36 Provincial Government of the Western Cape, Department of Health (2009) Adult Chronic Disease Management Policy, A strategy for the five key conditions. Cape Town.
- 37 Mäkelä M, Booth B, Roberts R (ed) *Family Doctors' Journey to Quality*. Stakes, Helsinki, 2001, p 21
- 38 University Hospital Bristol Clinical Audit Team [Internet]. *How To: Implement Change Successfully*; 2009 [cited 2010, 14 Aug]. Available from

- <http://www.uhbristol.nhs.uk/files/nhs-ubht/8%20How%20to%20implement%20change%20v3.pdf>.
- 39 National Institute of Clinical Excellence. Principles for Best Practice in Clinical Audit [Internet]. Abingdon, Oxfordshire, United Kingdom: Radcliffe Medical Press; 2002 [cited 2010 Aug 14]. Available from: <http://www.nice.org.uk/media/796/23/BestPracticeClinicalAudit.pdf>.
 - 40 Van der Merwe, JV. Clinical Governance. Clinical Risk Management Workshop; 2006 Aug [cited 2010 Aug 14]. Available from: http://www.mediscor.net/Conferences/CRM0806/Clinical%20Governance_Prof%20vd%20Merwe.pdf
 - 41 Census 2011 Municipal Fact Sheet, published by Statistics South Africa
 - 42 Western Cape Government. Integrated Audit for Chronic Disease Management 2014.
 - 43 De Vries E. Conference presentation. Auditing chronic disease care: does it make a difference. Available from http://saafp.org/conferences/index.php/congress/index/pages/view/speaker_presentations.(Accessed 28 August 2012)
 - 44 Erasmus RT, Soita DJ, Hassan MS, Blanco-Blanco E, Vergotine Z, Kengne AP et al. High prevalence of diabetes mellitus and metabolic syndrome in a South African coloured population: Baseline data of a study in Bellville, Cape Town. *S Afr Med J* 2012; 102: 841–844. Web of Science® Times Cited: 6
 - 45 Michelle Greiver. Improving hypertension management in my practice. *Can Fam Physician*. 2008 Mar; 54(3): 358–359.
 - 46 Brandi White. Using flow sheets to improve diabetes care. *Fam Pract Manag* 2000 June; 7(6):60-62
 - 47 Zelra Malan, Bob Mash, Katherine Everett-Murphy. A situational analysis of training for behaviour change counselling for primary care providers, South Africa. *African Journal of Primary Health Care & Family Medicine*; Vol 7, No 1 (2015), 10 pages. doi: 10.4102/phcfm.v7i1.731
 - 48 Fiore MC, Jaén CR, Baker TB, et al. Treating Tobacco Use and Dependence: 2008 Update. Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service. May 2008
 - 49 Whitlock E., Orleans CT., Pender N., Allan J (2002). Evaluating primary care behavioural counselling interventions: An evidence-based approach. A review. *American Journal of Preventive Medicine* 22 (4): 267-284.
 - 50 Fina Lubaki, J, Mabuza, L, Malete, N, Maduna, P, Ndimande, J. Reasons for non-compliance among patients with hypertension at Vanga Hospital, Bandundu Province, Democratic Republic of Congo: A qualitative study. *African Journal of*

- Primary Health Care & Family Medicine, North America, 1, Aug 2009. Available at: <<http://www.phcfm.org/index.php/phcfm/article/view/68>
- 51 Thinkexist.com [Internet]. Quote by William A. Foster. [cited 2010 6 Aug]. Available from: http://thinkexist.com/quotation/quality_is_never_an_accident-it_is_always_the/226780.html.
 - 52 Stewart MA (1995) Effective physician-patient communication and health outcomes: a review. *Can Med Assoc J* 152:1423–1433
 - 53 Renehan AG and Howell A (2005). Preventing cancer, cardiovascular disease and diabetes. *Lancet*; 365 (9469):1449-51
 - 54 Gaziano TA, Steyn K, Cohen DJ, Weinstein MC, Opie LH. Cost-effectiveness analysis of hypertension guidelines in South Africa: Absolute risk versus blood pressure level. *Circulation* 2005; 112(23):3569-3576. <http://dx.doi.org/10.1161/circulationaha.105.535922>
 - 55 Wright JT Jr, Bakris G, Greene T, Agodoa LY, Appel LJ, Charleston J, et al. Effect of blood pressure lowering and antihypertensive drug class on progression of hypertensive kidney disease: results from the AASK trial. *JAMA* 2002; 288:2421–31
 - 56 Huebschmann AG, Mizrahi T, Soenksen A, Beaty BL and Denberg TD. (2012), Reducing Clinical Inertia in Hypertension Treatment: A Pragmatic Randomized Controlled Trial. *The Journal of Clinical Hypertension*, 14:322–329. doi: 10.1111/j.1751-7176.2012.00607.x

Appendices

Appendix 1: The Quality Improvement Cycle



Copy of PowerPoint Slide used in Teaching Intervention: the Quality Improvement Cycle

Appendix 2: Example of the IACDM tool for Hypertension

HYPERTENSION		1	2	3
Patient Folder Number				
Number of chronic disease visits in 1 year:				
Counselling	Dietitian/Diet:			
	Exercise:			
	Smoking:			
	ETOH:			
Number of visits that recorded BP:				
Number of visits that recorded body weight:				
Annual Recordings of the following:	Random Total Cholesterol			
	Creatinine			
	Urine dipstix for proteinuria			
	Resting ECG or clinical assessment for LVH			
	Annual random blood glucose			
	BMI/ Waist Circumference			
BMI < 25 OR Waist Circ M<102cm, F< 88cm				
Last visit - BP <140/90				
Cholesterol: <5				
Creatinine: <120				

Appendix 3: Example of structural aspects in the IACDM

Data Element:	Room 1	Room 2	Room 3	Room 4	Room 5
(A) Do each of the Chronic Care consulting rooms have the following:	Y or N				
1. Standard BP cuff:					
2. Obese cuff:					
3. Baumanometer:					
4. Chronic Diseases of Lifestyle stationery (Pink Sheet)					
5. Foot screening forms					
6. Ophthalmoscope					
7. Peak expiratory flow meter					
8. Peak expiratory flow reference chart					
9. Asthma 20-second questions					
10. Demonstration material for asthma: (a) Spacer					
10. Demonstration material for asthma: (b) Placebo inhaler					
11. Access to PHC Standard treatment guideline EDL book					
(B) Does the prep room have access to the following:					Y or N
Functioning scale					
Tape measure					
Height measurement					
BMI chart or wheel					
Urine dipsticks					
Glucometer					
Glucostrix for glucometer					
(C) Does your facility have access to:					Y or N
Monofilaments for foot exam					
Snellen chart for literate patients					
Snellen chart for illiterate patients					
Pin-holes					
ECG machine					
Eye drops for dilating pupils					
(D) With regard to your facility chronic care processes:					Y or N
1. Does your facility use a chronic disease register?					
2. Does your facility use the Central Dispensing Unit (CDU) or a pre-packing system?					
3. Does your facility have a Chronic Care Team (CCT)?					
4. If yes to number 3, does the CCT meet regularly, e.g. monthly? If the answer to number 3 is No, write an X.					
5. Does your facility do group health education?					
6. Does your facility have a process for calibrating baumanometers?					
7. Does your facility have access to community based support groups?					

Appendix 4: Blood Pressure measuring technique

Blood pressure measurement by standard mercury sphygmomanometer or semiautomatic device

- Use a properly maintained, calibrated, and validated device
- Measure sitting blood pressure routinely: standing blood pressure should be recorded at least at the initial estimation in elderly or diabetic patients
- Remove tight clothing, support arm at heart level, ensure arm relaxed and avoid talking during the measurement procedure
- Use cuff of appropriate size
- Lower mercury column slowly (2 mm per second)
- Read blood pressure to the nearest 2 mm Hg
- Measure diastolic blood pressure as disappearance of sounds (phase V)
- Take the mean of at least two readings, more recordings are needed if marked differences between initial measurements are found
- Do not treat on the basis of an isolated reading

Appendix 5: Example of Hypertension Flow sheet

CDM CLINIC RECORD

		Patient Name								
		Folder number								
		Id number/Date of birth						HEIGHT:		
		PREVENTION = at least once/year								
		DATE Weight =	DATE BMI =	DATE BP =		DATE HGT =				
		DATE HCT done = Y/N	DATE PAP smear {as indicated} Y/N							
		DIABETES Date diagnosed:	HYPERTENSION Date diagnosed:	DATE	DATE	DATE	DATE	DATE	DATE	
EVERY CLINIC VISIT (ECV)	OBS ROOM	COUNSELLING								
		Diet								
		Exercise								
		Smoke & ETOH								
		Correct medication use								
		Aspirin								
		Simvastatin								
		OBSERVATIONS								
		Blood pressure								
		Urine dipstick results								
Weight										
HGT										
ANNUAL CLINIC VISIT (ACV)	CNP/PN	BMI (<25)								
		Waist circumference (M<102cm; W<88cm)								
		Snellen eye test								
						ECG if indicated				
	CNP/PN	CNP					HGT			
			Foot screening (Nurse)							
			Dr Fundoscopy							
			LAB BLOOD TESTS							
			Cholesterol (<i>Baseline</i>)							
			Creatinine							
HbA1C										
Framingham Cardiac Risk assessment										
Unstable/stable										
		EPILEPTIC PATIENTS Date diagnosed:								
ECV	CNP/PN	Type of seizure								
		COUNSELLING								
		Lifestyle changes								
		ETOH use/abuse								
		Correct medication use								
		Medication side effects								
		SEIZURE INFORMATION								
		Number of seizure last month								
Intervention if seizures recorded (Y/N/X)										
Number of emergency visits for epilepsy										
		BLOODS:(Drug) level if uncontrolled)								
AC	OBS	OBSERVATIONS								
		HIV Test								