

RESEARCH ASSIGNMENT

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

PROJECT TITLE

**A Quality Improvement Audit of Diabetes Care in Macassar Community Health
Centre**

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Project Title

A Quality Improvement Audit of Diabetes Care in Macassar Community Health Centre

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.

Signature:

Date:”

Print Name:

Abstract

Background: The responsibility for the management of diabetes mellitus, a highly prevalent and serious chronic condition, falls mostly on our primary health care services. Macassar Community Health Centre (CHC) in the Western Cape provides care for over 1000 patients with diabetes. Many studies show that disease and case management can improve patient care for chronic illnesses and the researcher decided to assess the management of diabetic patients at this CHC.

Aim: To perform an audit on diabetes care in the Macassar Community Health Centre population and implement a cycle of quality improvement.

Methods: An audit (as part of a quality improvement cycle) was done to assess the standard of care as reflected in 2009. Two hundred and fifty patient folders were selected randomly and assessed. A year of interventions, including training of staff and the use of a patient-held chronic care card took place. This was followed by a second audit of 250 folders from 2010, and the results were compared.

Results: Most of the targets for structure outcomes were achieved, yet only 3 out of 13 process outcomes, and 3 out of 11 patient outcomes were achieved. In general there was an improvement in all outcomes with the second audit yet some issues will still need particular attention in the next quality improvement cycle. There was a big difference between these results and the Integrated Audit of Chronic Disease Management of 2009 which only looked at 10 folders, for example the CDM audit found that 75% of HbA1c's were under 7, yet in this audit which assessed the same year, only 5% of HbA1c's were under 7.

Conclusion: The study was successful in determining the current standard of care of diabetics at Macassar CHC and commencing a cycle of quality improvement. An audit team was created and involved in setting target standards. They possibly overestimated their current standards when setting the targets which explain why only 3 out 13 process outcomes, and 3 out of 11 patient outcomes were achieved in the second audit, despite the general improvements after the cycle of interventions. Retinal photography is available and must be fully utilised by staff and patients. Foot examinations need to take place more frequently with prevention of complications being the focus. Hand-held patient cards were handed out to most of the patients, but this intervention would have to be assessed separately with a different research tool to assess its particular impact on improved management of diabetics. The audit also showed the need for both training of the clinic staff, as well as patients in the future. The quality improvement cycle should continue with new interventions taking place and periods of reflection, until the target standards are met.

Introduction, background and motivation

At the Helderberg District Hospital, clinicians deal with many complications of diabetic patients in their medical, paediatric, surgical, ophthalmology and casualty departments. Minimal systems are in place to ensure that the diabetics in their area get regular follow up appointments and screening of their feet, eyes, HbA1c's etc. This is a district hospital that serves half of the Eastern Sub-district, from Macassar to Grabouw. A total of 4 Community Health Centres and 4 municipal clinics refer to the hospital, and there is no consensus to diabetes care in the area. Many of the patients seem to be unsure of their medication and even the correct diet. When changes to medication takes place, there is little or inadequate communication between clinics and the hospital.

One of the referral clinics is Macassar Community Health Centre (CHC). About one thousand diabetic patients are on their diabetes register, although it isn't clear how many of these patients are actively using the clinic services. The CHC has a sister in charge of chronic care patients and they see a doctor every 6 months. The audit addressed this group of patients, as there are sufficient numbers for the type of sample group needed and a structure is in place in order to find and assess the necessary files. Previously, the Integrated Audit of Chronic Disease management was done in 2009, but this only looked at 10 files, with no quality improvement interventions performed. The chronic care sisters at Macassar CHC were eager to assess the current state of diabetic care and improve it.

In addition to this, there are also a number of interested healthcare workers and sisters from the hospital and outpatient department which would love to follow the progress of such an audit and support any changes that take place as quality improvement initiatives. Many may have been harbouring ideas for some time already on how to improve the diabetes care in the district, and these ideas can be turned into plans to improve areas of care that the audit process identifies as deficient. One possible intervention that could be used to regulate the whole process of screening and managing diabetics, is a patient-held record card, which prompts healthcare workers and patients to complete outstanding screening tests, and to improve glycaemic and hypertension control when needed. This is based on a similar idea to the ARV patients' treatment cards, the Road-to Health cards for paediatric patients and Antenatal cards. (see Appendix A for format of the card)

An audit has been selected in this setting as it focuses on a local group, using our own target standards – this makes it highly applicable and significant to the population being studied. Even though this question has been looked at before¹, the fact that it has not been looked at in this specific population, or with sufficient numbers, makes it highly relevant research. Previous published audits mostly took place in different settings, with different population groups, different resources in terms of

facilities, skilled staff, medications and equipment.¹ The audit also allows for the opportunity of an intervention and constant review to continue a cycle of improvement.

This study can help establish whether changes in the system can produce positive results in diabetes care. The results of the audit can also be used to motivate for extended services or acquisition of equipment. The audit process itself can then be continued and expanded to include the other referral clinics the following year. The results concerning successful or unsuccessful interventions, referral pathways, and the audit outcomes can be used in the planning of interventions and changes for the other clinics.

From the literature it is clear,^{1,2} that many places, even in first world countries, there is the realization that systems administration and management, is the key to improving diabetes care. The proposed audit and quality improvement cycle is a system which counts on improved education and involvement of patients, better communications between clinics and the district hospital and a means of pointing out when vital screening tests for all diabetics are outstanding.

Over and above this, the researcher's own personal preference to research is to determine why the "therapies" that are already known to clinicians and proven by years of use in other locations, are not being used optimally in the communities of the Helderberg District. As pointed out by Engelgau MM, et.al there are already proven and available therapies for diabetic patients.² One must just find a way of reaching each one and starting that treatment appropriately. This is the foundation to the research as well as the motivation to improve the care of diabetic patients in the Macassar Community Health Centre.

Literature Review:

Diabetes Mellitus remains a highly prevalent and serious condition despite effective treatment regimens being widely available. The community of diabetics in the Helderberg District form just a small part of a worldwide pandemic. In South Africa the national estimated prevalence rate is 4,5% for 2010³ and in the Cape Town coloured population it could be as high as 10,8%.⁴ It is expected that the prevalence of diabetes in developing countries will increase by 170% by 2025.² In numerous systematic reviews, audits, appreciative inquiries and studies, it is clear that the answer to improved patient care does not lie in finding new and exciting therapies, but in disease and case management.¹⁻¹³ Complications due to poor glycaemic, hypertension or lipid control, or inadequate screening, are serious, and include cardiovascular disease, blindness, renal failure and amputations.² Guidelines and protocols for screening and patient care are available worldwide, a guideline for Sub-Saharan Africa was developed in 2006,¹⁴ and a national guideline in the form of standard treatment guidelines is available for all primary care workers.¹⁵ Yet the gap between recommended and actual care is currently the factor under the spotlight.

A systematic review of 27 articles assessing the effectiveness of disease and case management found these processes as critical to improving patient outcomes, and leading to significant cost savings. Disease management must incorporate identification of the population affected, have guidelines for standards of care, management of the identified people and have information systems in place for monitoring it all. A “case manager” is needed for case management (normally a nurse) who oversees and co-ordinates the care of eligible patients. This person will assess the patient and develop and implement individual care plans for each patient. Monitoring of individuals’ outcomes is part of the case management.¹

The positive news is that in whatever area or country, whether in Australia,⁵ Netherlands,⁷ United States,⁷ Tunisia,⁶ South Africa¹² etc., any form of disease or case management implemented showed an improvement in patient outcomes. Interventions included using disease specific medical records for diabetes patients⁵ improving patient education and self-management programs, implementing guidelines (in one case after a workshop with the doctors who were caring for the patients, who went through the evidence behind each guideline and adjusted it to apply to the community they served and the resources available to them),⁹ addressing psycho-social issues that were a barrier to patient self-management¹⁶ or providing training for health-care workers in specific screening tests.²

Certain quality improvement programs were conducted amongst poorer or “underserved” populations and it was found that even then, using nurse managed, culturally sensitive patient training and care programs, complications decreased and health outcomes improved.¹¹

Unexpected or “less positive” research outcomes revealed that electronic medical records used in family medicine practices in the UK did not guarantee better diabetes care.¹⁷ It was also found that there was a greater change in process outcomes than patient outcomes (for example, more HbA1c’s been done annually, but not necessarily leading to less admissions to hospital), in a study done on two QI programs in the Netherlands and the United States. The authors found this to be consistent with the literature they reviewed.⁷

A concept of “clinical inertia” was also found in a study in Australian Indigenous Communities. More regular screening revealed inadequate glycaemic control or blood pressure, but doctors failed to change or increase treatment dosages, therefore leading to poorer patient outcomes.⁵ This is something the researcher suspects to be prevalent in her own local health care system too, from day to day experience of working with diabetic patients and reading through their files.

Audits that followed up on improvements over a few years pointed out that without regular interventions and review, the outcomes were difficult to sustain. They found it important not to just focus on doctors, but to include other health care workers, community resources and the patients themselves to maintain improvements over a number of years.⁹

Few studies that were found evaluated the use of a patient held record card specifically for diabetes, but most systems operated in such a way that only one major caregiver was involved in the care of each patient (e.g. family practitioner/clinic) who would be involved in investigations, referral for investigations and change in treatment. Communication between hospitals and clinics or between tertiary/secondary care and primary care providers did not seem to be a problem in articles that were reviewed, but this remains a serious problem in the researcher's district. One study did look at the use of a patient held card, as well as an information leaflet, as aids to an "education pathway" for newly diagnosed type 2 diabetics. It was found to be a useful tool, and improved patient involvement in their own health care.¹⁸ In Tunisia, the use of disease specific medical records in the patient's actual files, was found to be useful. This would prompt practitioners to do certain investigations as needed, ask about smoking, diet and exercise, examine eyes and feet and record all results concisely.⁶

The concept of patient-held medical records or cards with other conditions, or for general practice patients, has been widely researched. A number of studies looked at the use of patient held records in cancer patients. A randomised trial found that the patients did value the concept, as they had control over information, information could be shared by different professionals involved with their care, and records were immediately available in the event of an emergency.¹⁹ In the UK, as part of an effort to get more public involvement in healthcare, it was found the issuing a patient held card which highlighted risk factors for each individual and their targets, was found beneficial by patients and doctors alike.²⁰ Another study in which patients were issued a patient-held health summary found that the greatest effect in changing patients' knowledge, attitudes and behaviour to health promotion came from combining this health summary with an explanatory booklet.²¹ This is something the researcher should consider carefully when planning interventions as part of the quality improvement cycle.

The use of a patient held "treatment card" for patients on ARV treatment in South Africa is most likely based on World Health Organisation guidelines²² as an aid to improve monitoring and care of patients. However, no trials in which the use of this or a similar card had been evaluated were found. In South Africa the use of general patient-held records was investigated in a rural sub district in KwaZulu-Natal.²³ It was found that they have a valuable role to play in improving the standard of health care and in improving continuity of care between a district hospital and clinics or GP's. In areas where patients may make use of their community clinics, general practitioners or the hospital casualty sporadically, a cycle of "episodic care" can be perpetuated. The patient-held record can create a vital link between these health care facilities.²⁴ Owning their own patient-held record has also been found to encourage patients to take more "ownership" of their own health.²⁵ Fears that these patient-held records can easily get lost appear to be unfounded.²⁵ A study in the North-West Province found that only 2,6% of patients lost their record over a period of 30 months,²⁶ versus many hospital records departments where up to 10% of patient files cannot be found.²⁴ Although these studies refer specifically to patient-held records

(i.e. the whole patient file), it does illustrate that patients can benefit and take good responsibility for holding any form of record concerning their health.

The researcher did not find many published audits, quality improvement cycles from South Africa, except for an appreciative inquiry done by the Metro District Health Services⁴ and an audit in Khayelitsha.¹² The findings of the inquiry revealed 11 points which brought about results. Developing clinical skills, empowering patients and involving community were interventions consistent with those in international articles that were reviewed. This local inquiry highlighted the importance of building chronic care teams, having strong consistent leadership of that team, having a structured approach, caring for the healthcare workers themselves when facing high patient loads and improving referral pathways. Another study was performed in a tertiary setting, and found that although a structured consultation schedule did increase individual consultation time, it decreased the number of visits that was necessary per year, and improved patient care.²⁷

In choosing target outcomes for the audit, the researcher found abundant studies which reinforce the use of certain investigations, treatment modalities and goals in the care of diabetics. Control of blood pressure is of vital importance in improving patient outcomes. In the UK Diabetes Prospective Observational Study where results were adjusted to all other factors such as age, ethnicity, smoking, cholesterol levels etc., they found a nearly linear association between systolic BP and myocardial infarctions, strokes, amputations and micro vascular complications.²⁸ For each 10mmHg reduction in mean systolic BP, there was an associated 12% decreased risk for any end-point related to diabetes, including death.

The same study also looked at glycaemic control in type 2 diabetics. A 1% reduction in the updated mean HbA1c was associated with a 21% risk reduction for any endpoint of diabetes.²⁹ Another study looked at tight glycaemic control in type 1 diabetics and this was found to significantly decrease the progression of diabetic nephropathy.³⁰ Two systematic reviews that looked at the impact of retinopathy screening found that the use of a mydriatic camera was the most sensitive method.^{31,32} In patients that were subsequently treated, it would have prevented 6% from going blind in the first year after treatment and 34% in the subsequent 10 years. In a systemic review concerning the reduction of foot ulcers in diabetics, it was found that patient education, well-organised and regular care with rapid referral to appropriate teams can decrease the morbidity associated with diabetic foot ulcers.³³ Even intensive patient education only can decrease the morbidity.³⁴ Monofilaments were also found to be cost-effective in monitoring for early neuropathy.³²

Good management and a structured, systematic approach to the care of diabetics, remains the key to improving patient outcomes, with certain interventions showing more promise than others. A patient held record card is an intervention that has not been researched for diabetic patients, but would be a simple intervention in the public health population of South Africa.

Aims and Objectives:

Aim

To perform an audit on diabetes care in the Macassar Community Health Centre population and implement a cycle of quality improvement.

Objectives

- To determine the number of diabetic patients attending Macassar Community Health Centre from clinic records or diabetic register.
- To determine the current standard of care for patients diagnosed with diabetes, by retrospective clinical audit.
- To use an audit team to discuss the current standard of care and determine ways of improving it.
- To evaluate the current fundoscopy clinic and identify areas where improvements can be achieved.
- To negotiate easier referral pathways to our surgical clinic for those assessed to have imminent/current diabetic foot complications.
- To implement the use of hand held cards to all patients in the clinic and staff at Macassar Community Health Centre (if this was decided to be a feasible intervention during the audit team planning) and assess its impact, as well as educate on better systems in place and inform them of the preliminary results of the audit and the standard outcomes and targets set.
- To repeat the audit after a year in order to assess whether target outcomes have been met, assess any significant differences in figures from original assessment and what changes had the biggest influence on improving these outcomes.
- To continue a new cycle of quality improvement involving all the other clinics and using the changes shown to be of benefit in the original audit.
- To use the audit to highlight problems or lack of services in the system and motivate for change.

Methods:

Setting:

The audit took place at the Macassar Community Health Centre. This facility has about 1000 patients in their diabetic register, although files were found where it was clear that the patient had not attended for a number of years, and it was not indicated if the patient had been transferred to another facility or had possibly died. Macassar is situated in the Helderberg area of the Eastern substructure of the Cape Peninsula. It is a low to middle income area, with many small homes, but most with running water and electricity. There is a population of about 38000 people in Macassar.³⁵

Study Design:

An audit (as part of a quality improvement cycle) took place between April 2010 and May 2011. The researcher met with all the staff involved in the management of diabetic patients at the clinic. This was attended by the Sister in charge of chronic diseases and 6 other sisters/ staff nurses. They discussed the project and together formulated criteria and set performance levels for each one, as they felt was appropriate for their population and clinic. These were divided into structure, process and patient outcomes (see table 1). Two Hundred and fifty folders were selected randomly and examined to determine to what extent these targets were met in 2009. The selection of folders was by means of convenience sampling, in which the administrative staff selected files off the shelves that had a colour coded sticker which marks all diabetic's folders, until 250 were obtained to be audited.

Numerous interventions took place between April 2010 and April 2011 including visits from a Family Medicine consultant every second week, talks and presentations to the staff on aspects of diabetic care, e.g. reminder on use of foot examination, checking and addressing weight issues and insulin use. Patients were issued a newly designed patient held card (see fig.1), which served as a means to record the results of screening tests and prompt both the patient and clinic staff to address all issues over a period of 12 months.

Clinic staff were also encouraged to make optimal use of facilities at their disposal, e.g. retinal screening by means of mydriatic camera assessment.

After a year of interventions, another random sample of 250 files was drawn and evaluated to see if improvement in reaching the target standards had occurred and highlight areas that still need attention.

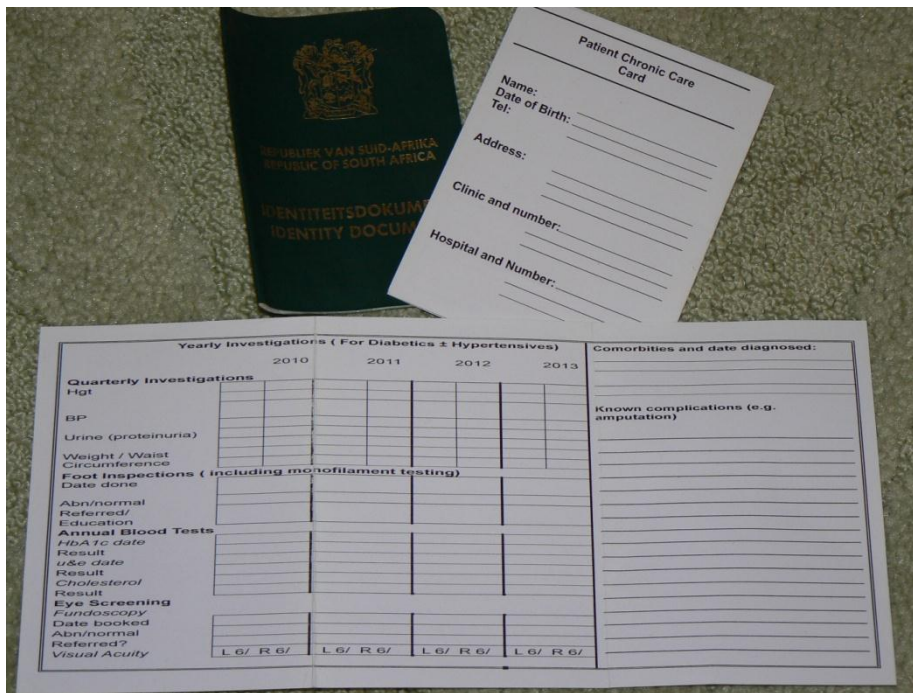


Figure 1: Example of patient chronic care card

There were some problems encountered during this process – firstly, the “random” selection of folders was not what the researcher had in mind, but was accepted as being the least disruptive to their daily work and unlikely to affect the quality of results. Information was not always recorded in the folders e.g. admissions to hospital for diabetes related complications or an indication of when the complications, such as amputations or myocardial infarctions, had occurred. Sometimes folders were drawn in which it was evident that the patient had moved away from the area or no longer attended the clinic. If the patient had not been seen for more than a year or not at all in the period that was audited, the file was discarded and a new one selected.

Ethical Considerations:

Permission to conduct the study was obtained from the University of Stellenbosch Ethics committee and the Director of the Eastern Substructure of District Health Services.

Due to the fact that it was a retrospective clinical audit, a “waiver of informed consent” was requested from the Stellenbosch Ethics Committee (Ethics research number N10/02/061). It was considered to be valuable research that will improve patient care and the health of the community. The information was collected by only using file numbers on the data schedule to protect patient confidentiality. The final results reflected general trends in current diabetes care and do not refer to any particular individual.

Results:

The results are presented in table form to compare the findings of the audit pre and post intervention. The chosen criteria and standards are included, as well as the results of the Integrated Audit of Chronic Disease Management (CDM) 2009 for Macassar Community Health Centre. The CDM integrated audit looked at 10 folders of diabetic patients, compared to the 250 folders assessed with the current audit. Twenty-eight out of thirty-five outcomes showed an improvement with the second audit, yet only nine of these were a significant improvement when taking a confidence interval of 99% into account. P-values were not calculated for structure outcomes.

Structure Outcomes

Criteria Each consultation room has:	Set Standard	CDM Integrated Audit 2009	Audit Jan 2009-Dec 2010	Audit May 2010 – Apr 2011
<i>Copy of approved protocol</i>	100%	Not checked	100%	100%
<i>Working blood glucose metre</i>	100%	100%	100%	100%
<i>Blood glucose strips</i>	100%	100%	100%	100%
<i>Working Scale</i>	100%	100%	100%	100%
<i>Tape measure</i>	100%	100%	100%	100%
<i>BP monitor with different size cuffs</i>	100%	50%	50%	100%
<i>Urine dipsticks</i>	100%	100%	100%	100%
<i>Snellen chart</i>	100%	100%	100%	100%
<i>Tuning fork</i>	100%	Not checked	100%	100%
<i>Patella hammer</i>	100%	Not checked	0%	50%
<i>Monofilament</i>	100%	100%	100%	100%

Table I

Process Outcomes

Criteria	Set Standard	CDM Integrated Audit 2009	Audit Jan 2009- Dec 2010	Audit May 2010 – Apr 2011	P values (CI=99%)
<i>Patient weighed during the year</i>	80%	33%	43%	92%	0,000
<i>BMI recorded during the year</i>	80%	50%	57%	79%	0.000
<i>Waist circumference measured during the year</i>	80%	Not part of audit	0%	63%	0.000
<i>Blood glucose tested on last visit</i>	100%	Not part of audit	97%	100%	0.006
<i>Blood pressure checked on last visit</i>	100%	100%	96%	78%	0.085
<i>Urine tested on last visit</i>	100%	Tested annually 90%	48%	100%	0.000
<i>HbA1c recorded annually</i>	95%	40%	21%	42%	0.000
<i>Creatinine recorded annually</i>	95%	70%	53%	48%	0.262
<i>Cholesterol recorded annually</i>	95%	70%	51%	46%	0.227
<i>Visual acuity tested annually</i>	95%	60%	34%	40%	0.123
<i>Retinal screening done annually</i>	95%	50%	31%	38%	0.640
<i>Foot examination done annually</i>	95%	30%	29%	33%	0.400
<i>Counselling on diet, exercise, smoking cessation and alcohol use</i>	100%	50%	56%	84%	0.000

Table II

Patient Outcomes

Criteria	Set Standard	CDM Integrated Audit 2009	Audit Jan 2009 - Dec 2010	Audit May 2010 – Apr 2011	P values (CI=99%)
<i>Average blood glucose <11mmol/l</i>	90%	Not audited	74%	69%	0.201
<i>Average BP <140/90</i>	100%	Not audited	47%	56%	0.035
<i>Average BP <130/80</i>	90%	70%	26%	28%	0.706
<i>Admissions to hospital for diabetes related complication</i>	<25%	Not audited	16%	10%	0.022
<i>Prevalence of foot complications</i>	<25%	Not audited	10%	20%	0.000
<i>Prevalence of eye complications</i>	<25%	Not audited	23%	36%	0.000
<i>Prevalence of renal complications</i>	<25%	Not audited	7%	14%	0.001
<i>HbA1c <7</i>	75%	75%	5%	7%	0.000
<i>Cholesterol <4,5</i>	75%	14%	13%	20%	0.049
<i>Creatinine <120</i>	75%	71%	41%	43%	0.146
<i>Medication changed if HbA1c>7 or average blood glucose >11</i>	95%	Not audited	57%	32%	0.000

Table III

Discussion:

According to the knowledge of current staff at Macassar Community Health Centre, this is the first audit of this size looking at diabetes care. It therefore provides us with very relevant and significant evidence on which to judge current standards of care and to guide future interventions and planning at this centre.

Most of the targets for the structure outcomes were achieved once the need for appropriately sized BP cuffs was emphasized and an understanding of the use of the recommended equipment for checking for an “at risk diabetic foot”.

In general, the follow up audit in 2011 showed an improvement in process outcomes, yet still only 3 out of 13 were above the chosen performance level. It is also important to note that the majority of results showed a much lower outcome than the CDM audit, which shows how an increased sample size can give more accurate information.

Prior to the audit process, the staff did not know the usefulness of waist circumference measurements in assessing cardiovascular risk, and therefore it was never done before 2010. In the second audit 63% of patients had had their waist circumferences measured annually, which although not on target, was a statistically significant improvement. Waist circumference is also an important measurement for staff and patients to use to assess the success of weight loss and exercise programs.

There was also an increase in the taking of HbA1c's, yet not an increase in taking other bloods such as creatinine and cholesterol. In assessing the folders, this seemed to be related to which doctors were working at the clinic at that period. There is generally a high turnover of doctors at the CHC, most often Community Service doctors that only stay for a year. Yet the drawing and assessment of these blood tests should be part of the routine management done by nurse practitioners, who can then refer those with abnormal test results to the doctors for further management.

Despite having access to retinal photography screening the last few years, there is still too few patients getting retinal screening. The staff pointed out that although appointments were made, many patients would not come on that day. This was confirmed by assessment of the folders in which the appointment date for retinal screening was written down, but no results found for that day. This does not, however, explain the same low figure for measurement of visual acuity, which can be done at any time the patient presents for follow up. It also shows that sometimes our focus needs to be on the patient's knowledge and perception of their illness and not just the training of the staff. Future interventions in the quality improvement cycle could focus on education of the patients instead.

There was a similarly low number of foot examinations taking place, despite a session to remind the staff on how to do such an examination. This could be due to a perception that the examination doesn't

add much to the patient's care, except for some advice on how to take care of their feet. This could be due to the lack of podiatrist services in the state sector. Often, it is only the extremely vascular compromised patients that would be referred for actual interventions, the rest left to be managed at clinic level. Yet evidence shows that many primary level interventions can still be of great benefit to patients, for example a graded exercise program to treat claudication, or referral to an orthotist for those with deformities of their feet (an orthotist does visit the clinics and district hospital a few times a year and can issue specially designed insoles for example). Thus the need for annual foot exam should not be underestimated and it also remains an opportunity to reinforce good foot care to the patient.

The amount of counseling given to patients improved during the year of intervention, yet this could be that the staff were making more effort to actually record in the file that it was given. There was also no means of checking what sort of counselling was given concerning the areas of diet, exercise, smoking and alcohol use, yet in general this would be guided by available protocols used in the clinic.

None of the patient outcomes achieved the set performance levels, except those assessing the presence of complications. Yet this low prevalence of complications or hospital admissions is quite likely due to the fact that it was not recorded, and also taking into account that more than 50% of patients missed out on some of these vital screening tests. For example, 36% of all the patients reviewed had eye complications (mostly an early grade of retinopathy), yet if one only looks at the patients that actually had the screening done, the incidence moves up to 75% which gives a better reflection of the actual number of complications in this population.

It is in keeping with the literature that structure and process outcomes showed a bigger improvement than patient outcomes⁷.

It is particularly disappointing to see the small proportion of patients with blood pressures under the target of 130/80, which is the recommended blood pressure for diabetic patients.¹⁴ HbA1c results should also prompt an effort to improve glucose control. Studies have shown that a 1% decrease in mean annual HbA1c can give a 21% reduction in any endpoint of diabetes, including death.¹⁶ Yet we see that in only 32% of patients who had an average blood glucose more than 11mmol/L or an HbA1c greater than 7, was a change in medication made. This could be due to a phenomenon described in the literature as "clinical inertia", where a healthcare worker acknowledges an abnormal result, but fails to make changes that would lead to an improvement.⁵ This could be due to time constraints or the perception that these abnormal results were due to a temporary situation which will rectify itself in the future (e.g. the patient might have admitted to not following diet regulations very carefully the days prior to the consultation). However, this could lead to persistent problems in the primary health system where patients often only see a doctor every 6 months. The problem is just "recycled" to the next visit, without anyone taking the step of changing the medication or starting a patient on insulin when it is actually needed.

Conclusion

The study was successful in determining the current standard of care of diabetics at Macassar CHC and commencing a cycle of quality improvement. An audit team was created and involved in setting target standards. They possibly overestimated their current standards when setting the targets, which could be why only 3 out of 13 process outcomes, and 3 out of 11 patient outcomes were achieved in the second audit, despite the general improvements after the cycle of interventions. Retinal photography is available and must be fully utilised by staff and patients. Foot examinations need to take place more frequently with prevention of complications being the focus. Hand-held patient cards were handed out to most of the patients, but this intervention would have to be assessed separately with a different research tool to assess its particular impact on improved management of diabetics. The audit also showed the need for both training of the clinic staff, as well as patients in the future. The quality improvement cycle should continue with new interventions taking place and periods of reflection, until the target standards are met.

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Appendix A.

Patient-held card:

The card was designed to fold in into thirds and would then be the size of an ID book.

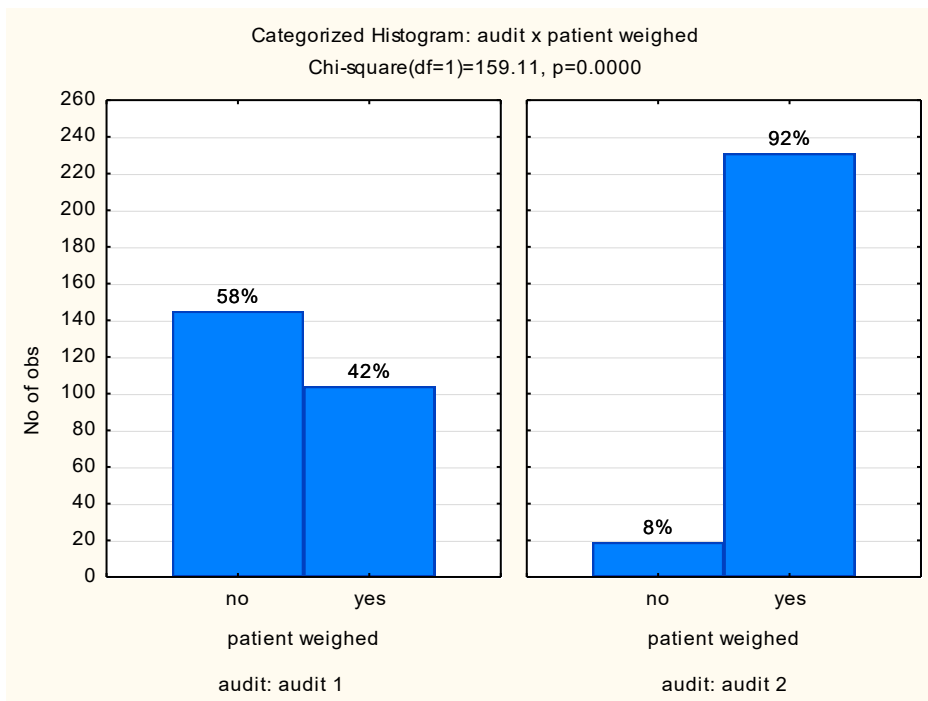
On the outside cover, there is place for the patients name and hospital/ clinic file numbers. On the back, there was space for notes and adjustments to medication.

Yearly Investigations								Comorbidities and date diagnosed:
	2010	2011	2012	2013				
Quarterly Investigations								
Hgt								Known complications
BP								
Urine								
Weight/waist circumference								
Foot Inspections (including monofilament testing)								
Date done								
Abn/normal								
Referred/								
Education								
Annual Blood Tests								
HbA1c date								
Result								
Creatinine date								
Result								
Cholesterol								
Result								
Eye Screening								
Fundoscopy								
Date done								
Abn/normal								
Referred?								
Visual Acuity	L 6/ R 6/	L 6/ R 6/	L 6/ R 6/	L 6/ R 6/	L 6/ R 6/	L 6/ R 6/	L 6/ R 6/	

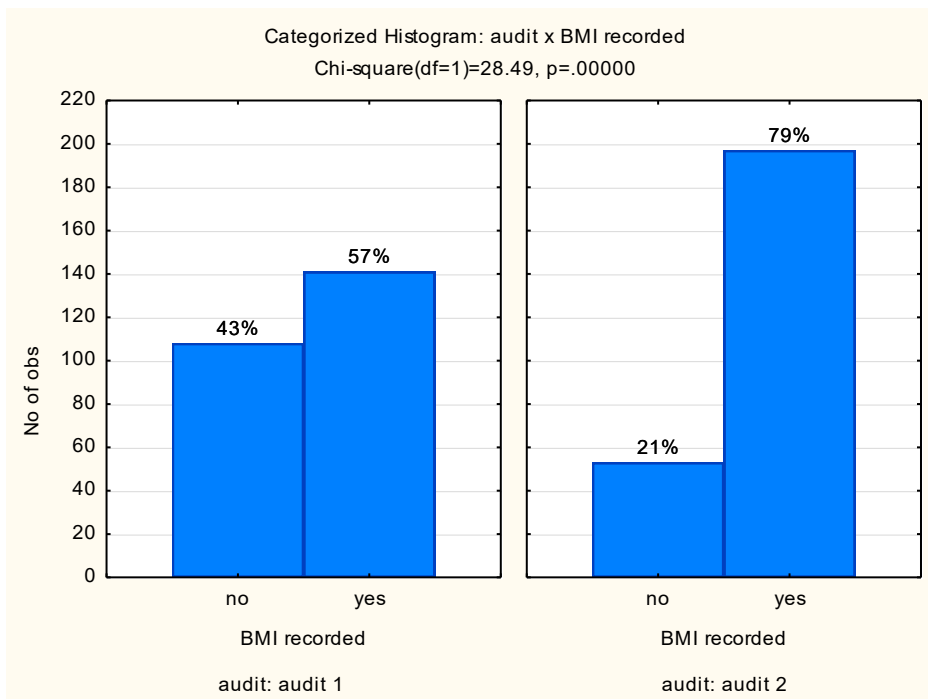
Appendix B

Results in graphic form

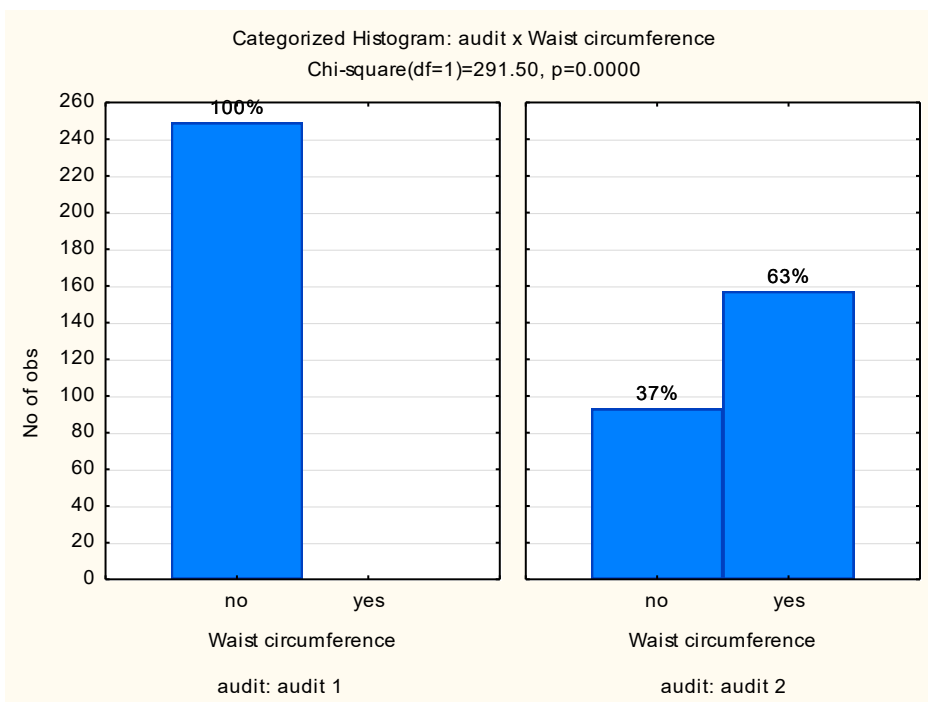
Categorized Histogram: audit x patient weighed



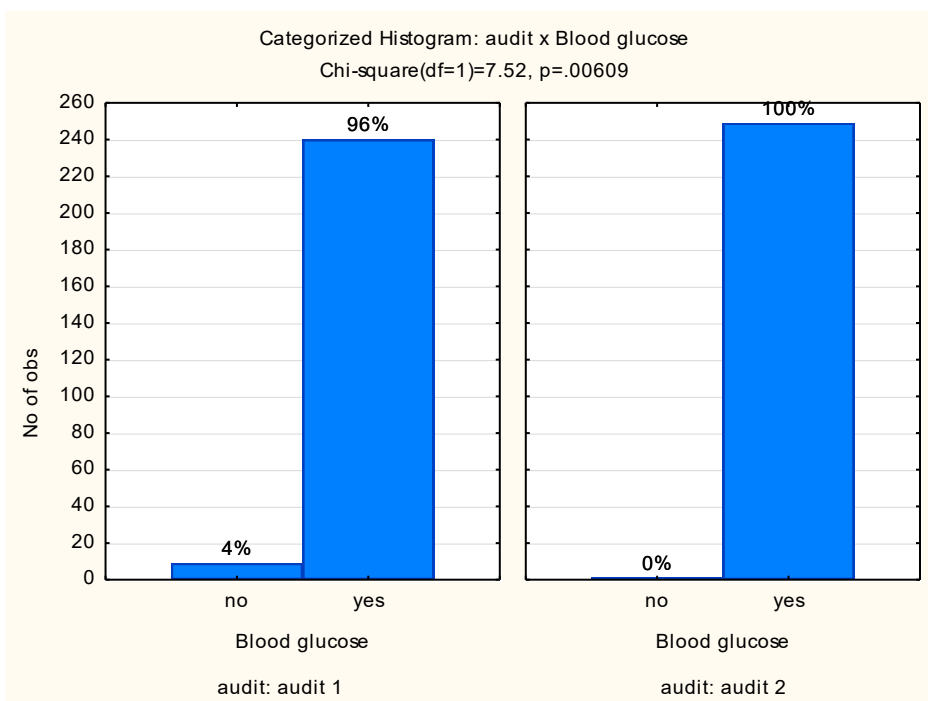
Categorized Histogram: audit x BMI recorded



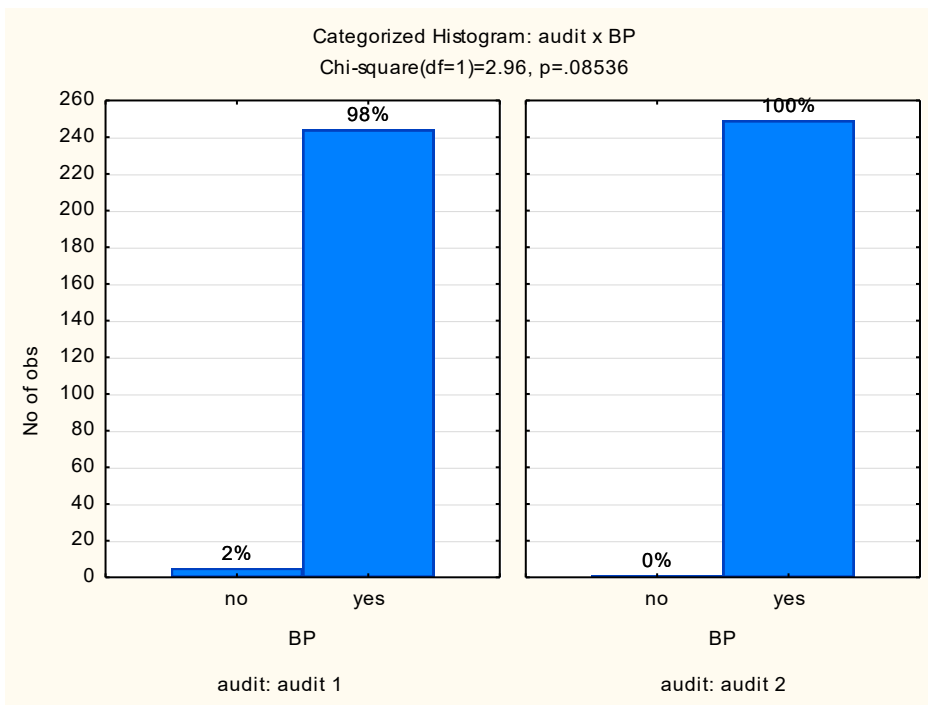
Categorized Histogram: audit x Waist circumference



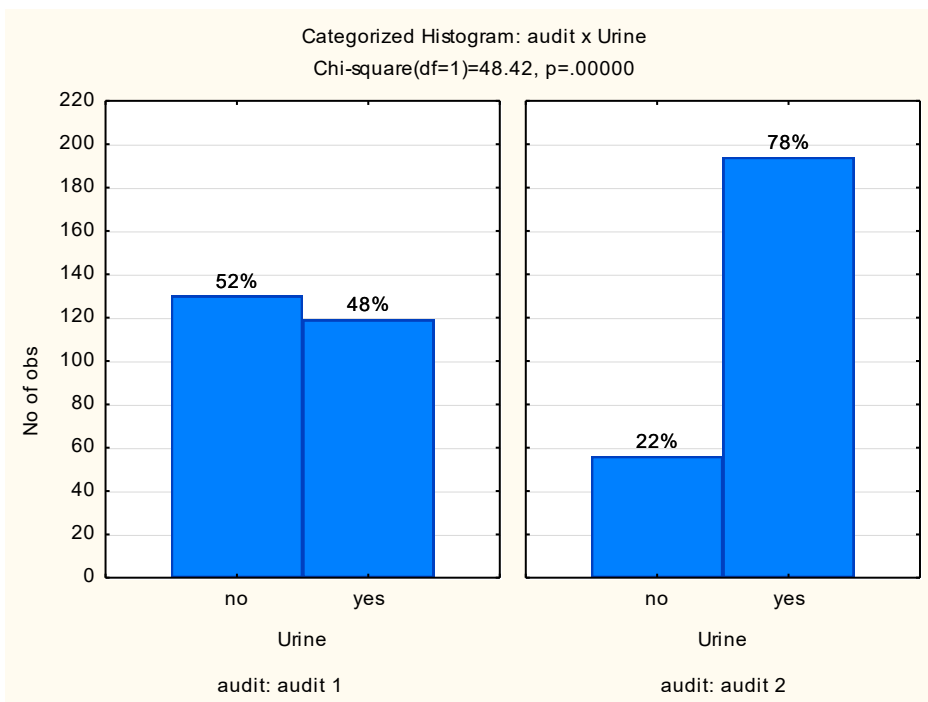
Categorized Histogram: audit x Blood glucose



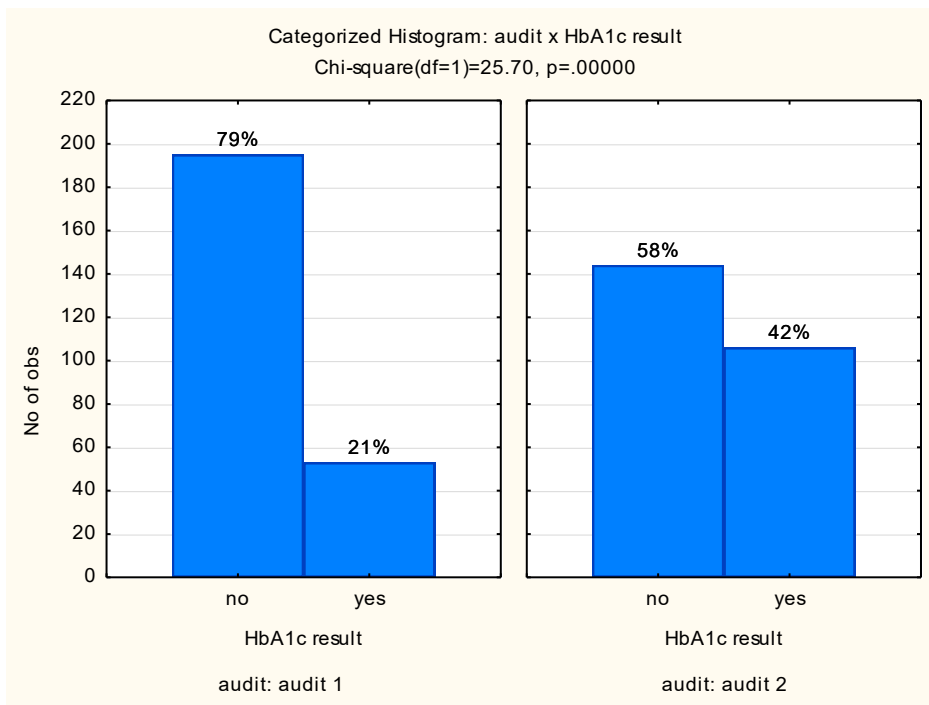
Categorized Histogram: audit x BP



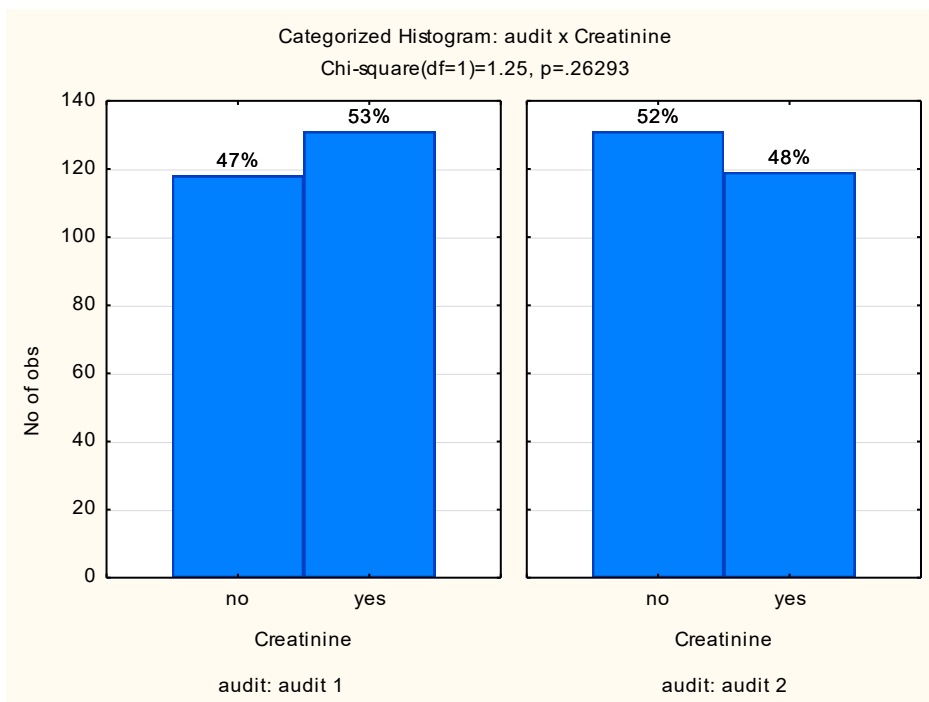
Categorized Histogram: audit x Urine



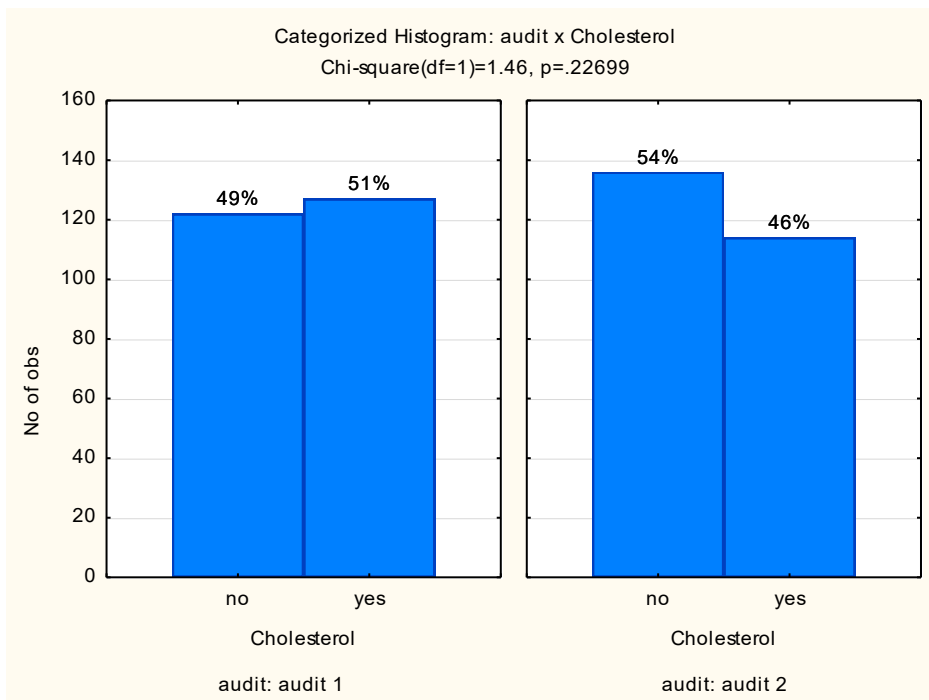
Categorized Histogram: audit x HbA1c result



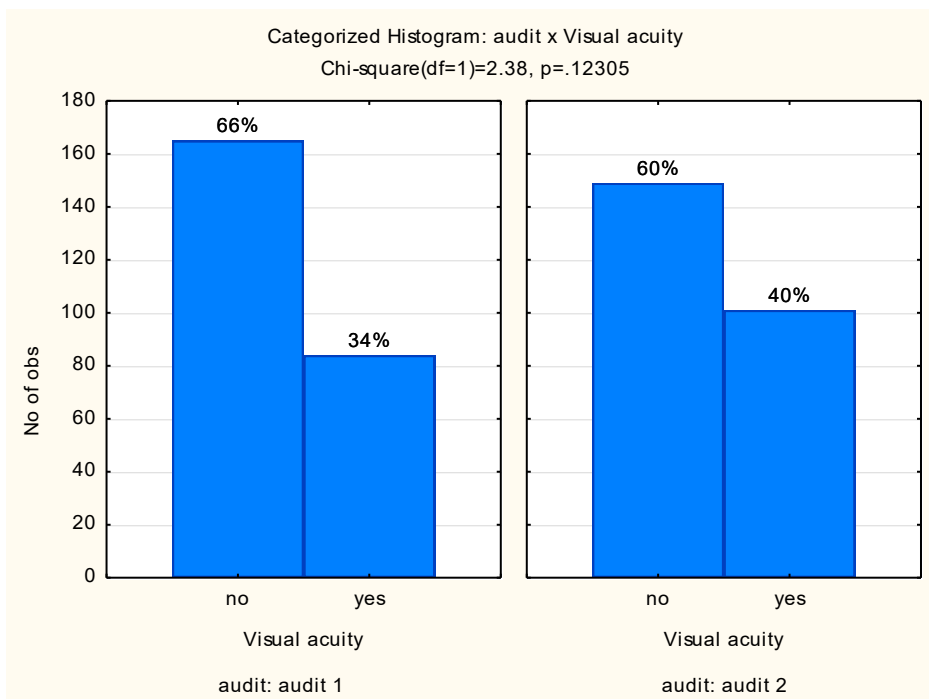
Categorized Histogram: audit x Creatinine



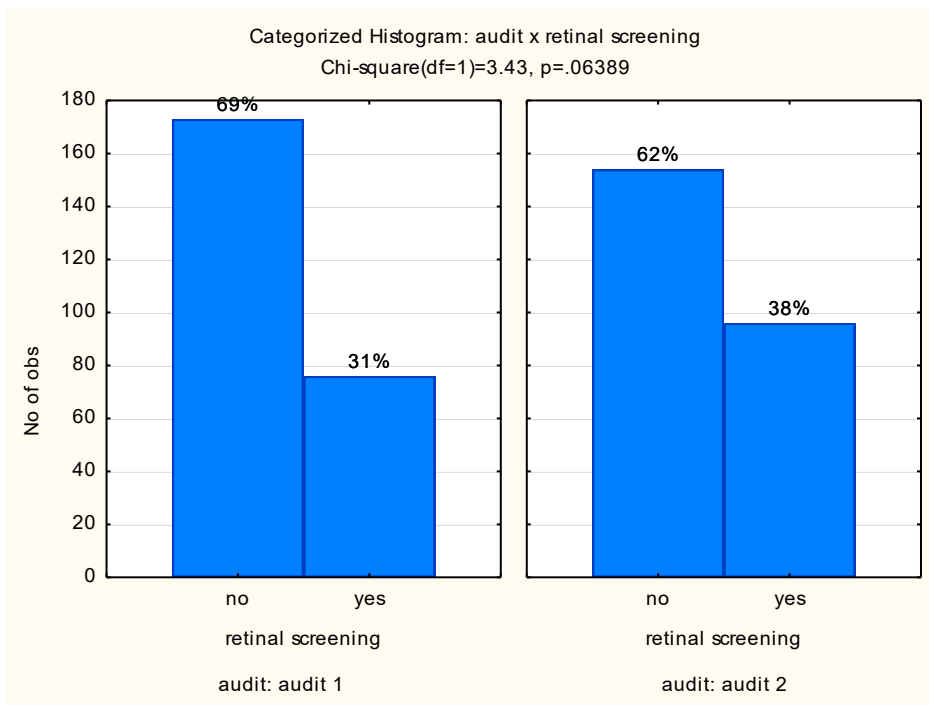
Categorized Histogram: audit x Cholesterol



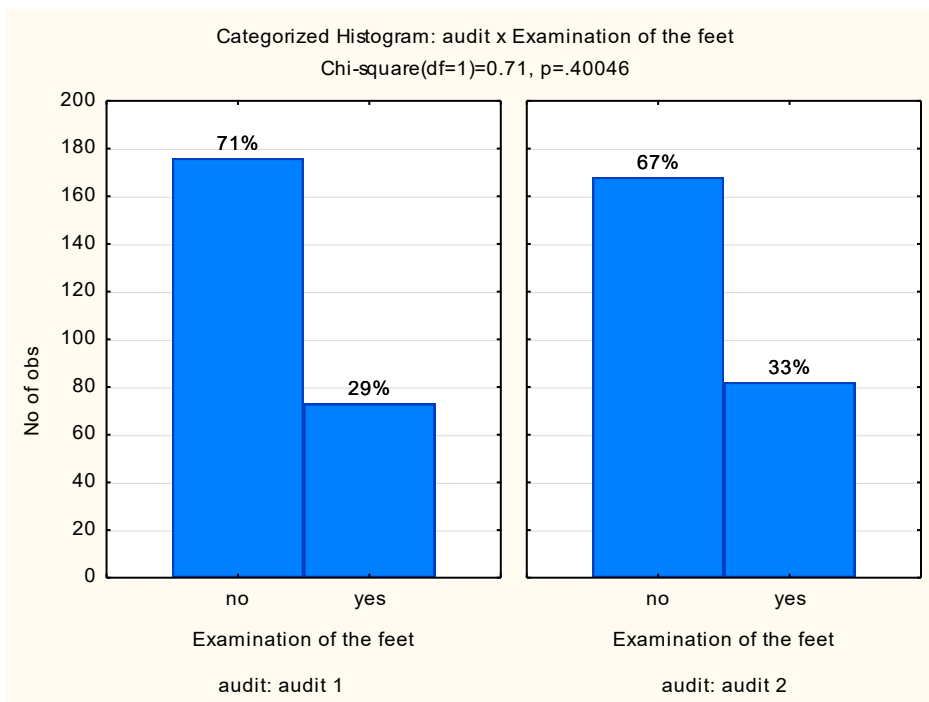
Categorized Histogram: audit x Visual acuity



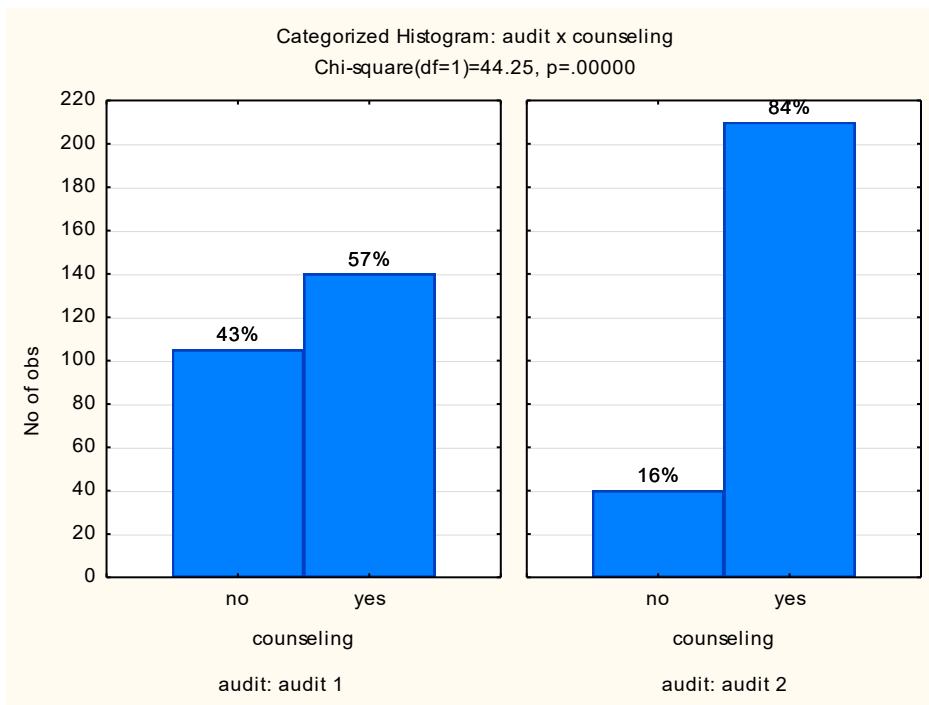
Categorized Histogram: audit x retinal screening



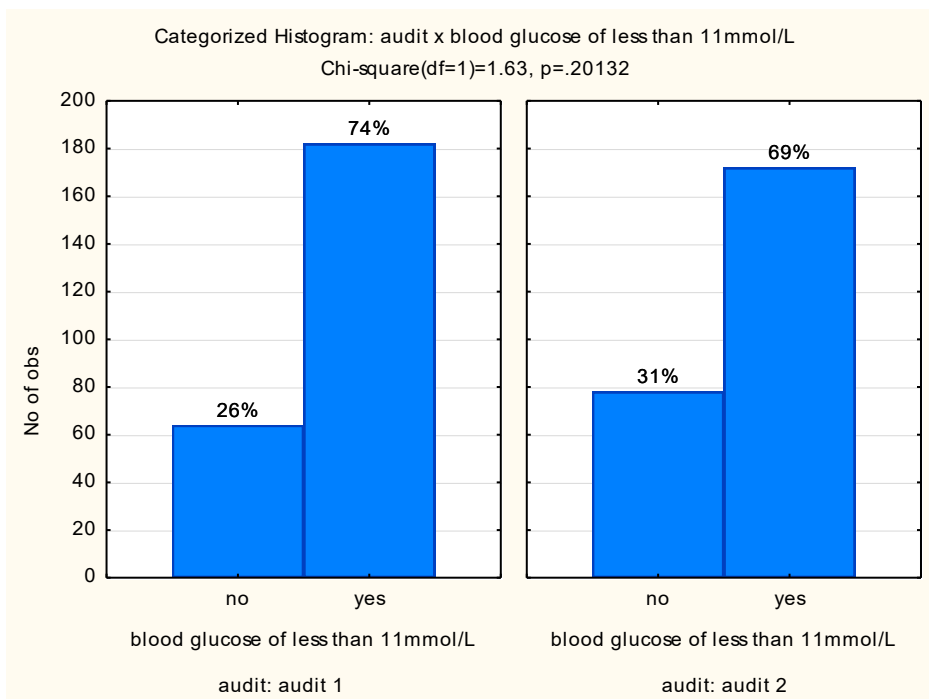
Categorized Histogram: audit x Examination of the feet



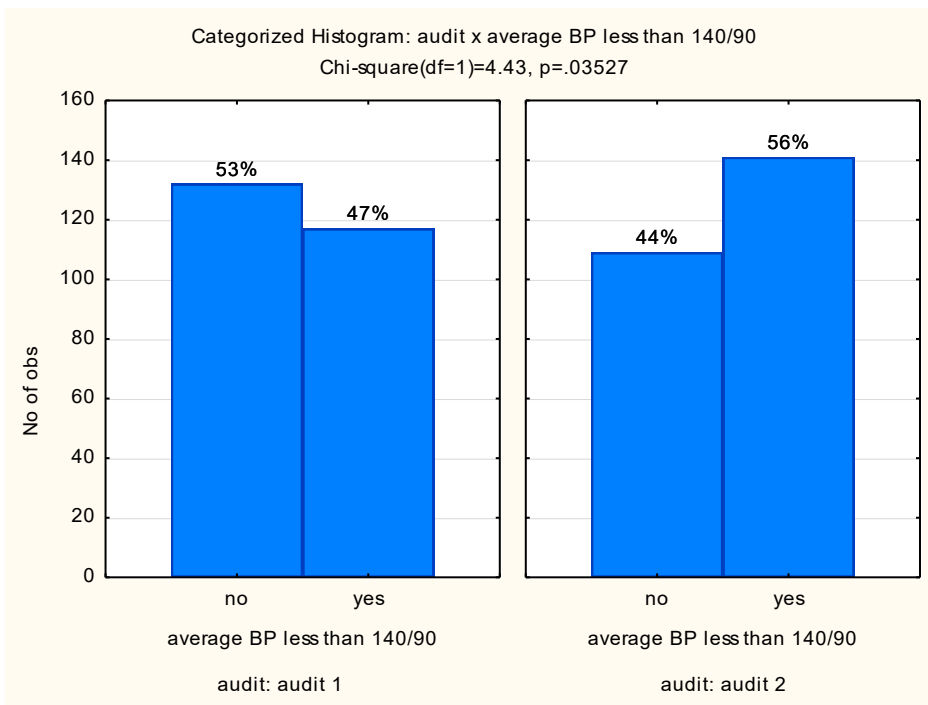
Categorized Histogram: audit x counseling



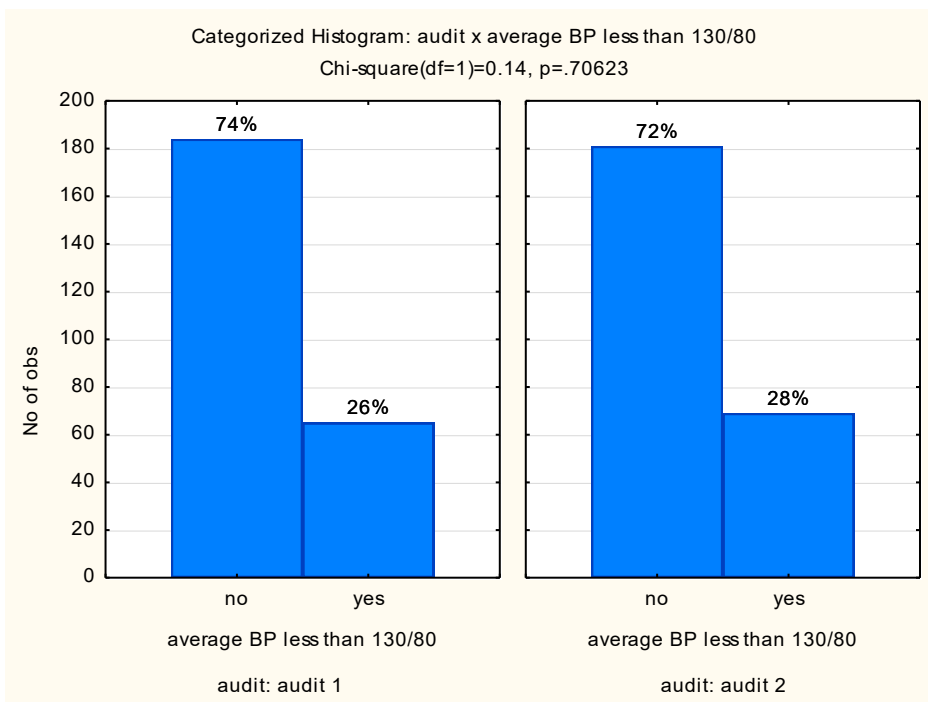
Categorized Histogram: audit x blood glucose of less than 11mmol/L



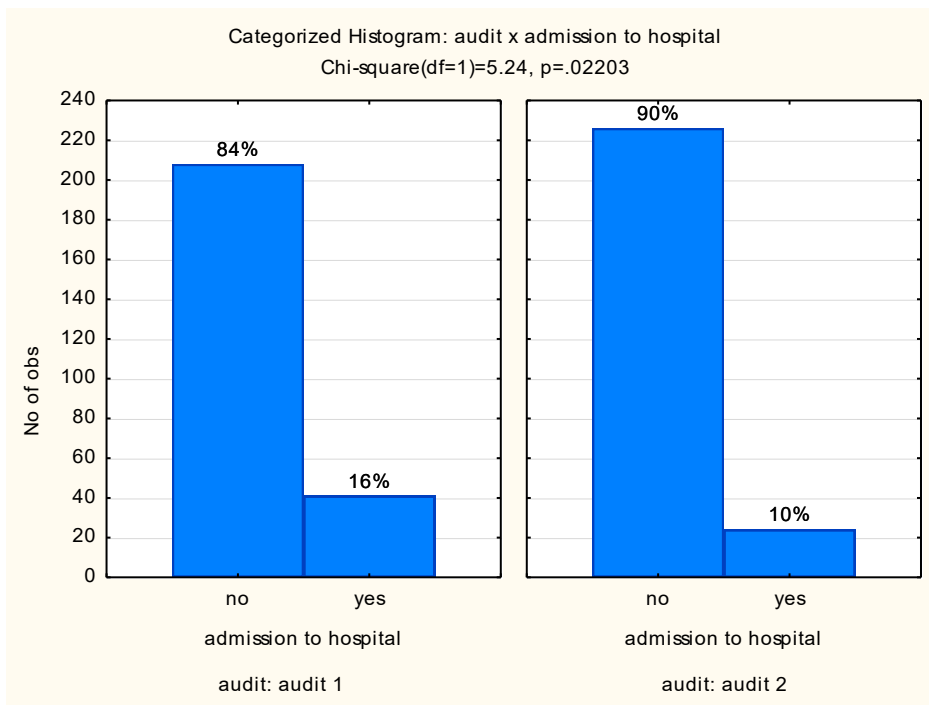
Categorized Histogram: audit x average BP less than 140/90



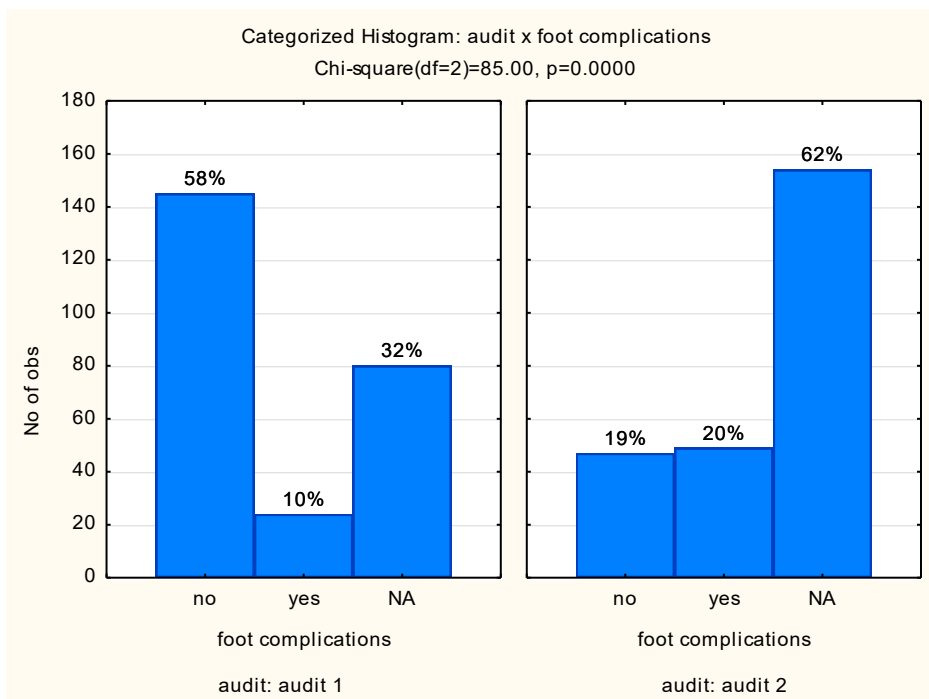
Categorized Histogram: audit x average BP less than 130/80



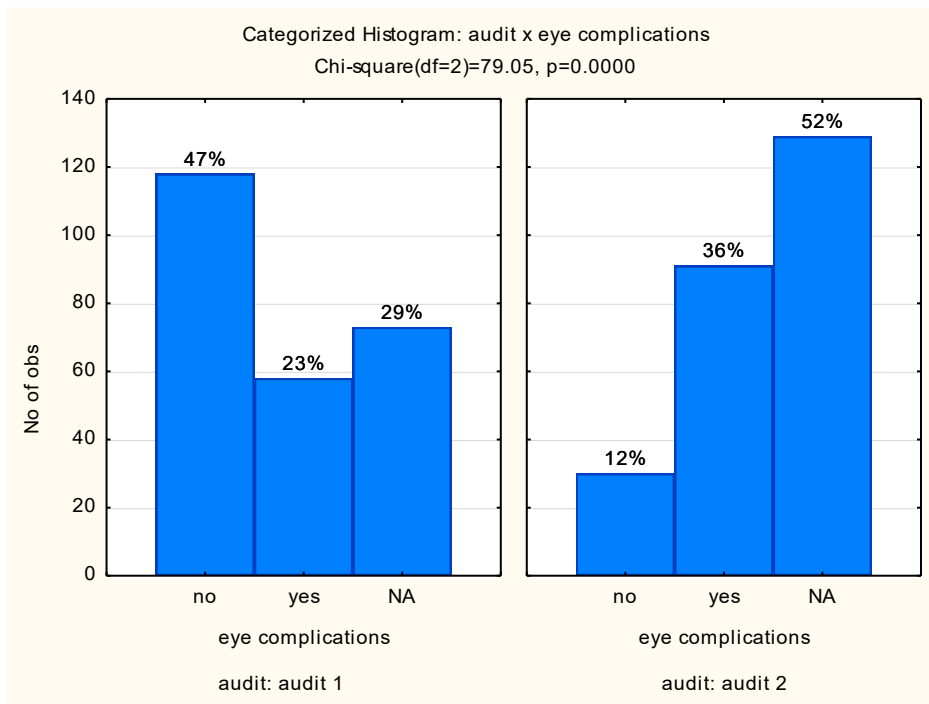
Categorized Histogram: audit x admission to hospital



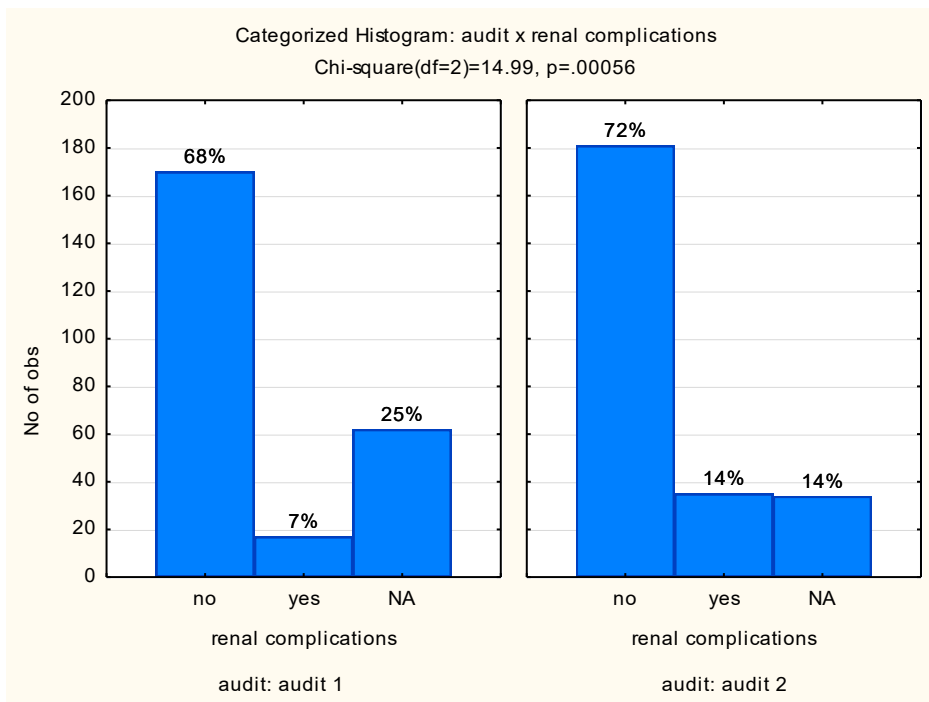
Categorized Histogram: audit x foot complications



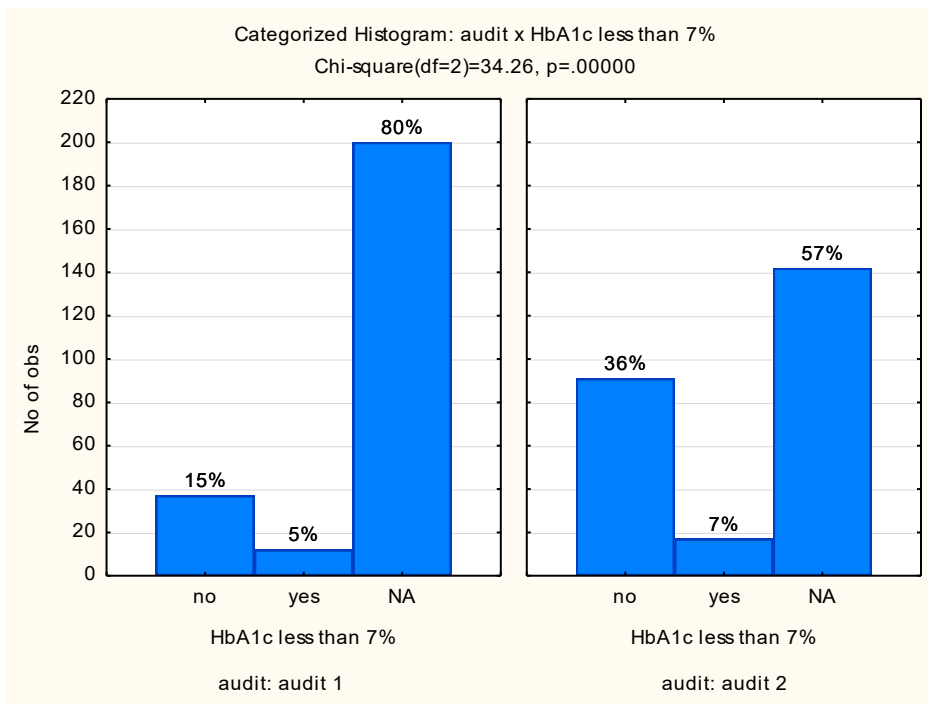
Categorized Histogram: audit x eye complications



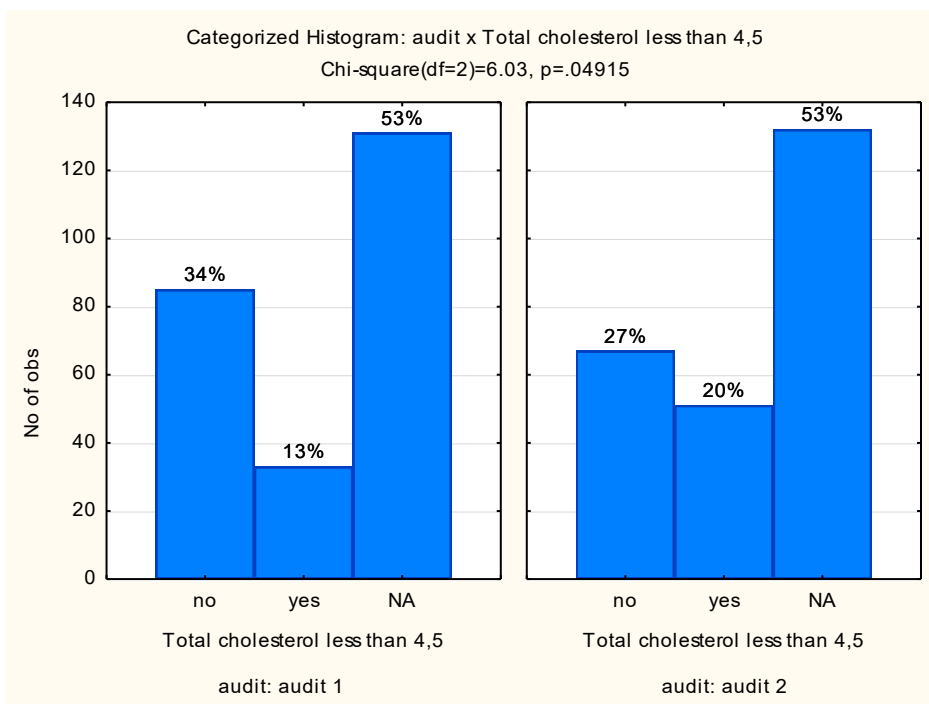
Categorized Histogram: audit x renal complications



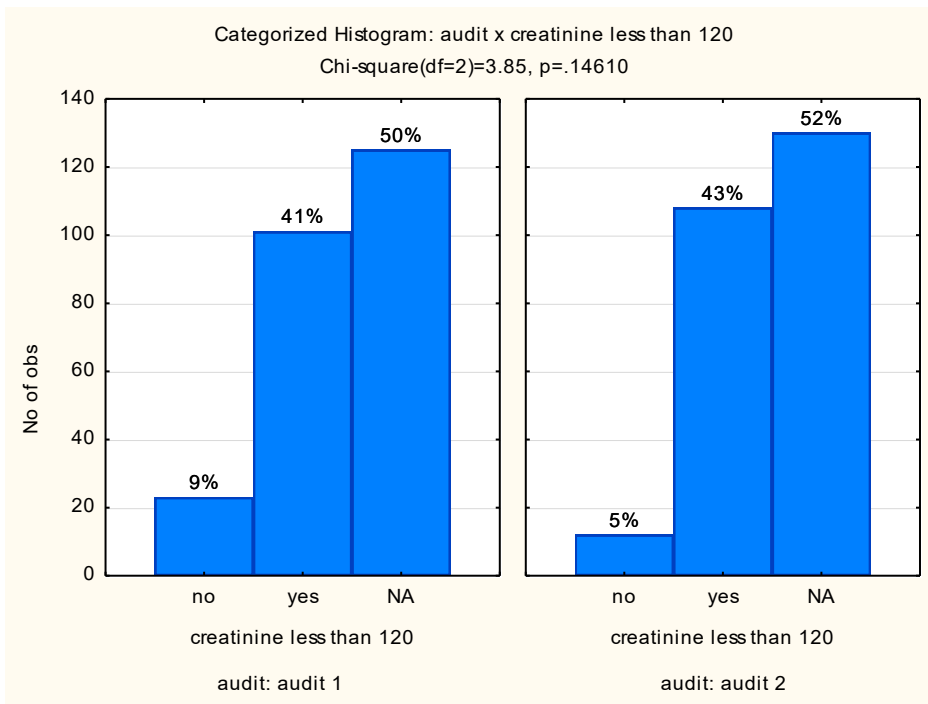
Categorized Histogram: audit x HbA1c less than 7%



Categorized Histogram: audit x Total cholesterol less than 4,5



Categorized Histogram: audit x creatinine less than 120



Categorized Histogram: audit x change of medication

