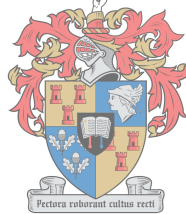


Improving the quality of care for patients at increased risk for type 2 diabetes at Onandjokwe Intermediate Hospital, Oshikoto region, Namibia.

Dr Louis Dikolela Kenga

Thesis presented in partial fulfilment of the requirements for the degree of Master of Philosophy in Family Medicine, in the Faculty of Medicine and Health sciences at Stellenbosch University.



UNIVERSITEIT
iYUNIVESITHI
STELLENBOSCH
UNIVERSITY

100
1918 · 2018

Supervisor: Dr Klaus B von Pressentin

March 2018

Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (extent explicitly, that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

17 November 2017

Copyright © 2018 Stellenbosch University. All rights reserved

Abstract

Type 2 diabetes mellitus accounts for more than ninety per cent of patients with diabetes and its incidence is on the rise in low and middle-income countries. Obesity is the main risk factor for type 2 diabetes mellitus.

Aim: The aim of this study was to improve the quality of care provided to patients at increased risk of developing type 2 diabetes.

Setting: Medical outpatient clinic; Onandjokwe Intermediate Hospital. Namibia

Method: The steps of quality improvement cycle were followed

Result: Two hundred and six participants were recruited in the audit. Ninety one % were female and the mean age was 44years. At baseline audit only 2 % of participants had their body mass index (BMI) recorded, one month later after training of staff on importance of documentation of non-invasive risk factors for type 2 diabetes followed by implementation of changes to practice; 65 % of participants had their BMI and additional risk factors for type 2 diabetes recorded during the re-audit and were provided with diet and physical activity counselling. The difference was statistically significant between baseline audit and re-audit ($p < 0.001$)

Conclusion

The quality of care for patients at increased risk of developing type 2 diabetes mellitus in our setting was suboptimal. Simple interventions were designed and implemented to improve the quality of care. A corresponding significant improvement in the documentation of risk factors for type 2 diabetes and provision of diet and physical activity counselling was observed.

1. Introduction

Diabetes mellitus (DM) is a chronic condition that occurs when the body cannot produce or use insulin.¹ Type 2 diabetes mellitus (T2DM) is characterised by relative insulin deficiency caused by pancreatic beta-cell failure and insulin resistance in target organs.² Intermediate hyperglycaemia, or “prediabetes”, is defined by impaired fasting glucose (IFG) and / or impaired glucose tolerance (IGT), and people with IFG and / or IGT are at increased risk of developing diabetes.³ IFG is fasting plasma glucose (FPG) concentration of ≥ 6.1 mmol/L and < 7 mmol/L and IGT is a FPG concentration of < 7 mmol/L and a 2-hour plasma glucose concentration of ≥ 7.8 mmol/L and < 11.1 mmol/L, measured during a 75 grams oral glucose tolerance test (OGTT).³

T2DM accounts for more than 90 % of all types of diabetes mellitus; and its incidence is on rise globally, especially in low and middle-income countries (LMIC) where most new cases are expected in next decades.¹ Based on the International Diabetes Federation (IDF) 2015 estimates; 415 million people worldwide had diabetes, out of whom 193 million were undiagnosed. In addition 318 million individuals had impaired glucose regulation. The African region had 14.2 million people with diabetes in 2015, of whom more than two thirds (66.7%) were undiagnosed. If this trend continues, by 2040, 642 million people will have diabetes worldwide.¹

Rapid urbanisation with associated consumption of energy-dense foods and beverages rich in fat and refined sugar (fast foods), instead of traditional foods rich in fibre (nutritional transition) as well as decreased physical activity are known drivers of obesity in the world, especially in LMIC.⁴ Increased body mass index (BMI) is an established risk factor for multiple chronic diseases (T2DM, cancers, cardiovascular diseases, and osteoarthritis).⁴⁻⁵ Obesity is the most important modifiable risk factor for T2DM.⁵ World Health Organization (WHO) classifies individuals according to their BMI: normal BMI = 18.9 - 24.9 kg/m²; overweight: BMI = 25 – 29.9 kg/m² and obese: BMI ≥ 30 kg/m².⁶ The Society of Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA)⁷ defines high risk individuals for T2DM as all adults who are overweight (BMI ≥ 25 kg/m² or > 23 kg/m² in Asians), with one or more additional risk factors:

- Physical inactivity
- Hypertension [blood pressure (B.P) $\geq 140/90$ mm Hg] or on treatment for hypertension
- First degree relative with diabetes
- Dyslipidaemia
- Polycystic ovarian syndrome
- High risk race / ethnicity
- Cardiovascular disease history
- Gestational diabetes or having had baby with birth weight > 4 kg
- Previous IFG or IGT
- Other conditions (such as acanthosis)

The relationship between higher BMI and T2DM and the potential benefits of lifestyle modifications in reducing the chance of developing T2DM among overweight and obese patients are well established.⁸⁻⁹ Several randomised control trials have demonstrated that the onset of T2DM can be delayed/ prevented by lifestyle and / or pharmacological interventions.⁸⁻
⁹ In LMIC where most people with diabetes remain undiagnosed, screening for diabetes among individuals who present to health facilities for non- diabetes related matters is uncommon.^{1,10}

Documentation of risk factors for T2DM at each routine patient encounter might facilitate at low cost and low effort diabetes risk assessment. Those identified as high risk for diabetes will be offered a glucose screening test (fasting glucose or OGTT) and lifestyle modifications counselling to enable them to reduce their chance of developing T2DM.¹¹

From the most recent Namibia population census estimates, the country's population is about 2.5 million in 2017. About 47% of this population are now living in urban areas compared to only 28% of total population in 1990, when the country obtained its independence from South Africa.¹² According to the recent 2013 report on global, regional and national obesity; 42.4% of female Namibians and 21.2% male Namibians aged ≥ 20 years were overweight, while 19.8% of females and 6% males were obese.¹³

According to the recent International Diabetes Federation (IDF) 2015 estimates, 45 300 adults (aged 20 - 79 years) had diabetes in Namibia in 2015, of whom 27 500 (61%) were undiagnosed with a national prevalence of 3.5%.¹ The Namibia Demographic and Health Survey (NDHS) 2013 reported that 6% of women and 7% men aged 35 - 64 years had diabetes in 2013, and reported a high prevalence of diabetes amongst the obese (12 % and 19% for women and men respectively).¹⁴ These studies illustrate that the main risk factor for T2DM is on rise in Namibia^{12,13} as well as the number of adults with diabetes. As is the case in most LMIC, a shift in orientation of health services towards focusing on prevention is required to delay or prevent the onset of T2DM amongst overweight or obese citizens.

Problematically, little is known about the quality of risk factors for T2DM documentation performed by clinicians for patients at increased risk of developing T2DM in our setting. It is hoped that overweight and obese patients would be evaluated for additional risk factors for T2DM at each clinical encounter and be provided with diet and physical activity counselling to enable them to initiate lifestyle modifications required to reduce their chance of developing diabetes in the future.⁷

This study intended to assess how best to improve the documentation of risk factors for T2DM by clinicians among overweight and obese patients, aged 25 - 64 years attending the medical outpatient unit of the Internal Medicine department, at Onandjokwe Intermediate Hospital, Oshikoto region, Namibia. In 2015, Onandjokwe Hospital registered 184 patients with new diabetes mellitus, most of whom were adults with an average BMI $> 25\text{k/m}^2$ (Onandjokwe Intermediate Hospital, 2015 report, unpublished).

The aim of this study was to assess and improve the quality of care provided to patients at increased risk of developing T2DM visiting medical outpatient unit at Onandjokwe Hospital. The specific objectives were:

- To assess the quality of care provided to patients at increased risk of developing T2DM visiting medical outpatient, at Onandjokwe Hospital.
- To plan and implement required changes to improve the quality of care.
- To determine if these changes were associated with measurable improvement in the quality of care provided to patients at increased risk of developing T2DM.
- To make recommendations to the department of internal medicine on how to improve the quality of care provided to patients at increased risk of developing type 2 diabetes.

2. Research methods and design

2.1 Study design

This project was a quality improvement cycle comprising the following steps:¹⁵

- Establishing an audit team: members were chosen because of their daily contacts with patients at increased risk of T2DM (one doctor and three nurses)
- Defining criteria and agreeing on target standards: Criteria and targets standards were agreed up on by research team members after a presentation on risk factors for T2DM by principal researcher.
- Data collection
- Data analysis: after baseline audit
- Data interpretation: after baseline audit
- Planning and implementation of changes to practice at Medical outpatient Unit / Internal medicine department: Patient's BMI should be calculated and documented during each clinical encounter; patients with a raised BMI should be informed about their risk of developing T2DM; should be screened for T2DM with a glucose testing and provided with lifestyle modifications counselling.
- Re-audit to detect changes in quality of care

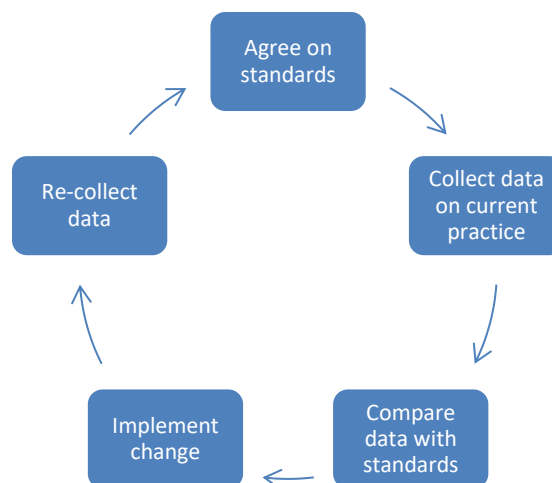


Figure 1: The quality improvement cycle.¹⁵

2.2 The setting

Onandjokwe Intermediate Hospital is situated in the northern part of Namibia in Onandjokwe district, Oshikoto region. It has been a referral hospital since August 2015 for Oshikoto region with five major departments (Internal medicine, Paediatrics, General surgery, Gynaecology and Obstetrics and Anaesthetics) and an accident and emergency department with medical officers working in 8 hours shifts. Each department is headed by a consultant specialist, with three to four medical officers. After registration at reception, patients are screened by nursing staff and directed to the appropriate outpatient unit.

This project took place at medical outpatient unit of the Internal medicine department, Onandjokwe Intermediate Hospital, which attends to an average of 3000 patients (aged 13 years and above) per month. This translates to an average of 160 patients per day. The most common reason for visiting the medical outpatient unit is follow-up for chronic conditions like chronic psychiatric conditions, diabetes, hypertension, asthma and epilepsy. The majority of patients seen at medical outpatient unit are black Namibians, from the Owambo tribe, and Oshiwambo is the most commonly spoken language. Three medical officers and two registered nurses participate in the consultation of adult patients. The documentation of risk factors for T2DM depends on individual clinician's expertise and documentation habits.

2.3 The audit team

The audit team was headed by the principal researcher and included one additional doctor and three nurses.

2.4 Setting of criteria and target standards

The team opted to use the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) 2012 guidelines⁷, which were the latest regional guidelines based on internationally accepted evidence. These guidelines define high risk for T2DM as any adult overweight or obese with one or more additional risk factors.⁷ The performance levels were set to be achievable targets and were based on the opinion of the audit team.

The criteria were discussed during a meeting with the members of the audit team that agreed upon the performance levels. Performance levels were set for the structure and process necessary for identification and screening of patients at high risk of developing T2DM and their outcome.

2.4.1 Structural standards

One would expect some key items to be available at the medical outpatient unit and in the consultation rooms.

Target standards for structure were the presence of:

- Tape measure in each consultation room
- Functional weighing scale
- Functional height scale
- Glucometer in good condition with strips

- Accurate sphygmomanometer with an obese cuff
- Adequate space for individual and group education
- Education material
- Specimen bottles for urine
- Specimen tubes for blood tests
- Investigation request forms

2.4.2 Process standards

Target standards for the process were as follow:

- 70% of medical records have the height recorded at least once in last 12 months.
- 70% of medical records have weight recorded on each visit
- 70% of medical records have BMI recorded on each visit
- 70% of medical records have additional risk factors for T2DM documented
- 70% of medical records show that patients were informed about their risk factors for T2DM
- 70% of medical records show that patients were provided with diet and physical activity counselling
- 70% of medical records have patient target weight and BMI documented
- 70% of medical records have patient's fasting or random plasma glucose recorded

2.4.3 Outcome standards

Target standards for outcome were assessed on the basis that these are recorded on the chart:

- 90% records have BMI recorded on each visit
- 90% records show that patients at high risk of developing T2DM were informed about their risk
- 90% of records show that additional risk factors related to BMI for T2DM (such as diet and physical activity) were documented

2.5 Study population

The study was carried out amongst overweight and obese adults aged 25 – 64 years, without previously documented diabetes, attending a medical clinic for various medical problems; with at least one additional risk factor for T2DM.

A sample size calculation based on the ability to detect a 20% difference in the percentage of compliance of the main outcome with p-value of 0,05 recommended that 103 participants be included in baseline audit and 103 in re-audit.

Exclusion criteria were: being less than 25 years or above 64 years old on the day of consultation, having documented diabetes, not being overweight/ obese, not having additional risk factors for T2DM, and not being able to consent.

2.6 Data collection

Participants were selected systematically by taking every second overweight or obese patient aged between 25 - 64 years, without documented diagnosis of diabetes, who walked into the consultation room for any other reason than follow-up for diabetes during the study period. Baseline audit from 18/11/2016 to 15/2/2017; the intervention period was from 16/2/2017 to 15/3/2017, followed by re-audit from 18/3/2017 to 03/07/17. Patients were informed about the objectives of the study, written informed consent was obtained. Data were collected by audit team members from the patient's outpatients' booklet using a data collection tool. To ensure that each patient's booklet only contributed once to the dataset, each patient's booklet was marked with a unique number after recruitment and the same number was used in the data collection tool. The structural criteria were evaluated by inspection of the consultation rooms by the audit team.

2.7 Data analysis

Data were captured using a Microsoft Excel spreadsheet and analysed by the Bio-statistical Unit at Stellenbosch University. Data analysis included frequency tables and pre-post comparison of indicators for pre-diabetes care and prevention. Numerical characteristics were compared using the T- test where normality assumption was plausible; and the non-parametric Wilcoxon test was used for skewed data. The level of significance was set at 5%.

2.8 Data interpretation

The results of the actual performance were discussed and compared with the target standards by audit team.

2.9 The planning and implementation of change

Following the discussion about the low level of documentation of risk factors for T2DM and provision of lifestyle modifications counselling observed during baseline audit, the research team designed the intervention which consisted of:

- Training the quality improvement team on T2DM risk factors and the importance of their accurate documentation towards identification and screening of individuals at increased risk of developing T2DM.
- The quality improvement team decided that, every patient attending the medical outpatient unit would have weight documented during each visit; and the height should be documented during the first visit and annually.
- The following procedure was used to standardise the body measurements:
 - Weight was to be measured with participants in light clothes, without shoes, using a calibrated ADE floor mechanical scale made by ADE Germany to the nearest 0.5kg.
 - Height was to be measured using an ADE wall mounted height measure tape.
 - Waist circumference was to be measured using non-stretchable measure tape at midway between the lowest rib and the iliac crest.
 - BMI was to be calculated by dividing weight in kilograms by the square of the height in meters.

- Plasma glucose was to be measured using a drop of whole blood obtained via a needle prick from patient's finger which was immediately analysed using a glucometer (Accu-check Active, Roche diagnostics Germany). At least 8-hours of fasting was required for plasma glucose to be considered as fasting; if the participant had taken any food except water since awakening, the plasma glucose was considered as a random plasma glucose.
- Blood pressure was to be measured using the MCP healthcare digital blood pressure monitor; and hypertension was defined as blood pressure $\geq 140/90$ mmHg or being on anti-hypertension medication.
- BMI should be calculated and documented in patient's records during each visit.
- Patients with raised BMI should be counselled regarding their target weight and BMI; patients should be involved in goal setting according to individual abilities, and information on diet and physical activity should be provided.
- Additional risk factors for T2DM (such as family history of diabetes, hypertension and gestational diabetes) should also be documented in the patient's records, and the patient classified as high risk or low risk for T2DM.
- Overweight and obese patients with additional risk factors for T2DM should be screened for T2DM or pre-diabetes by measuring the random or fasting plasma glucose using glucometer.

The intervention was implemented from 16/2/2017 to 17/03/2017, followed by the re-audit.

2.10 The re-audit

Data collection was repeated one month later after the intervention from: 18/3/2017 to 3/7/2017. The same data collection tool was used to assess the level of documentation of risk factors for T2DM and provision of lifestyle modifications counselling to overweight and obese patients with additional risk factors for T2DM.

2.11 Ethical considerations

Approval to conduct the study was obtained from the Health Research Ethical Committee of Stellenbosch University (reference S16/07/132) and from Onandjokwe Hospital research committee.

3. Results

Table 1 shows the socio-demographic and clinical characteristics of the participants. Two hundred and six participants were recruited into two audits. Participants were aged 25 - 64 years, with a mean age of 44 (± 10.54) years. One hundred twenty (58.25%) participants were under 45 years and 86 (41.75%) were 45 years or older. One hundred and eighty seven (91%) participants were female, nineteen (9%) were male, and 69% of participants had attended secondary school.

Most participants had BMI $\geq 30\text{kg/m}^2$ (64%) and the mean BMI was $32.60 \pm 5.26 \text{ kg/m}^2$. The average waist circumference for men and women was $97.21 \pm 5.73\text{cm}$ and $101.45 \pm 10.02 \text{ cm}$ respectively.

In terms of medical history, one hundred and sixty participants (78%) were previously diagnosed with hypertension, 49 (24%) had first degree relative with diabetes and 16% of female participants had babies with birth weight $> 4\text{kg}$. All participants had plasma glucose testing done. One hundred eighty one (87.86%) participants had taken food and twenty five did not before glucose testing; of twenty five participants who had fasting plasma glucose measured: 52% had normal glucose level; 28% had impaired fasting glucose and 20% had plasma glucose $\geq 7\text{mmol/L}$ and were subsequently confirmed by laboratory testing as having new diabetes.

3.1 Structural standards

The performance levels for structural standards in both audits are compared in table 2, which shows that six out of ten standards and eight out of ten standards were achieved respectively during audit and re-audit.

3.2 Process standards

The performance levels for process criteria are compared in table 3, which shows that none of the standards were achieved at baseline but one was achieved at re-audit. The documentation of risk factors for T2DM (BMI and additional risk factors) improved significantly during re-audit as well as provision of diet and physical activity counselling ($p < 0.001$).

3.3 Outcome standards

Table 3 shows that 65% of participants were informed about their risk of developing T2DM, had their target weight and BMI recorded, and received diet and physical activity counselling. There was a statistically significant difference between baseline and re-audit ($p < 0.001$).

Table 1. Characteristics of study participants

Characteristics	Audit (n=103)	Re-audit (n=103)	Total (N=206)
Age (in years)			
Mean age (SD)	42.10 (10.01)	45.95 (10.76)	44 (10.54)
Age range (in years)	Number of participants (percentage)		
25 - 34	24(23.3)	17(16.5)	41(19.90)
34 - 44	44(42.72)	35(33.98)	79(38.35)
45 - 54	20(19.42)	22(21.36)	42(20.39)
55 - 64	15(14.56)	29(28.16)	44(21.36)
Gender	Number of participants (percentage)		
Male	14(13.59)	5(4.85)	19(9.22)
Female	89(86.41)	98(95.15)	187(90.78)
Education level	Number of participants (percentage)		
Grade 0—7	22(21.36)	27(26.21)	49(23.79)
Grade 8—12	70(67.96)	72(69.90)	142(68.93)
Tertiary Education	11(10.68)	4(3.88)	15(7.28)
Risk factors for type 2 Diabetes			
Body Mass Index(BMI) in Kg/m²			
Mean (SD)	32.33(5.30)	32.86(5.23)	32.60(5.26)
	Number of participants (percentage)		
25—29.99	39(37.86)	36(34.95)	75(36.41)
30—34.99	40(38.83)	37(35.92)	77(37.38)
35—39.99	14(13.59)	18(17.48)	32(15.52)
≥ 40	10(9.71)	12(11.65)	22(10.68)
Waist Circumference in cm			
Mean (standard deviation)	99.81(10.03)	102.32(9.40)	101.06(9.78)
Male: mean ± SD (range)	mean (SD) = 97.21 ± 5.73 (range: 85-110)		
Female: mean ± SD (range)	mean (SD) = 101.45 ± 10.02 (range: 82-133)		
Glucose concentrations (mmol/L)	Number of participants (percentage)		
Fasting Plasma glucose (FPG)	11(10.67)	14(13.59)	25(12.13)
Mean FPG (SD)	6.08(0.96)	6.27(1.08)	6.1(1.0)
Range FPG	4.4 - 7.4	4.4 – 8.2	4.4 – 8.2
New T2DM (%)	2(18.18)	3(21.42)	5(20.00)
Random Plasma glucose (RPG)	92(89.32)	89(86.40)	181(87.86)
Mean RPG (SD)	6.37(1.51)	6.27(1.01)	6.32(1.29)
Range RPG	4.4-12.6	3.9 - 9.9	3.99- 12.6
Documented risk factors	Number of participants (percentage)		
First degree relative with diabetes	21(20.38)	28(27.14)	49(23.78)

Gestational diabetes/ baby > 4 kg	18(20.22)	12(12.24)	30(16.04)
Temporary diabetes	1(0.97)	0.00	1(0.48)
Impaired fasting glucose/ impaired glucose tolerance	6(5.82)	1(0.97)	7(3.39)
Cardiovascular disease	1(0.97)	0.00	1(0.48)
Hypertension	69(66.99)	91(88.34)	160(77.66)
Raised cholesterol	3(2.91)	31(30.39)	34(16.50)

Table 2. Structural target standards

Structure standards	Baseline audit		Re- audit	
	Present	Absent	Present	Absent
Tape measure		no	yes	
Weight scale	yes		yes	
Height scale	yes		yes	
Functional blood pressure machine in each room with two cuff sizes		no		no
Functional glucometer with strips	yes		yes	
Educational material about diabetes		no		no
Adequate space for individual and group education	yes		yes	
Specimen bottles	yes		yes	
Specimen tubes		no	yes	
Laboratory investigations forms	yes		yes	
Total (available minimum equipment)	6/10		8/10	
Percentage	60%		80%	

Table 3. Results for process and outcome target standards

Process standard	Baseline audit		Re- audit		p-value
	%	Standards achieved	%	Standards achieved	
70% of patients have height recorded	9.7	no	68	no	<0.001
70% patients have weight recorded	66.01	no	94.17	yes	<0.001
70% of patients have BMI recorded	3.9	no	66	no	<0.001
70% of patients have additional risk factor(s) for T2DM recorded	3.9	no	65	no	<0.001
70% of patients informed about diabetes risk factors recorded	1.94	no	65	no	<0.001
70% patients informed about target weight and BMI	1.94	no	65	no	<0.001

70% patient informed about physical activity and diet	1.94	no	65	no	<0.001
70% patient plasma glucose recorded	2.91	no	65	no	<0.001
Outcome standard	Baseline audit		Re-audit		p-value
	%	Standard achieved	%	Standards achieved	
90% records with BMI	1.94	no	65	no	<0.001
90% records with physical activity and diet	1.94	no	65	no	<0.001
90% records with target Weight and BMI	1.94	no	65	no	<0.001

3.4 Implementation of changes to practice

Following the discussion about the low level of documentation of risk factors for T2DM observed during the baseline audit; the medical outpatient unit staff were reminded about the importance of documentation of risk factors for T2DM towards identification of individuals at high risk for T2DM^{7,11} and the following changes to practice were implemented:

- Every patient attending the medical outpatient unit should have height, weight and BMI documented as part of routine practice.
- Nurses at screening area and in consultation rooms were involved in making sure that every patient attending the medical outpatient unit had height and weight measured and recorded in the booklet.
- Doctors and nurses in consultation rooms should document other risk factors for T2DM
- Overweight and obese patients should be informed about their risk of developing T2DM and offered diet and physical activity counselling to enable them to lose weight in order to reduce their chance of developing T2DM
- Target weight and BMI for each patient should be agreed jointly by clinician and individual patient.
- Overweight and obese patients should be screened for T2DM using glucose testing (FPG or RPG).

4. Discussion

The results suggest that the quality of care provided to overweight / obese patients attending outpatient unit of Internal medicine department, at Onandjokwe Intermediate Hospital was suboptimal; only 2% of participants had their BMI and additional risk factors for T2DM documented and were provided with diet and physical activity counselling at baseline audit. This may be considered as missed opportunity for identification of patients at increased risk of developing T2DM and potentially prevent or delay some of new cases of T2DM in our settings.¹⁶⁻¹⁷

Training was organised around recording of risk factors for T2DM and the importance of this documentation towards identification of patients at increased risk for T2DM. The American Diabetes Association (ADA) 2016¹⁶ and SEDMSA 2017¹⁷ guidelines recommend that patient's

weight, height and BMI be recorded on each clinical encounter and patients should then be classified as normal weight, overweight and obese. These guidelines are based on evidence showing that lifestyle modifications can help to prevent or delay the onset of T2DM amongst patients at increased risk.^{8,9}

Moreover, the documentation of risk factors might enable identification of patients at increased risk of T2DM, and potentially enable early detection of new cases of T2DM through earlier screening and who may benefit from earlier glycaemic management before complications of chronic hyperglycaemia occur.¹¹ One month after training of medical outpatient unit staff on importance of documentation of risk factors for T2DM towards identification of individuals at increased risk of developing T2DM; during re-audit; 65% of participants had their BMI and additional risk factors for T2DM documented, were informed about their risk of developing T2DM and provided with diet and physical activity counselling, the difference between two audits was statistically significant ($p < 0.001$) (table 3).

Implementation of simple changes led to improved identification of patients at increased risk of developing T2DM who needed support to enable them to initiate lifestyle modifications necessary to delay / prevent the onset of T2DM.¹¹ Hypertension, condition often associated with insulin resistance was present in 78% of participants; and it is known to precede diabetes.¹⁰ In addition, the risk of developing T2DM in overweight / obese with hypertension might be compounded by use of diuretics as first line drugs which are known to induce glucose intolerance; hence the need for diet and physical activity counselling for these patients. The prevalence of hypertension (78%) in our sample was higher than that reported in Ouagadougou (30.4%) during one day screening for diabetes in March 2011.¹⁸ Other non-modifiable risk factors for T2DM were family history of diabetes (23.78%) and having had babies with birth weight $> 4\text{kg}$ (16.04%).

Out of 25 participants who had their FPG measured, five (20%) had $\text{FPG} \geq 7\text{mmol/l}$ and were subsequently confirmed new cases of diabetes by laboratory tests; seven (28%) had impaired fasting glucose which is a high risk state for future T2DM.¹ The prevalence of unknown diabetes (20%) in this study is similar to one reported by 2013 Namibia demographic and health survey among obese women (19%)¹⁴ but higher than 3.2% reported in Ouagadougou.¹⁸ The difference between our findings and Sagna and colleagues findings might be due to the differences in study design.

The high prevalence of impaired fasting glucose (28%) among our participants may suggest an increase in number of new cases of diabetes in our settings in coming years; and indicate the need for T2DM prevention programme in our setting in coming years. Indeed the rapid urbanization of Namibia after independence in 1990 with increased consumption of processed foods and beverages and associated decreased physical activity are known risk factors for obesity which is the main modifiable risk factor for T2DM.⁴

5. Limitations

The main limitation of this study was the short intervention period (one month) that might have affected the performance levels of set standard targets. The performance levels of target

standards were defined arbitrary and may have been too high and ambitious. Another limitation was that the before and after samples consisted of different patients, and this prevented the research team from doing a comparative analysis. Nevertheless, this study provided the first estimates of quality of care provided to patients at increased risk of developing T2DM in our setting and baseline data for development of diabetes prevention programme in our hospital. It must also be stated that the study aimed to enhance the quality of care provided to patients presenting for routine care, and was not intended to be a cohort study or randomised control study to assess an intervention.

Lack of educational material for prevention of diabetes and different size of cuffs for blood pressure monitors was one of challenges to the implementation of changes to practice. These may be addressed during subsequent cycles of this quality improvement process.

5. Conclusion

The aim of this study was to improve the quality of care provided to patients at increased risk of developing T2DM at medical outpatient unit of rural referral hospital. The findings show that, at baseline, only about 2% of patients attending medical outpatient clinic had their BMI and additional risk factors for T2DM documented in their records.

After training of medical outpatient unit staff on the importance of documentation of risk factors of T2DM and the implementation of change to practice, significant improvement in documentation of risk factors of T2DM was noted and 65% of participants during re-audit had their BMI documented, were informed about risk of developing T2DM, and provided with diet and physical activity counselling.

Documentation of risk factors of T2DM may contribute to early identification of individuals at high risk for T2DM who might benefit from adopting lifestyle changes required to reduce their chances for developing T2DM.

7. Recommendations

Improvement in performance is an ongoing process; that should be maintained; and new targets set, T2DM is growing health issue with individual, familial and national implications as such efforts to increase population awareness of risk factors of the disease and lifestyle modifications that can help reduce one's chance of developing T2DM should be encouraged and supported. The audit team recommends that:

1. Height, weight and BMI should be documented at each visit in patient's records; and BMI classified as normal, overweight and obese. Overweight and obese clients should be provided with diet and physical activity counselling regularly.
2. Overweight or obese with additional risk factors for T2DM attending the medical outpatient unit be screened for diabetes using glucose testing at least once per year.
3. Educational material be supplied to medical outpatient unit to enable staff to educate patients about prevention and management of diabetes.

4. Multidisciplinary team (physicians, nurses, social worker and community leaders and representatives) to lead the efforts to improve community awareness of diabetes and promote healthy lifestyle in our local community.

8. Acknowledgements

We would like to thank the Onandjokwe hospital management and research committee for authorising data collection, the research team members for their contribution, the participants for allowing us to review their outpatient booklets, and Mr Tawanda Chivese from the Centre for Statistical Consultation, Stellenbosch University for biostatistical support.

References

1. International Diabetes federation. IDF Diabetes Atlas, 7ed. Int Diabetes Fed, 2015. Available from: <http://www.idf.org/diabetesatlas>. Accessed August 2, 2016.
2. Chatterjee S, Khunti K and Davies MJ. Type2 diabetes. *Lancet* 2017;389:2239-51. Available from: [http://dxdoi.org/10.1016/s0140-6736\(17\)30058-2](http://dxdoi.org/10.1016/s0140-6736(17)30058-2).
3. WHO, International Diabetes Federation. Definition and diagnosis of diabetes mellitus and Intermediate hyperglycaemia: report of a WHO/IDF consultation. Geneva: World Health Organization, 2006.
4. Swinburn BA, Sacks G, Hall KD, Mcpherson DT, Moodie ML and Gortmaker SL. The Global obesity pandemic: Shaped by global drivers and local environments. *Lancet* 2011; 378:804- 14.
5. NCD Risk Factor Collaboration (NCD-Risc). Worldwide trends in diabetes since 1980: a pooled analysis of 751 population based studies with 4.4 million participants. *Lancet* 2016; 387:1513-30. Available from: [http://dx.doi.org/10.1016/S0140-6736\(16\)00618-8](http://dx.doi.org/10.1016/S0140-6736(16)00618-8).
6. WHO. BMI classification. 2006. Available from: www.euro.who.int/en/health-topics/disease-prevention/.../a/body-mass-index-bmi.
7. The Society of Endocrinology, Metabolism and Diabetes of South Africa. Guidelines Expert Committee. The 2012 SEMDSA Guidelines for Management of type 2 Diabetes. *JEMDSA* 2012;2 (Supplement 1):S1 – S95.
8. Lindstrom J, Ilanne - Parikka P, Peltonen M, Aunola S, Eriksson JG, Hermio K, et al. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: The follow-up results of the Finnish Diabetes Prevention Study. *Lancet* 2006;368:1673-9.
9. Li G, Zhang P, Wong J, Gregg EW, Yang W, Gong Q, et al. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes prevention study: a 20 – year follow-up study. *Lancet* 2008;371(9626):1783-9.

10. Mohan V, Seedat Y K, and Pradeepa R. The rising Burden of Diabetes and Hypertension in Southeast Asia and African Regions: Need for Effective Strategies for Prevention and control in Primary Health Care Settings. *International Journal of Hypertension*. 2014;5(2):5-4. Available from: <http://dx.doi.org/10.1155/2013/409083>.
11. Tabak AG, Herder C, Rathman W, Brunner E and Kivimaki M. Prediabetes: a high- risk state for diabetes development. Available from: www.thelancet.com; DOI:10.1016/S0140-6736(12) 60283-9.
12. Namibia Statistics Agency, Agency NS. Namibia 2011 Population and housing census indicators. Windhoek: Namibia statistics Agency; 2013.
13. Ng M, Fleming T, Robinson M et al. Global, Regional, and National prevalence of overweight and obesity in children and adults during 1980 – 2013: a systematic analysis for Global Burden of Disease Study 2013. *Lancet* 2014;384:766-81. Available from: [http://dx.doi.org/10.1016/So140-6736\(14\)60480-8](http://dx.doi.org/10.1016/So140-6736(14)60480-8).
14. International TNM of H and SS (MoHSS) and ICF. The 2013 Namibia demographic and health survey [online]. 2014. Available from: <http://dhsprogram.com/pubs/pdf/Fr298/FR298.pdf> (Accessed 26/05/2016)
15. Van Deventer C, Mash B. African primary Care Research: quality improvement cycles. *Afr J Prm Health care Fam Med*.2014;6(1),1-7. Available from: <http://dx.doi.org/10.4102/phcfm.v6i1.598>.
16. American Diabetes Association. Obesity management for treatment of type 2 Diabetes Mellitus. Sec 6. In: *Standards of Medical care in Diabetes*, 2016;39(Suppl1):S47- S51.
17. The Society for Endocrinology, Metabolism and Diabetes of South Africa, Type 2 diabetes Guidelines Expert Committee. Prevention or delay of type 2 diabetes mellitus. In 2017 SEMDSA Guideline for Management of type 2 Diabetes Guideline Committee. *JEMDSA* 2017;21(1):S1- S196.
18. Sagna Y, Guira O, Yanogo D.A.R, Benon L.E, Zida S, Nikiema P. Et al. Prevalence and associated risk factors for Diabetes and Impaired fasting glucose in Urban population; a study from Burkina Faso. *Journal of Diabetology*, June 2014;2(4). Available from: <http://www.journalofdiabetology.org>.

Addenda

1. Intervention training plan

- Definition and clinical presentation of type 2 diabetes mellitus (T2DM)
- Importance of earlier detection and management of T2DM
- Risk factors for T2DM
- Documentation of risk factors for T2DM
- Screening for T2DM: random screening, opportunistic screening and targeted screening.
- How to measure correctly (weight, height, waist circumference), to calculate body mass index (BMI)
- Target weight and BMI
- Minimum required equipment for T2DM prevention clinic
- T2DM prevention strategies

2. Data collection tools

PART A: DATA COLLECTION TOOL

Date: / / 201

Section A: Identification

NO :207		
Region:		Gender: M F
Constituency:		Date of birth / / (Age=
Education level:		
Grade 0-3		
Grade 4- 7		
Grade 8-12		
Tertiary		

Section B: Risk factors for Type 2 Diabetes

	Yes	No
First degree family history of Diabetes(FDRDM)		
History of gestational diabetes or child with birth weight >4kg(GDM)		
History of temporary induced diabetes(TDM)		
History of Ischaemic heart disease, Stroke or peripheral neuropathy(ISP)		
History of severe mental health problem / receiving anti-psychotic drugs(MHC)		
History of impaired glucose tolerance(IGT) or Impaired fasting glucose(IFG)= HIGT		
Dyslipidemia(cholesterol > 5mmol/l) = Cholesterol: high total cholesterol		
Body mass Index(BMI) $\geq 25\text{Kg/m}^2$: BMI $\geq 30\text{Kg/m}^2$:		
Waist circumference (WC): Men $\geq 94\text{cm}$: Women $\geq 80\text{cm}$:		
B.P $\geq 140/90\text{mmHg}$ or Normal while taking anti-HPT drugs(HPT)		

Fasting Plasma Glucose (mmol/L)	Random Plasma Glucose (mmol/L)

PART B

DATA COLLECTION TOOL: STRUCTURE

Research team Member code:

Room Number: MOPD: (1) (2) (3) Sister Room 2

Minimum required equipment in MOPD rooms	Yes	No
Tape measure(WC)		
Scale		
Height measure		
Accurate sphygmomanometer with 2 sizes cuff		
Glucometer in good working condition +strips		
Specimen bottles		
Specimen tubes		
Educational material		
Investigating request forms(Laboratory)		
Adequate space for individual and group Education		
Total		
Percentage (%)		

PART C: DATA COLLECTION TOOL**NO:****PROCESS**

Patient booklet records	Yes	No
Height Documented at least once in last 12 months(HD)		
Weight Documented at least once in last 12 months(WD)		
BMI Documented at least once in last 12 months(BMID)		
Diabetes risk factors documented in last 12 months and pt classified as High risk for future T2DM (DRFD)		
Patient with T2DM risk factors are informed/ Encouraged to start lifestyle modification needed to reduce their risk(PIRFD)		
Patient Ideal Weight target , Documented (PIWD)		
Physical activity and Diet counselling documented(PPADD)		
Patient 's Fasting or random glucose documented (PBGD)		
Percentage () (%)		

PART D**OUTCOME**

Target standards for outcome	Yes	No
BMI recorded on each visit in the past 12 months(BMIR)		
Patients at increased risk for T2DM are informed and encouraged on each visit to initiate lifestyle modifications to reduce their risk(PHDIR)		
Target weight, BMI and Diet & Exercise level documented(TWBDR)		
Percentage () (%)		

3. Approval letters



UNIVERSITEIT • STELLENBOSCH-UNIVERSITY
jeu keatšivenoot • your knowledge partner

Approval Notice Response to Modifications- (New Application)

08-Nov-2016
kenga, Dikolela D

Ethics Reference #: S16/07/132

Title: Improving the quality of care for patients at increased risk for developing Type 2 Diabetes Mellitus at Onandjokwe Intermediate Hospital, Namibia

Dear Dr Dikolela kenga,

The **Response to Modifications - (New Application)** received on 13-Oct-2016, was reviewed by members of **Health Research Ethics Committee 1** via Expedited review procedures on 08-Nov-2016 and was approved.
Please note the following information about your approved research protocol:

Protocol Approval Period: 08-Nov-2016 -07-Nov-2017

Please remember to use your **protocol number** (S16/07/132) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note a template of the progress report is obtainable on www.sun.ac.za/rdc and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel:



**MINISTRY OF HEALTH AND SOCIAL SERVICES
INTERMEDIATE HOSPITAL ONANDJOKWE**

Private Bag 2016, Ondangwa
Tel: (065) 280400, Fax: (065) 240688
Practice No: 057 000 0012572, E-mail: imsokwe@gmail.com

From: Local Research Committee, Onandjokwe
Date: 17/11/2016
To: Dr DikolelaKenga, Department of Internal Medicine
CC: Head of Department, Internal Medicine at Onandjokwe

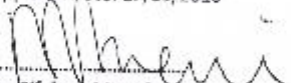
RESEARCH HYPOTHESIS: THE QUALITY OF CARE PROVIDED TO PATIENTS AT INCREASED RISK OF DEVELOPING TYPE 2 DIABETES MELLITUS AT INTERMEDIATE HOSPITAL ONANDJOKWE IS SUBOPTIMAL


Thank you for your application with the above mentioned title seeking approval from the Local Research Committee of Intermediate Hospital Onandjokwe (LRCO). The material was successfully evaluated.

It was agreed that your application be approved as a research project which is ethically sound. It is advised that you still seek approval from the National Research Committee at the Ministry of Health and Social Services in Windhoek.

We wish you an enjoyable and fruitful research

Approval Date: 17/11/2016


Dr. Sifelani Mtombeni
Chairman


Dr. Akutu Munyika
Secretary