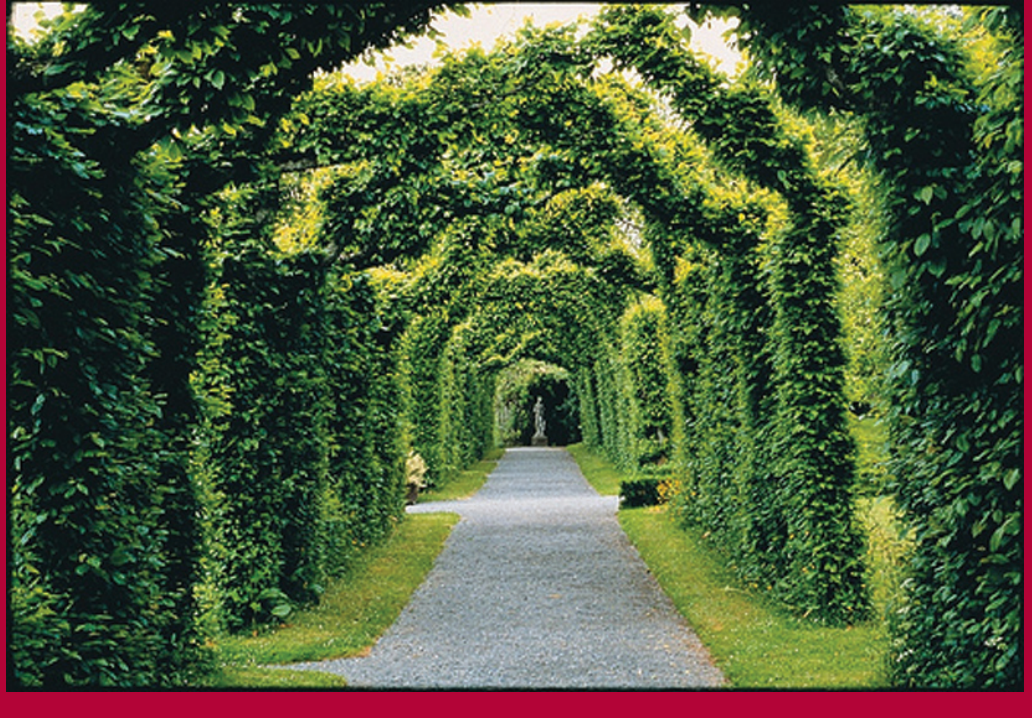
Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Audit Report of the HSE Midland Diabetes Structured Care Programme



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Midland Diabetes Structured Care Programme

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Executive Summary

The HSE Midland Diabetes Structured Care Programme is a primary care based programme dedicated to improving the quality of care for patients with diabetes. The HSE Midland area encompasses the counties of Longford, Westmeath, Laois and Offaly. The programme was established in 1997/1998 through a partnership between a number of General Practitioners (GP's) with an interest in diabetes and the Department of Public Health and Planning in the then Midland Health Board. Recently, a Consultant Endocrinologist has been appointed to Midland Regional Hospital Mullingar to provide a hospital based diabetes service to the region.

Patients with diabetes enrolled on the programme are managed in primary care with structured specialist support provided to participating practices including diabetes nurse specialists, enhanced access to dietetic, ophthalmology and chiropody/podiatry services and 'fast track' referral to the vascular services at Midland Regional Hospital Tullamore. Participating practices also receive education inputs for GP's and practice nurses and project management support for the development of local clinical guidelines, protocols and quality assurance systems. Structured care for patients with diabetes is now provided in 30 GP practices comprising 67 GP's and since the commencement of the programme over 3,700 patients have been identified as having diabetes and are registered with participating practices.

Audit Methodology

There are currently 30 practices actively participating in the HSE Midland Diabetes Structured Care Programme. Data from 28 practices were collected by the Diabetes Clinical Nurse Specialists between November 2008 and March 2009. Data sources included the patient's clinical notes (both electronic and paper) together with letters in the clinical notes regarding outpatient appointments in acute hospitals, referrals to other services such as chiropody/podiatry, retinopathy and dietetics etc.

Due to the large number of patients currently enrolled on the programme it was not feasible to audit every patient so it was decided to audit an appropriate random sample of patients from each practice. The sample size calculation resulted in 1,168 patients to be included in the audit and after data collection there were data for 1,071 patients for analysis.

The recently published Irish College of General Practitioners guidelines – "A Practical Guide to Integrated Type 2 Diabetes Care", were used to benchmark performance. Comparisons were also made with previous audit reports of the programme and other national audits such as the Diabetes Interest Group Cork and Diabetes Watch in the HSE North East area and also the recent audit from the UK.

Overall Findings

Of the sample of patients audited, males accounted for 56.5% and 92.3% of patients had Type 2 diabetes. Regarding age profile, 36% of patients with Type 1 diabetes were under 40 years and over half of all patients with Type 2 diabetes were over 65 years which is in line with international norms.

The insulin use in patients with Type 2 diabetes now stands at 17.2% compared to 7.6% at the last audit in 2003.

Process of Care Measures

Recording of process of care measures was in excess of 98% for HbA1c, blood pressure, total cholesterol, triglycerides and creatinine, while the recording of smoking status and body mass index (BMI) improved since the 2003 audit.

Annual Review and Screening

The percentage of patients who attended for their annual review increased substantially to 90.5% compared to 32.5% in 2003 although attendance is significantly greater for patients with Type 2 diabetes (91.1% v 81.3%).

Fifty seven percent of patients were reviewed by a chiropodist/podiatrist compared to 32.6% in 2003. This increase can be attributed to increased numbers of chiropodists/podiatrists involved in the provision of this service. Due to ongoing education provision by the Diabetes Clinical Nurse Specialists, the GP's and practice nurses are now capable of carrying out a diabetic foot assessment and this is reflected in 78% of patients receiving a diabetic foot assessment in the past year.

Over half of all patients (51.5%) attended for retinopathy screening in 2009 which is an increase on 44.2% in 2003. However it is still disappointing to see that only half of patients are in receipt of a retinopathy review currently.

There was little change in the proportion of patients attending for dietetic review – 41.8% compared to 42.4% in 2003. This is of concern given the rising prevalence of obesity in Ireland.

Overall, the level of screening for diabetic complications falls far short of current guidelines. These highlight the need for substantial increases in resources to manage diabetes care in the community.

Outcomes of Care

Regarding glycaemic control, 36.3% of patients with Type 2 diabetes are currently in the low risk category (<6.5%) compared to 28.6% in 2003. At the other end of the scale, 25.6% are in the high risk category (>7.5%) – this was 42.9% in 2003.

For patients with Type 1 diabetes there has not been as much of an improvement with just 11.3% categorised as low risk compared to 10.9% in 2003, while 72.5% are in the high risk category – this was 71.7% in 2003.

These findings emphasise the challenge of optimising glycaemic control in patients with diabetes, the need to work with individual patients to implement current best practice with regard to dietary management and intensive therapy, without an unacceptable increase in the risk of hypoglycaemia or adverse effects on patient's quality of life. This is where the availability of the Diabetes Nurse Specialists to patients in the programme is crucial.

There has been an increase in the prevalence of retinopathy from 17.2% to 24.8%. This may be due to increased ascertainment due to more patients undergoing screening or perhaps due to the increased length of time since diagnosis for some of these patients as the data shows that those diagnosed for more than five years have much higher rates of retinopathy.

There has been a significant decrease in the prevalence of foot ulcers for patients with both Type 1 and Type 2 diabetes – 2.5% in 2009 compared to 6.1% in 2003. This improvement can be attributed to the implementation of the evidence based foot assessment protocol in addition to increasing numbers of patients having a regular foot assessment and review by chiropodist/podiatrist.

The admission rates for complications such as ketoacidosis and hypoglycaemia and other complications such as micro and macrovascular complications and amputations all decreased since 2003 showing the benefits of the programme for patients with both Type 1 and Type 2 diabetes even though the programme would be predominantly aimed at patients with Type 2 diabetes.

Risk Factors

Smoking prevalence was 20.4% - a minor decrease from 2003 (20.7%). However prevalence was 37.7% for patients with Type 1 diabetes and 19.1% for patients with Type 2 diabetes. It should be noted that this data were missing for approximately 23% of patients.

The median body mass index (BMI) was unchanged in this audit from 2003 at 30kg/m^2, with over half (51.5%) of all patients in the category of obese (>30kg/m^2). This was 52% in 2003 which highlights the fact that overweight and obesity continues to be a major challenge in the provision of diabetes care.

Waist circumference was measured for the first time in this audit and showed that 81.7% of males and 93% of females had central obesity as defined by waist circumference. The results of these two risk factors serve as timely reminders of the input needed to encourage patients to modify behaviour in order to attain healthier lifestyle and better health.

The data showed that blood pressure control has improved over the past number of years but it still remains a challenge with less than half of the patients audited meeting the recommended guideline of ≤130mmHg for systolic blood pressure. The picture was significantly better for diastolic blood pressure with 73% meeting the recommended guideline of ≤80mmHg. The recent ICGP guidelines indicate a target overall blood pressure of ≤130/80mmHg but only 38% of patients met this target which reflects the difficulty of achieving optimal blood pressure control in everyday practice with patients with diabetes.

The lipid profile improved from the previous audit with 80.6% of patients meeting the target for cholesterol (54.6% in 2003), 61.3% meeting the target for triglycerides (49% in 2003) and 66.2% meeting the target for LDL cholesterol (32.8% in 2003). There was no change in HDL cholesterol levels between the two audits with 76.3% currently meeting the specified target.

The Cardiovascular Health Strategy (1999) recommended that patients with diabetes should receive the same secondary preventative care as would be given to a patient who is known to have cardiovascular disease. Patients with diabetes should be targeted with aspirin and statins. The audit showed that 80% of patients were prescribed a statin and 74% were prescribed aspirin.

Performance in a National and International Context

It is important to put the findings from this audit in context by comparing the performance of the HSE Midland Diabetes Structured Care Programme with similar programmes nationally and internationally. The audit reports of the recent Diabetes Watch and Diabetes Interest Group provide important national comparators for the programme with similar numbers of patients involved in both programmes. The findings from the current audit compare very favourably with the Diabetes Watch and Diabetes Interest Group findings in relation to all processes and outcomes of care.

An international perspective is also of value in appraising the findings from this audit. In the UK, the National Diabetes Audit recently reported on its 2007/2008 audit and the HSE Midland Diabetes Structured Care Programme compares extremely well in the areas of recording of processes of care, achievement of treatment targets, risk factor targets and glycaemic control.

Conclusion

The findings from this audit show that the HSE Midland Diabetes Structured Care Programme is delivering care to patients with diabetes in accordance with the recommended national guidelines. The findings also demonstrate that there have been improvements in glycaemic control since previous audits, the prescribing levels of secondary preventative medications are extremely high and that the incidence of complications has improved considerably over time despite increased numbers of patients being enrolled onto the programme.

The HSE Midland Diabetes Structured Care Programme demonstrates the high level of care that can be achieved in the primary care setting due to the commitment of the primary care staff in conjunction with the support and education being offered by the project team.

Managing diabetes in the community is challenging. Not all elements of this audit report are satisfactory and it is important that the HSE Midland Diabetes

Structured Care Programme does not get complacent regarding the excellent performance as reported here. The audit has highlighted some areas where improvement is required, such as screening for complications and a need to address the increasing obesity levels, if patients with diabetes are to get quality care that is consistent with national and international standards.

Recommendations

Based on the findings from this audit report, we make the following recommendations:

1. The HSE Midland Diabetes Structured Care Programme has demonstrated how care for Type 2 diabetes can be effectively managed in primary care. This should be considered by the HSE as an appropriate and cost-effective model for delivery of care for Type 2 diabetes to the whole population within an integrated services approach.

2. The renewed focus to the delivery of diabetes care, through the Quality and Clinical Care Directorate, is welcomed. The experience gained over the past 10 years by the Diabetes Structured Care programme and shared through audit and research should inform future work.

3. The HSE Midland Diabetes Structured Care Programme should be expanded to include all General Practices and Primary Care Teams in the Local Health Office Areas of Laois/Offaly and Longford/Westmeath.

4. Regarding education, the HSE Midland Diabetes Structured Care Programme should promote the development of a multidisciplinary diabetes module on the management of the patient with diabetes in primary care. This module would be open to all service providers within the Diabetes Structured Care Programme and would greatly assist in ensuring the consistent implementation of the Diabetes Integrated Care Guidelines.

5. The HSE Midland Diabetes Structured Care Programme should provide support to GP's to enable their practice nurses to attend the five-day diabetes programme - Nursing Management of Individual with Diabetes, which is accredited by Dublin City University.

6. The HSE Midland Diabetes Structured Care Research Group should review the current audit data collection tool with a view to collecting additional data on mortality from cardiovascular disease in addition to overall incidence rates for complications.

7. The foot care risk assessment protocol should be modified to classify risk assessment per foot. This should give a more accurate reflection of risk of developing foot complications. Also, who conducted the foot assessment should be noted for future audits.

8. The HSE Midland Diabetes Structured Care Programme should continue to work with the National Diabetes Register Project.

9. There is a further need to develop the Information Technology infrastructure to allow for real-time collection of audit data, annual reporting of audit findings and long term follow up of all patients participating in the project. The output from the National Diabetes Dataset project will influence this development.

10. The issues identified regarding the retinopathy screening process need to be addressed.

1. Introduction

The HSE Midland Diabetes Structured Care Programme is a primary care based programme dedicated to improving the quality of care for patients with diabetes in the counties of Longford, Westmeath, Laois and Offaly. The programme is one of the longest established primary care based diabetes care programmes in Ireland. It was established in 1997/1998 through a partnership between a number of General Practitioners (GP's) with an interest in diabetes and the Department of Public Health and Planning in the then Midland Health Board. Recently, a Consultant Endocrinologist has been appointed to Midland Regional Hospital Mullingar to provide a hospital based diabetes service to the region.

Patients with diabetes are managed in primary care with structured specialist support provided to participating practices including diabetes nurse specialists, enhanced access to dietetic, ophthalmology and chiropody/podiatry services and 'fast track' referral to the vascular services at Midland Regional Hospital Tullamore. Participating practices also receive education inputs for GP's and practice nurses and clinical guidelines and protocols have been developed along with quality assurance systems. Structured care for patients with diabetes is now provided in 30 GP practice sites with 67 GP's (and 18 GP Registrars) and 37 practice nurses delivering the programme. Over 3,600 patients have enrolled in the programme over the ten years and there are over 3,000 patients currently enrolled.

HSE Midland Diabetes Structured Care Programme: Overview

The initial aims of the programme were to develop a model of care for people with diabetes suitable for the Irish healthcare environment based on the St. Vincent Declaration and on best evidence. The specific aims of the programme initially were:

- To raise the overall standard of care for people with diabetes in the region.
- To document the barriers to implementing the model of care.
- To develop methods to evaluate the effect of changed processes on health outcomes for people with diabetes.
- To document the costs of implementing the changes and to maximise return per unit of resource consumed.

The programme mirrors recent developments in Irish health policy. Under the auspices of the Cardiovascular Health Strategy[1], the main aim of the programme is to provide high quality, equitable, effective and efficient services to patients with diabetes in the region. The programme was linked to the Cardiovascular Strategy in 2001 through the HSE Midland Area Primary Care Working Group and in 2002 the programme was integrated into the national cardiovascular disease secondary prevention programme in General Practice: *Heartwatch*. Since the reconfiguration of the health services in 2005/2006, the programme has a Diabetes Structured Care Research and Audit Group that co-ordinates audit and research for the programme, under the chairmanship of a Consultant in Public Health Medicine.

Previous Reports

An interim report on the programme was published in 1999[2] and this was followed by the first audit report in 2000[3]. A further audit was conducted in 2003 in conjunction with members of the University College Cork Department of Epidemiology and Public Health and this report was published in 2006[4].

The interim report addressed the objectives of the project and outlined the provision of care for patients with diabetes in the Midland Health Board area in the 1990's. It also outlined the work carried out on the development of a diabetic register and the development of a diabetes shared care book, including the consultation process with local GP's. This report also provided a brief review of the literature on specific aspects of diabetes care and diabetic registers.

The 2000 audit report was based on data collected in 1998/1999 from the first ten participating General Practices. Data were available from 298 patients with diabetes – this equated to 76% of the 392 patients identified as having diabetes from these initial ten practices. The audit report, following Donabedian's classification, presented data on structures, processes and outcomes of care evaluated against standards specified in the 1990 St. Vincent Declaration[5]. The findings from this audit provided the baseline comparator data for the 2003 audit. The background to the 2000 audit report provided a brief overview of indicators of the need for diabetes care, including data on the burden of the disease in the population and the evidence base for health service interventions. It also included a brief discussion of international and national trends with regard to service provision for patients with diabetes, with particular reference to the principles and targets adopted in the 1990 St Vincent Declaration.

The 2006 audit report followed on from the 2000 audit report and provided an assessment of the structures, process and outcomes of care defined on the basis of the national and international standards in place at the time. It compared the data from the audit report of 2000 and summarised trends in key quality of care indicators over this time. This report also reviewed the performance of the programme relative to other models of care in Ireland and internationally using available and relevant published data. The report made 11 recommendations in total including highlighting the need to expand the programme to all GP practices and Primary Care Teams in the area, to develop a diabetes register, to establish a formal chronic disease management system, identifying the need for a national diabetes strategy and to seek increased investment in health services and health systems research.

Aims and Objectives of the HSE Midland Diabetes Structured Care Audit Report 2008/2009

There are four specific objectives of this report:

- To measure to what extent the best practice guidelines for diabetes care in general medicine are being met
- To measure improvements in glycosylated haemoglobin (HbA1c) measurement over time using previous audit data.
- To investigate the level of prescribing of the recommended cardiovascular secondary preventative medications (aspirin and statins).
- To determine the incidence of complications in diabetes patients.

2. Background

2.1 Overview

Diabetes is the fifth leading cause of death in the world[6]. It places an enormous burden on the individual and his/her wider social network due to the continuous self-management required and the risk of micro- and macrovascular complications. The rising cost and prevalence of chronic illnesses, such as diabetes, have led to healthcare systems examining ways to reorganise services with growing emphasis on the development of primary care services[7]. It is widely accepted that acute models of care delivery will not cope with the future burden of disease and a more integrated disease management approach is needed[8]. This perspective is reflected in the wider policy framework of the national health strategy[9], the primary care strategy[10], and the most recent policy framework for the management of chronic illness[8]. In providing structured care for patients with diabetes in the primary care setting, the HSE Midland Diabetes Structured Care Programme offers a viable option to health systems trying to marry both cost effectiveness and quality improvement[11].

This chapter will outline the increasing problem of diabetes nationally and internationally and burden placed on the healthcare system and the individual. It will update the evidence base for diabetes management including developments in management of glycaemia and the complications of diabetes. It will also readdress the model of diabetes care provision in the community and efforts to improve care delivery.

2.2 The Burden of Diabetes

The rising problem of obesity, a more sedentary lifestyle and an ageing population are just some of the reasons for the projected increase internationally and nationally in the number of people with diabetes[12,13,14]. The World Health Organisation (WHO) Burden of Disease study estimated an increase in the worldwide prevalence of diabetes from 2.8% in 2000 to 4.4% by 2030. This equates to an increase from 171 million people in 2000 to 366 million people in 2030[13]. Looking towards Europe, the International Diabetes Federation – European Region (IDF-Europe) and the Federation of European Nurses in Diabetes (FEND) have collaborated on an audit of the epidemic levels of diabetes in 27 EU countries. The latest report projects an increase in the prevalence of

diabetes from 7.5% in 2003 to 8.6% of the population aged between 29 and 79 years in 2008 or over 31 million people[15].

The Diabetes Federation of Ireland estimated that 200,000 people have Type 2 diabetes in this country with a further 100,000 people who had the disease but were undiagnosed[16]. The most recent forecast in Ireland by the Institute of Public Health (IPH), estimated in 2005 that just over 140,000 people had diabetes (4.7% of the population). This figure is expected to rise to over 190,000 adults or 5.6% of the population by 2015 based on the most realistic forecast whereby obesity increases in a linear fashion[17]. The IPH figures for Ireland are likely to underestimate the true prevalence of diabetes as the proportion of undiagnosed cases was not determined due to inadequate primary care data. General practice prevalence rates estimate that approximately 9% of adult patients of Irish GP's have diabetes although this figure can vary widely depending on the age profile of the practice[18]. The 2006 census reported that the population of the four counties of the HSE Midlands Area - Laois, Offaly, Longford and Westmeath, was 251,664. Using the IPH estimate of a prevalence rate of 4.7% would indicate that there were 11,828 people in the HSE Midlands Area with diabetes in 2005.

2.3 Diabetes and its consequences

Diagnosis and Classification

Diabetes Mellitus is a group of chronic metabolic disorders characterised by hyperglycaemia as a result of defects in insulin secretion, insulin action or both[19]. According to WHO guidelines, the diagnostic criteria for diabetes is a fasting plasma glucose ≥ 7.0mmol/L or 2 hour post load glucose ≥ 11.1mmol/L during an Oral Glucose Tolerance Test (OGTT)[20,21]. These diagnostic criteria are reiterated in the recently published national guidelines[14]. The main categories of diabetes are Type 1 diabetes, Type 2 diabetes and 'other specific types' encompassing gestational diabetes and diabetes due to genetic defects. Type 1 diabetes is attributable to the destruction of insulin secreting cells in the pancreas leading to absolute insulin deficiency. Type 2 diabetes is characterised by defective insulin secretion and contributing insulin resistance[20]. Type 2 diabetes typically has a more gradual onset, indeed people often present with evidence of complications at diagnosis[22]. Initially people with Type 2 diabetes do not need insulin to survive but may in future require insulin therapy to manage their diabetes[20].

There are intermediate stages of elevated glucose levels between normal glucose regulation and diabetes known as Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT). In 2003 the American Diabetes Association (ADA) reviewed its diagnostic criteria for diabetes and recommended lowering the threshold for IFG from 6.1mmol/L to 5.6mmol/L[23]. This modification led to discrepancies with the global guidelines produced by the WHO in 1999[20]. In 2005 the WHO and IDF reviewed its own recommendations but decided to maintain the fasting plasma glucose cut-off point at 6.1mmol/L. Lowering the cut-off point would increase the prevalence of IFG and result in increased pressure on health systems while there is no evidence to suggest it would benefit people in terms of adverse outcomes or progression to diabetes[21]. According to the Irish guidelines for managing diabetes, IFG is classified as fasting blood glucose between 5.6 and 6.9mmols/L. IGT equates to two hour plasma glucose between 7.8 and 11.0mmols/L during glucose tolerance testing[14].

People with IFG and/or IGT are considered to be in a pre-diabetes state and at increased risk of developing Type 2 diabetes. The risk of progression is approximately 5% per year[14]. This group are also vulnerable to developing complications associated with the disease[24]. The risk of cardiovascular disease is almost equivalent to that conferred by Type 2 diabetes, particularly for people with IGT[14].

2.4 Diabetes Mortality and Morbidity

Mortality

The overall risk of dying among people with diabetes is at least double the risk of individuals without diabetes[25]. In 2000, 5.2% of all cause mortality was attributable to diabetes worldwide representing an estimated excess global mortality of 2.9 million deaths due to diabetes. This figure is more realistic as it takes into account deaths in which diabetes was a contributory condition[6]. Previous studies underestimated the true burden of diabetes mortality as they were based on the cause of death recorded on death certificates[26]. People with diabetes usually die of cardiovascular disease or renal disease rather than causes uniquely related to diabetes[27].

Morbidity

Life expectancy may be reduced by more than 15 years in people with Type 1 diabetes and between five and seven years in people with Type 2 diabetes of five to ten years[28]. The decrease in life expectancy among patients with diabetes is reflective of the severe and long term complications associated with the illness[29]. Diabetes also has an impact on an individual's quality of life. The WHO estimated that diabetes is responsible for 2.4% of all years of life lost in disability and 2.1% of all disability adjusted life years[30]. Given the high degree of self management involved for people living with diabetes, quality of life is increasingly recognised as an important health outcome[31]. Reviews of the literature on quality of life in diabetes suggest worse quality of life for people with diabetes compared to the general population but better when compared to people with other chronic conditions[32]. Diabetes has been shown to have the greatest negative impact through the dietary restrictions it requires, while it also has a profound effect on family and working life[33].

There are several potential complications facing an individual with diabetes including those affecting the microvascular system – retinopathy, nephropathy and neuropathy.

- Retinopathy - Diabetes is one of the leading causes of blindness among adults aged 20-74 years[34]. After 15 years of diabetes, approximately 2% of people become blind and about 10% develop severe visual impairment[25].
- Neuropathy – Up to 50% of people with diabetes develop nerve damage. This can lead to foot ulcers and in severe cases, limb amputation[25]. In fact every 30 seconds a leg is lost to diabetes somewhere in the world[35].
- Nephropathy – Diabetes has become the single most common cause of end stage renal disease[28]. The WHO estimate that between 10 and 20% of people with diabetes die of kidney failure[25].

Macrovascular complications include cerebrovascular disease, ischaemic heart disease and peripheral heart disease. In people with diabetes:

- All manifestations of cardiovascular disease are increased. In fact, cardiovascular disease is the leading cause of death among people with Type 2 diabetes[36].
- The risk of myocardial infarction and stroke is two to five times higher[28].

2.5 Health Care Costs

Due to its chronic nature and severe complications, diabetes is a costly disease for healthcare systems to manage. In 2002, the American Diabetes Association (ADA) estimated that $132 billion expenditure in the U.S. was attributable to diabetes[37]. If adjusted for inflation, this figure would be the equivalent of $153 billion in 2007. However a new estimate by the ADA in 2007 suggested the total estimated cost of diabetes was $21 billion higher than its initial prediction of $174 billion[38].

The Cost of Diabetes in Europe – Type 2 (CODE-2) study assessed the cost of managing Type 2 diabetes in eight European countries. The estimated total direct medical cost was €29 billion a year (1999 values) or an average of €2834 per person per year[39]. The cost of Type 2 diabetes care was largely attributable to the management of diabetes related complications as the total cost of managing patients with both microvascular and macrovascular complications was up to 250% higher then those without complications[40]. In the UK, diabetes is estimated to cost 5% of total NHS expenditure, similar to other European countries included in the study[41].

In Ireland, a study carried out with Type 2 diabetes patients in 2000 estimated that the total annual direct cost was €377.2 million for diagnosed diabetes. This figure increased to €580.2 million when undiagnosed diabetes was taken into account, equating to 6.4% of total healthcare expenditure. Hospitalisations accounted for 30 to 65% of the overall cost as 60% of patients sampled had developed complications. In fact, the cost of treating someone with both microvascular complications and macrovascular complications (21% of sample) was 3.8 times the cost of treating those without such complications[42]. Unlike the figures from the U.S., this study did not take into account the indirect economic burden of diabetes due to loss of productivity and workdays. In addition, many people with diabetes are cared for outside the hospital setting. However, there are no published studies to date on the cost of treating diabetes in primary care.

2.6 Managing Diabetes

There are several treatment goals in the management of diabetes including controlling blood glucose levels, managing blood pressure and lipids, foot care and screening for complications such as retinopathy and kidney disease. The individual is also responsible for managing his/her illness by maintaining a healthy lifestyle including a healthy diet, regular exercise and avoiding smoking.

Prevention

- **Screening**

There are a number of logical arguments for widespread screening to detect diabetes. The rising prevalence of the disease has been well documented, yet many people remain undiagnosed while many individuals with Type 2 diabetes present with complications at the time of diagnosis[22]. There are also effective treatments for the management of blood glucose levels, blood pressure and lipids. Yet, according to the WHO criteria, Type 2 diabetes does not meet the criteria for population based screening[43]. The effectiveness of early diagnosis through screening asymptomatic individuals has not been established by direct evidence from randomised controlled trials while the psychological consequences of widespread screening are unknown. These issues were highlighted by a joint report from the WHO and IDF[44]. This report advocated for immediate further research in 2003, however, the situation remains largely the same.

Population based screening also has significant cost implications for healthcare systems. The emerging evidence suggests it is more cost effective to target screening. Hoeger et al (2004) demonstrated that targeting those with hypertension was more cost effective than universal screening and suggested that screening was most cost effective among those aged 55 to 75 years[45]. A position statement from Diabetes UK in 2006 advocated targeted screening among high risk groups every three years. Risk factors included being older than 40 years (older than 25 years for Black, Asian and ethnic minority groups); family history; macrovascular disease or hypertension; overweight or obese; gestational diabetes; polycystic ovaries; impaired glucose tolerance and impaired fasting glucose. The recommendations are based on consensus from healthcare professionals and the professional advisory council of Diabetes UK. In the UK, those at high risk of diabetes are screened under the framework of cardiovascular disease risk management programmes[46].

- **Screening for Diabetic Retinopathy**

Retinopathy can often be asymptomatic and effective treatments are aimed as preventing or delaying rather than restoring vision loss underlining the importance of screening for this complication[47]. The early detection and treatment of retinopathy can reduce the risk of blindness and loss of sight[41]. The cost effectiveness of retinopathy screening has also been demonstrated[48,49]. The U.K. is the world leader in diabetic retinopathy

screening. As of 2007, 86% of people with diabetes had been offered retinopathy screening[50]. In Ireland in 2008, a national framework for retinopathy screening was approved by the HSE based on work by the diabetic retinopathy subcommittee of the Expert Advisory Group on Diabetes (EAG). The framework endorsed a national population-based call-recall programme delivered annually. The scheme would be facilitated by a register of people with diagnosed diabetes set up in each HSE area and collated nationally[51]. However, due to lack of resources, this scheme was not rolled out in 2008 as planned. Instead the screening programme will be rolled out on a phased basis, commencing in the HSE West region as a similar programme was established in the former North-Western Health Board.

Treatment

- **Optimal Glycaemic Control**

"Glucose control has become a measure of success in managing diabetes" (p.995; Wolpert et al, 2001)[52]. In the 1990's, several well documented clinical trials demonstrated the effectiveness of intensive glucose management in slowing the progression of microvascular and macrocvascular complications. The Diabetes Control and Complications Trial (DCCT) demonstrated that lowering glucose levels in patients with Type 1 diabetes was effective in the primary and secondary prevention of eye, kidney and nerve damage[53]. The UKPDS study found that improvements in glycaemic control among patients with Type 2 diabetes was associated with reductions in microvascular complications[22]. Both the UKPDS and DCCT trials concluded there was no significant difference in quality of life between patients on more or less intensive therapies. However, such conclusions may be overly optimistic given the measures used to assess the outcome. Bradley suggests it is misleading to suggest treatments do not damage quality of life when what was actually been measured and demonstrated is a lack of impact on perceived health[54].

- **Optimal Glycaemic Control and Progression of Complications**

There continue to be questions around the role of intensive glycaemic control in preventing macrovascular complications and all-cause mortality[55],[56]. More recent clinical trials have failed to demonstrate a consistent positive effect of intensive glucose management on reducing cardiovascular risk. The results of the Action to Control Cardiovascular Risk in Diabetes study showed no significant reduction in cardiovascular risk among patients with Type 2 diabetes[57].This trial also highlighted previously unrecognised risks of intensive

glucose management. The glycaemic arm of the five year study was stopped prematurely when it became apparent that the intensive glycaemic treatment group (target HbA1c 6%) had an increased mortality when compared to the conventional treatment group.

The ADVANCE study (Action in Diabetes and Vascular Disease: Preterax and Diamicron Modified Release Controlled Evaluation) also failed to demonstrate a significant reduction in cardiovascular risk following intensive glycaemic control[58]. The study did find a significant relative risk reduction in microvascular complications, mainly nephropathy. However, it has been suggested that this reduction is due entirely to a reduction in the incidence of albuminuria[55]. These results are in line with those from the VADT trial (Veteran Administration Diabetes Trial) where although multiple aspects of microvascular complications were assessed, the only statistically significant effect of tight glycaemic control was a reduction in the conversion from normo- to micro-albuminuria.

A meta-analysis was recently carried out on these three trials as well as the original UKPDS data from 1998 and the Proactive study to investigate the effect of differential glycaemic control on cardiovascular outcomes[56]. The results demonstrated a consistent beneficial effect of intensive glucose lowering treatment on cardiovascular events. Intensive treatment led to a significant 17% reduction in non-fatal myocardial infarction and a 15% reduction in events of coronary heart disease without a significant increase in the risk of all cause mortality. There was no significant reduction in events of stroke; however the authors suggest that the number of stroke events recorded conferred less power to detect a benefit[55,56].

A 10-year follow up of the UKPDS study, which was not included in the meta analysis, also provides optimistic results as the 1998 cohort of patients with Type 2 diabetes had maintained their cardiovascular risk reduction as well as showing significant reductions in microvascular complications and the risk of all cause mortality[59]. While the overall findings are reassuring of the effectiveness of tight glycaemic control on cardiovascular events, the evidence in terms of all-cause mortality is inconclusive. In addition, the results of the meta-analysis cannot indicate the optimum method of achieving tight glycaemic control or the superiority of one regimen over another. The findings reemphasise the need for specific recommendations for differing patient

populations regarding target HbA1c concentration and how quickly these targets should be reached[55,56].

Cardiovascular Risk Modification

Since the original UKPDS trial, the treatment strategy for diabetes has evolved and typically incorporates the use of statins, aspirin and hypertensive agents as well as smoking cessation. In contrast to tales of glycaemic control, there is robust evidence demonstrating the benefits of lipid lowering agents and blood pressure reduction in reducing all-cause mortality[56].

Hypertension is a highly prevalent risk factor among people with diabetes. An evaluation of hypertension treatment confirmed that improving blood pressure control conferred a consistent reduction in the risk of cardiovascular events and death. Aggressive blood pressure control can also lower the risk of microvascular events[60]. The risk reduction among patients with diabetes is greater than that seen among the general population who have similar blood pressure levels[61]. Based on the findings of the review, authors recommended that blood pressure targets for patients with diabetes should be more aggressive[60]. The current Irish national guidelines recommend a target of <80mmHg for diastolic blood pressure and <130mmHg for systolic blood pressure[14].

The UKPDS trial also examined the effect of blood pressure control in patients with Type 2 diabetes. In the 1998 study, the difference in blood pressure between the intensive treatment cohort and the conventional treatment group was associated with a 37% reduction in microvascular complications, a 42% reduction in the risk of stroke and a 32% reduction in the risk of death from "diabetes related causes"[22]. However, results from the UKPDS follow-up suggest the benefit of tight blood pressure control was not maintained over time[59].

Patients with diabetes may also have dislipidaemia as well as hypertension and require lipid management which aims to lower LDL cholesterol, raise HDL cholesterol and lower triglyceride levels[14]. Improved control of LDL cholesterol reduced cardiovascular risk by 20% to 50%[34]. A meta-analysis of 14 randomised trials of statins has demonstrated efficacy of this therapy in reducing macrovascular events and all-cause mortality[62]. Analysis of over 90,000 participants showed a 12% reduction in all-cause mortality per mmol/L reduction in LDL cholesterol as well as a reduction in major coronary events, coronary revascularisation and stroke by around one fifth per mmol/L reduction in LDL

cholesterol. This reduction was largely independent of the initial lipid profile or the presenting characteristics reinforcing the benefit of statin therapy in all patients at high risk of any major vascular event.

While the use of aspirin is still recommended for secondary prevention of cardiovascular disease in people with diabetes, its use in primary prevention has been questioned in recent times. The POPADAD trial (Prevention of Progression of Arterial Disease and Diabetes) found no evidence in favour of the use of aspirin or antioxidants in primary prevention of cardiovascular events and mortality in patients with diabetes and asymptomatic peripheral arterial disease[63]. The supplementary editorial recommended the prescription of aspirin in cases of established cardiovascular disease. The study challenges published clinical guidelines, such as the current Irish guidelines, which suggest a low dose aspirin be used even in the absence of established cardiovascular disease. However the results of a single trial are not conclusive and a series of questions have been raised including the statistical power of the trial. A meta-analysis of evidence from all relevant studies involving aspirin in primary prevention would go towards a more conclusive finding.

Foot Care

The risk of developing foot ulceration at some point over the lifespan is estimated to be as high as 25% among people with diabetes[64]. Diabetic foot ulcers have a serious impact on quality of life as well as having financial implications for the healthcare system due to hospitalisation and rehabilitation. A study conducted in Sweden estimated that the cost of treating a diabetic foot ulcer was $18,000 without amputation and almost twice as expensive with amputation ($34,000)[65]. A cost utility analysis study also based on the Swedish population suggested that if intensive prevention could reduce the incidence of foot ulcers and amputations by 25%, the strategy would be cost effective and even cost saving[66]. A preventative integrated approach should be taken on foot care, incorporating screening to identify people at high risk of ulceration as well as education and regular follow up[64,67].

2.7 Diabetes: Models of Care

The results from clinical trials have accumulated into a high quality evidence base for managing diabetes effectively and improving patient outcomes. However, there remains a measurable gap between the ideal standard specified in guidelines and the reality in everyday practice which has been demonstrated in several countries[68,69,70]. The organisation of diabetes care varies and involves primary care, the hospital based specialists, community services and increasingly participation by the patients and his/her support network. The degree of integration between these groups differs between countries. The varying and often suboptimal levels of care being delivered have led to a number of complex interventions, often called disease management programmes, aimed at improving the quality of diabetes care.

Shared Care

Shared care was one of the first demonstrations of efforts to improve care delivery for diabetes. The concept was a consequence of the increasing responsibility of primary care and GP's in the management of diabetes and to move away from the acute response to chronic disease management[71]. The HSE Midland Diabetes Structured Care Programme began as a shared care project in line with the definition of *"joint participation between hospital consultants and general practitioners in the planned delivery of care for patients with a chronic condition, informed by an enhanced information exchange over and above routine discharge and referral notices"*[3].

A recent systematic review of shared care interventions found insufficient evidence to support the introduction of shared care for chronic disease management into mainstream clinical practice[72]. There were no consistent improvements in physical, mental or psychosocial outcomes perhaps due in part to methodological weaknesses such as inadequate follow up. The review also reiterated the difficulty in pinpointing the most effective shared-care interventions or components of interventions given the homogeneity and complexity of the models introduced. While clinicians and service planners may intuitively believe shared care should improve outcomes, future research should explore other models of collaboration between primary and secondary care given the resource allocation implications[72].

More recently the concepts of shared care have been regarded as the precursor for chronic disease management programmes[69]. Chronic disease management

programmes, including those for diabetes, are designed to deliver structured, proactive, integrated, population based care and are largely based on the Chronic Care Model (CCM)[73]. This model of care incorporates the healthcare system, the healthcare provider, the patient and his/her family and the wider community and population. These are initiatives designed to address systematic barriers to effective care and establish evidence based standards of care for particular conditions[8].

Structured Care

Structured care can be regarded as an interim stage between shared care and the development of a formal chronic disease management model for diabetes. It involves the anchoring of care in general practice and the provision of structured care to participating GP's including administrative, clinical, education and audit/research support[4]. The structured approach involves regular patient follow up; active patient participation and goal setting; clinical guidelines; continuing education and quality assurance through audit thus reflecting structured, proactive and integrated elements of formal chronic disease management[74].

There is mounting evidence in favour of a structured approach to providing diabetes care. In 2000, Renders and colleagues assessed the effectiveness of different quality improvement interventions in primary care, outpatient and community settings. The results from 41 studies and over 40,000 patients underlined the diversity among interventions, participants, settings and outcomes. This systematic review found that multifaceted professional and organisational interventions were associated with improving the process of care for patients with diabetes. Combining patient education with these interventions and enhancing the nurses' role led to improvements in patient outcomes. Outcomes beyond measures of glycaemic control tended to be neglected in interventions[75]. Shojania and colleagues conducted a meta-analysis to assess the impact of quality improvement interventions on glycaemic control specifically. The results indicated that most quality improvement strategies conferred small to modest improvements in HbA1c concentrations. In terms of which quality improvement strategies were most beneficial, only 2 of 11 strategies (case management and team changes) were associated with significant incremental reductions in HbA1c[76].

Structured Care in Ireland

The structured approach to diabetes care has also produced favourable outcomes both internationally and nationally[74,77]. The HSE Midland Diabetes Structured Care Programme has contributed to the evidence base for structured primary care led diabetes management in Ireland. Findings published from the previous audit in 2003 demonstrated that primary care led structured care can achieve quality of care for patients comparable to international best practice[11]. A positive association has also been found between structured care, processes of care and quality of life in diabetes patients[78].

Improving Diabetes Care: Chronic Disease Management Programmes

Chronic disease management programmes centre on the aim of improving care, however there is substantial diversity between the diabetes management programmes in terms of settings, the organisation of care and the different indicators used to measure effectiveness and reflect quality[79]. A review by the Agency for Healthcare Research and Quality in the U.S. did not identify one particular type of quality improvement strategy for improving glycaemic control or provider adherence. However, this review suggested that interventions employing more than one strategy had a greater chance of success[70]. A more recent review of systematic reviews on diabetes care programmes also failed to find conclusive evidence of the critical components of such programmes or indeed practical guidance on design or implementation or evaluation of diabetes care programmes[79]. Widespread use of disease management programmes is hampered by mixed results in terms of effective design and implementation. The interdependency of the components makes evaluation of complex interventions difficult[80].

The Chronic Care Model (CCM)

The Chronic Care Model (CCM) is one of the most widely implemented frameworks in improving chronic care delivery. Developed by Wagner and colleagues during the 1990's, the framework suggests four interacting components necessary for good quality care: self management support, delivery system design, decision support and clinical information systems[81]. These components support an active, informed patient and a proactive practice team. The model also recognises the influence of the wider community and government on chronic disease management particularly in terms of resource allocation, policy

and incentives. Emphasis is placed on reorganising the way care is delivered and systematically improving care provision for patients.

Figure 1: The Chronic Care Model (Wagner et al)

There is a dearth of rigorous research evaluating the CCM in its entirety. However, there is a body of evidence outlining the effectiveness of various components in improving quality[73]. Bodenheimer and colleagues found that 32 out of 39 studies improved at least one process or outcome indicator among patients with diabetes. Each of these studies incorporated components of the CCM; however, the most effective component was not determined[82]. It has been suggested that the fragmentation of health services and lack of policy direction on managing chronic illness had inhibited the widespread adoption of the CCM in the U.S.[83]. While there is a clear policy direction towards integrated and multidisciplinary care in Ireland, health services remain fragmented and this could be a barrier to a formal and comprehensive chronic disease management model.

The National Service Framework (NSF) for Diabetes, developed by the National Health Service (NHS) in the U.K. is an important frame of reference for Ireland and the HSE Midland Diabetes Structured Care Programme. This ten year plan outlines standards and key interventions addressing prevention, identification and management of diabetes care including the detection and management of long-term complications[84]. It addressed the care of specific patient groups (adults,

young people, children and those who are pregnant) and proposes an active partnership between the patient and the service. It also addresses the management of diabetes in specific settings (emergencies and inpatient care). The NSF also set out specific targets to benchmark local performance such as routine retinopathy screening and updated patient registries compiled by GP practices as well as healthcare outcome indicators for adults with diabetes. It has been suggested that the National Service Framework for Diabetes offers an opportunity *"to guide sensible reform"* in the U.K.[85]. This template could also guide the development and further enhancement of the HSE Midland Diabetes Structured Care Programme.

2.8 Policy Framework

The HSE Midland Diabetes Structured Care Programme mirrors recent developments in Irish health policy. Under the auspices of the Cardiovascular Health Strategy (1999), the aim of the HSE Midland Diabetes Structured Care Programme is to provide high quality, equitable, effective and efficient services to patients with diabetes in the region. The programme has been linked to the Cardiovascular Strategy since 2001 through the HSE Midland Primary Care Working Group. In 2002 it was integrated into the national cardiovascular disease secondary prevention programme in General Practice – *Heartwatch.* The Diabetes Structured Care Programme has continued to develop and be guided by the principles of the Cardiovascular Health Strategy.

The HSE Midland Diabetes Structured Care Programme reflects the broader direction of health policy in Ireland by expanding the role of primary care in diabetes services. Appropriate care provided in the appropriate setting is one of the four cornerstones of the current National Health Strategy along with better health for everyone, fair access and high performance[9]. Primary care offers a viable setting for the care of the majority of patients with diabetes given the burden of disease in the community and the demands of chronic illness care on the health system, health professionals and patients[4]. Similarly, the opportunity for prevention of long-term complications lies in primary care[86]. Strengthening the role of primary care is pivotal to the Primary Care Strategy published in 2001[10]. The HSE Midland Diabetes Structured Care Programme is also in keeping with this strategy which promotes an inter-disciplinary, team based approach to primary care and the improved integration of service.

The fourth goal of the National Health Strategy "Quality and Fairness; a health system for you" is high performance. The concept of high performance is central to the HSE Midland Diabetes Structured Care Programme as it relates to the quality of care and commitment to continuous improvement. The process of rigorous audit and feedback is embedded in the Diabetes Structured Care Programme and is supported by the organisational culture[4]. This current audit report reflects the wider quality assurance framework of the programme. Quality assurance systems and evidence based decisions rely on the development of health information systems as recognised by the National Health Strategy and the Health Information Strategy[87]. The progress of appropriate and readily available information systems will be enhanced by unique patient identifiers and access to clinical records within an appropriate data protection framework. Systems such as patient registries would facilitate the tracking of patients and long-term follow up as well as the planning of services. These issues are relevant to the continuing development of the HSE Midland Diabetes Structured Care Programme and the integration of diabetes care services nationally.

The recent policy framework for managing chronic diseases in Ireland proposes to build on existing disease management initiatives such as the HSE Midland Diabetes Structured Care Programme[8]. "Tackling Chronic Disease" promotes a structured and integrated approach to care with an emphasis on the development of evidence based disease management programmes. It also recognises the central role of primary care in delivering chronic disease care. The integrated model of care has been adopted by the HSE based on recommendations from the Expert Advisory Group (EAG) in Diabetes. The EAG have also disseminated guidelines on the management of Type 2 diabetes.

The prevalence of diabetes together with the cost of managing long term complications is of mounting concern for health care systems. This metabolic disorder has a profound effect on the quality and length of an individual's life. However, there is a substantial body of evidence demonstrating effective treatment strategies for diabetes. There has been a surge of research into ways to improve the quality of care delivered to patients with diabetes. As yet, there is no consensus as to which model of care is most effective or which improvement strategies confer the most benefit for patients. However, there is growing emphasis in policy, research and practice on an integrated and structured approach to care.

3. Methodology

There are currently 30 GP practices and 67 GP's actively participating in the HSE Midland Diabetes Structured Care Programme. Data from 28 GP practices were collected by the Diabetes Clinical Nurse Specialists between November 2008 and March 2009. In advance of the audit a validation of the consent database was undertaken. Practices where there was less than 70% consent return rate based on the data available were omitted from the audit. The figure of 70% was chosen as this was consistent with the consent return rate used in the previous audit.

3.1 Sources of Data

Data sources included the patient's clinical notes (both electronic and paper) together with letters in the clinical notes regarding outpatient appointments in acute hospitals, referrals to other services such as chiropody/podiatry, retinopathy and dietetics etc.

Sample Size

As patients are enrolled on the programme they sign an informed consent form. A copy of this consent form is then sent to the Public Health Researcher who maintains a consent database. Previous audits have included all patients enrolled in the programme in the audit sample. However, as there were over 3,000 patients registered with the programme at the time of the audit, from a resource point of view, it was more prudent to audit an appropriate random sample of patients from each practice.

In calculating the sample size it was decided that the most important outcome of care measure was glycaemic control (HbA1c level). Other important outcomes of care include chronic complications such as diabetic retinopathy, renal disease and foot ulceration in addition to microvascular and macrovascular complications. However, poor documentation noted in the 2003 audit regarding data on retinal examinations (46%), foot ulceration (46.7%) and the fact that only 1.4% of the sample was attending a renal clinic would advocate the use of HbA1c as the main variable in determining the sample size. In the 2003 audit, 94.8% of all patients had HbA1c level recorded. A confidence level of 95% and a confidence interval of 2% were chosen. In the 2003 audit, the mean HbA1c for the total sample was 7.6% and the 95% confidence interval was ± 0.111% which equates to ~1.5%. Using a sample size calculator with a total population of fully consented and

currently active patients of 2,275 returned a sample size of 1,168 (51.3% of the total sample)

3.2 Data Collection

In advance of data collection, each GP practice was contacted by letter to inform them of the impending audit and to arrange a convenient date for data collection to take place. Patient lists were derived from the informed consent database, sent to the GP's with a request to select every second patient from the list and to make these patients clinical notes available on the day of data collection. Data were collected manually by the Diabetes Clinical Nurse Specialist and entered onto the paper based audit form (Appendix 1). Some of the larger practices were visited on more than one occasion.

Data were gathered retrospectively to the date that the audit was carried out. All data collected were based on the previous 12 months. There were a number of exceptions to this regarding questions 43 to 47 on the audit form on complications. For patients who had been audited previously, 'New' for these questions meant since their last audit. For the patients who had never been audited previously, 'New' meant since they were enrolled onto the programme. After data collection, data for analysis were available from 1,071 patients - 47.1% of the known consented and active patient population. This was 97 patients less than the determined sample size and this was due to the fact that a number of patients recorded on the informed consent database as current and active had died, left the practice or been transferred to a nursing home.

Data were collected on the following categories of variables:

- Demographic variables.
- Treatment: diabetes control and control of cardiovascular risk factors.
- Process of care measures: recording of processes of care, use of diabetes related services, prescription of recommended medications, and uptake of influenza vaccination.
- Diabetes related outcomes of care measures using the ICGP guidelines.
- Potentially modifiable risk factors for cardiovascular disease: blood pressure, lipid profile, renal profile (Albumin Creatinine Ratio ACR), body mass index (BMI) and smoking status.
- Complications: microvascular and macrovascular, co-morbidities.

3.3 Inclusion Criteria

Data from all patients over 18 years with Type 1 and Type 2 diabetes who were registered with one of the 30 participating GP practices and who provided a signed informed consent form were eligible for inclusion in the study.

3.4 Data Protection

The HSE Midland Area is registered with the office of the Data Protection Commissioner and the data obtained during this audit were stored, retrieved and shared in accordance with current data protection legislation. The confidentiality of the participants data was respected at all times with recording of the patients names and other potentially identifiable data in a password protected MS Excel file with restricted access and this was not transmitted electronically. Paper audit forms were stored in a locked filing cabinet in a secure office.

3.5 Data Analysis

The audit data were entered onto a statistical software package called Statistical Package for the Social Sciences (SPSS) for coding and analysis. Quality checks on the SPSS dataset were carried out through cross checking a random selection of audit data sheets against the SPSS file data. Standard descriptive statistics are used throughout the report. Categorical data are presented as number, percent and 95% confidence intervals as appropriate. Continuous data are presented with standard measures of central tendency and dispersion: median, interquartile range (range of values between 25^{th} and 75^{th} percentile) and range. Standard parametric and non-parametric tests (T-test and Mann-Whitney U test) were used to compare the distribution of continuous variables in independent groups. Differences between proportions were assessed using the Chi-squared test. A number of continuous variables were classified into risk categories according to the ICGP guidelines. There were missing data on a number of variables throughout the report. Where this occurs, the figures represent the recorded data.

3.6 Presentation and Comparison of Findings

One of the main tools used in quality assurance programmes is audit. It generally focuses on the structure, process and outcomes of care. In presenting the results for the HSE Midland Diabetes Structured Care Programme, the relevant parameters are presented under process and outcome of care in addition to the headings noted below.

- Organisation of the HSE Midland Diabetes Structured Care Programme.
- Profile of patients with diabetes managed in the programme.
- Process of care measures.
- Outcome of care measures.

Comparisons will be made throughout the report with a number of recently published audits:

- The previous HSE Midland Diabetes Structured Care Programme Audit (2006)[4].
- The Diabetes Interest Group audit report (2009) from Cork[88].
- The Diabetes Watch audit report from HSE North East Area[89].
- The National Diabetes Audit in England and Wales – Executive Summary (2007/2008)[90].

4. Results

Organisation of the HSE Midland Diabetes Structured Care Programme

When the programme was first piloted in 1998 there were ten practices participating with 392 diabetic patients identified. The 2003 audit reported that the number of participating practices had increased to 20 with 1,324 patients enrolled on the programme. Currently there are 30 participating GP practice sites with 67 GP's (and 18 GP registrars) and to date over 3,600 patients have enrolled since the programme started in 1998.

Infrastructure Support to Participating Practices

The HSE Midland Diabetes Structured Care Programme has consistently increased the level of support provided to participating practices since the 1998/1999 audit report. The current structured care infrastructure may be categorised as follows: clinical support, administrative support and support for audit and research.

Clinical Support

- The GP leader provides overall clinical leadership to the programme.
- Two Clinical Nurse Specialists in Diabetes provide education and training to practice nurses and patients.
- Practice level dietetic support is provided by the Community Nutrition and Dietetic Service.
- Retinopathy screening is provided by the community Ophthalmic specialists.
- The participating practices have 'fast track' access to vascular services at Midland Regional Hospital Tullamore through a defined care pathway – risk assessment and referral.
- A chiropody/podiatry service is provided to participating practices.

Educational Support

Recent and ongoing educational inputs to participating practices include the following:

- The development of the Integrated Care Guidelines for Type 2 Diabetes Care[14].

- The development of diabetes patient education guidelines for primary and secondary care.
- The development of an educational manual for practice nurses titled "What You Need to Know About Diabetes".
- The development of a foot assessment and risk classification protocol and the provision of videos on foot assessment.
- A group education programme on dietetics and nutrition – The Xpert programme.
- Nursing Management of the Individual with Diabetes. This is a five day diabetes programme, accredited by Dublin City University, that aims to analyse from a nursing perspective, the concept and models of care in relation to diabetic health management in the primary care setting. Three programmes have been facilitated over the last three years and a total of 64 nurses have attended from the midlands region.
- Nursing care of the older person with diabetes. Education and nursing management guidance on diabetes in the older person is provided for nursing and care assistant staff at a number of care of the elderly facilities in the HSE Midland region.
- Diabetes and Heart Health Promotion Programme for Travellers. This education programme was provided to Travellers to increase their awareness of heart and diabetes health. It was provided as part of collaboration between the HSE Midland Area Primary Care and Cardiovascular Health Services, Traveller Health Services and Offaly VEC and was provided in the four counties at specified Traveller training centres.
- The provision of annual study days.
    - An annual study day is organised for all GP's and practice nurses registered with the HSE Midland Diabetes Structured Care Programme. Each study day is approved by An Bord Altranais (Category 1) and is Continuing Medical Education (CME) accredited. Previous study days have included topics such as insulin initiation in primary care, foot care and diabetes, novel treatment therapies for Type 2 diabetes, diabetes and renal disease in addition to general topics such as blood pressure management, stroke, cognitive behaviour therapy, alcohol problems in primary care, palliative care and pulmonary rehabilitation.

Administrative Support

Administrative support was provided in recent years by the project manager and administrative assistant. However, these two posts have since been lost to the programme due to the moratorium on recruitment in the public service. Limited administrative work has been carried out by the researcher and the Clinical Nurse Specialists.

Research and Audit Support

The research and audit arm of the programme is carried out under the direction of the Diabetes Structured Care Research and Audit Group. This group meets two to three times a year under the chairmanship of a Consultant in Public Health Medicine and consists of the GP leader, Project Specialist in Cardiovascular Health, Clinical Nurse Specialists, researcher and local primary care managers.

Description of Participating Practices

Appendix 2 (Map) shows the geographic location of all 30 practices enrolled in the programme.

All practices have a practice nurse, either full time or part time, who takes a lead on the organisation and co-ordination of the diabetes service at practice level. Therefore it is crucial that dedicated practice nurse time is provided for through the Diabetes Structured Care Programme as diabetes is only one illness that the practice nurse must manage. Space is also made available in the practice where the practice nurse can see and assess patients. All practices have a register of all their diabetes patients. This is either paper based or on computer.

Funding is provided for the Clinical Nurse Specialists and dietitians and there is also a payment for sessional chiropody/podiatry services. GP's are reimbursed either for practice nurse time or through the Heartwatch (secondary prevention of cardiovascular disease) programme. Heartwatch payments are made through the Primary Care Reimbursement Service (PCRS).

Practice Services

All practices have access to dietetic, ophthalmic and chiropody/podiatry services. The HSE Community Nutrition and Dietetic Service see patients in the practices at specific sessions in a particular month. Regarding ophthalmology, public

retinopathy screening clinics are held in the three regional acute hospitals, and at two community clinics in Longford and Athlone. Patients may also be referred to Dr. Keane's private practice in Athlone, where the costs for medical card patients are covered by the HSE. The provision of chiropody/podiatry services to GP practices has varied throughout the years due to recruitment embargoes in the HSE and also the requirement of the HSE that podiatrists/chiropodists are registered. The chiropody/podiatry service is provided on a sessional basis in the GP practice.

4.1 Description of Patients

Patient profile

In total there were 1,071 randomly selected patients included in the audit. Of these, 80 (7.5%) had Type 1 diabetes, 989 (92.3%) had Type 2 diabetes and 2 (0.2%) did not have their diabetes type recorded.

Table 1: Comparison of Diabetes Type from Previous Audits

	Type 1 (%)	Type 2 (%)	Gestational (%)
1998/1999	15	85	0
2003	10.5	89.3	0.2
2009	7.5	92.3	0

There were 605 (56.5%) males in the sample and the proportion of males enrolled in the programme has increased steadily from 50% in 1998/1999 to 51.7% in 2003 to 56.5% in 2009.

Stratifying the 2009 sample by type of diabetes, 56.3% of patients with Type 1 diabetes are male and 56.6% of patients with Type 2 diabetes are male.

Table 2 shows the breakdown of diabetes type by gender and how this compares with the 2003 audit. While there has been a decrease in the overall percentage of patients with Type 1 diabetes since 2003, there remains no major difference in the percentage of males and females by diabetes type.

Table 2: Diabetes Type by Gender 2003 and 2009

	2003 (%)	2009 (%)
Type 1		
Male	10.4	7.4
Female	10.5	7.5
Type 2		
Male	89.6	92.6
Female	89.1*	92.5

*0.4% had gestational diabetes

Age

The median age of patients participating in the programme was 65 years. This is compared to a median age of 64 years in 2003. Overall, there was no significant difference between the ages of males and females (p=0.296).

However, as expected, patients with Type 2 diabetes were significantly older than those with Type 1 diabetes with a mean age difference of 18.8 years (p=0.000).

Table 3: Age of Participants by Type of Diabetes 2003 and 2009

	Type 1	Type 2	Total
2003			
Median (IQR)	53 (39 – 65)	65 (56 – 73)	64 (55 – 73)
Range	18 – 85	27 – 97	18 – 97
2009			
Median (IQR)	44.5 (32.5 – 60)	66 (59 – 74)	65 (57 – 74)
Range	19 – 82	25 – 102	19 – 102

*IQR – Interquartile range – 25th to 75th centile

Table 3 shows that the median age for patients with Type 1 diabetes was 44.5 years, 8.5 years younger than the 2003 median of 53 years. The median age for patients with Type 2 diabetes was 66 years which is a year older than in 2003.

As expected, the vast majority (80%) of patients with Type 1 diabetes were in the two younger age groups (18 – 39, 40 - 64 years) while 57.6% of patients with Type 2 diabetes were in the 65 – 84 years age group. The age distribution of patients by type of diabetes and gender is shown in Figure 2.

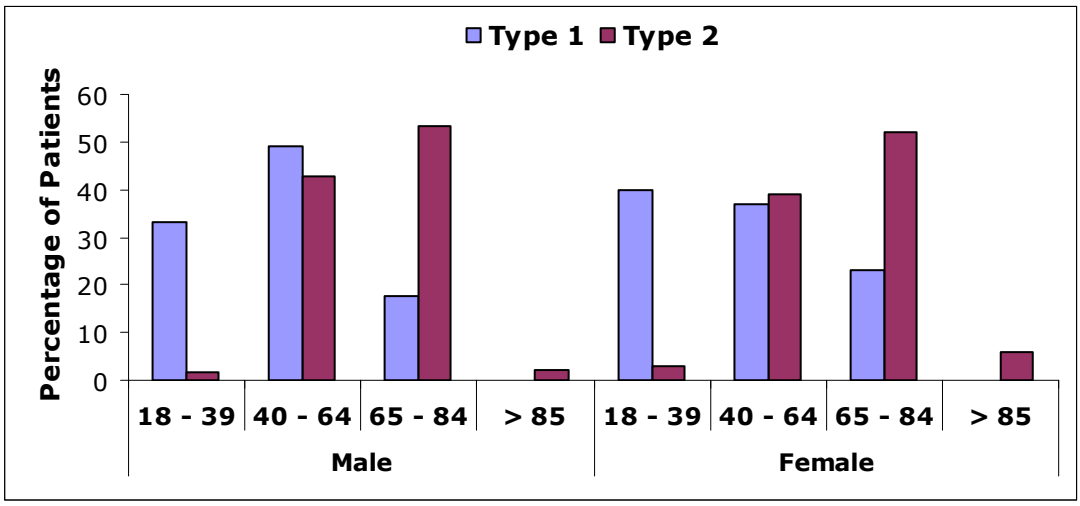


Figure 2: Percentage of patients in each age category

Duration of Diabetes

The date of diagnosis was available for 86% of patients. Therefore, it was possible to calculate the length of time since diagnosis of diabetes. One point to note is that in a lot of cases a completely accurate date of diagnosis is not available. There may only have been a month in a particular year or a particular year specified. Therefore, in these cases, the first of the month was taken or the first of January was taken where only a year of diagnosis was available.

The median disease duration for patients with Type 1 diabetes was 15 years with 70.5% having diabetes for more than 10 years. Patients with Type 2 diabetes had shorter disease duration with a median of six years. Just over 48% of patients with Type 2 diabetes were diagnosed within the last five years and this increases to 81.1% diagnosed within the last 10 years.

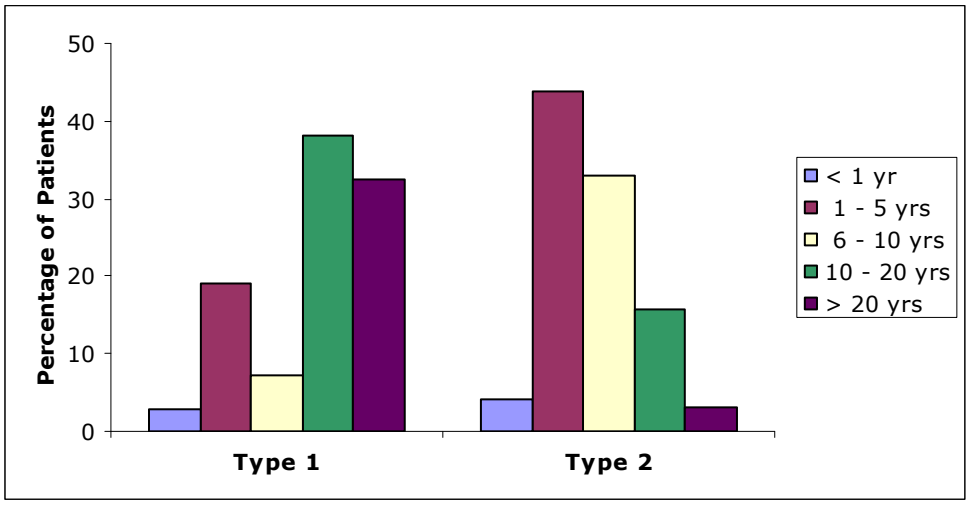


Figure 3: Percentage of Patients by Duration of Diabetes and Type of Diabetes

Comparison of Diabetes Duration with 2003 Audit

The date of diagnosis was not recorded in the 2003 audit but it was asked if diabetes was diagnosed within the last year. Therefore it is possible to compare the percentage of patients diagnosed within a year of audit for patients in 2003 and 2009. This is important when analysing complication rates as the longer the duration the patient has diabetes the greater the risk of complications.

Table 4: Comparison of Time Since Diagnosis of Diabetes

	Type1		Type 2	
	2003	**2009**	**2003**	**2009**
< 1 Year	6.1	2.9	20.7	4.1
> 1 Year	93.9	97.1	79.3	95.9

As expected, there are a greater proportion of patients in the 2009 audit who have had diabetes for longer than one year compared to the 2003 audit. This is more evident for patients with Type 2 diabetes (95.9% vs 79.3%).

4.2 Diabetes Control

In 2009, the majority of patients (64.3%) were treated using a combination of diet and tablets, which is a decrease on the 1998/1999 audit (68.8%) but an increase on the 2003 audit (62.9%). Table 5 demonstrates a comparison of diabetes control for all patients for all three audits. However, a better picture of diabetes control is obtained by stratifying by type of diabetes.

Table 5: Comparison of Diabetes Control for all Patients between 1998/1999, 2003 and 2009

	1998/1999 (%)	2003 (%)	2009 (%)
Diet	15.7	20	12.3
Diet &Tablets	68.8	62.8	64.3
Diet & Insulin	15.5	12.5	10.9
Diet & Tablets & Insulin	N/A	4.8	12.5

Diabetes Control for Patients with Type 1 Diabetes

As expected all patients with Type 1 diabetes were prescribed treatment of diet and insulin.

Diabetes Control for Patients with Type 2 Diabetes

The vast majority of patients with Type 2 diabetes (69.5%) were treated with diet and tablets which is no change from 2003. Table 6 demonstrates the comparison in diabetes control for patients with Type 2 diabetes between 2003 and 2009.

Table 6: Comparison of Diabetes Control for Type 2 Patients between 2003 and 2009

	2003	2009
Diet	22.2	13.3
Diet &Tablets	70.2	69.5
Diet & Insulin	3.0	3.8
Diet & Tablets & Insulin	4.6	13.4

There has been very little change since the previous audit in the proportion of patients with Type 2 diabetes who were treated with a combination of diet and

tablets and those who were treated with diet and insulin. However, there has been a big increase in the proportion of patients with Type 2 diabetes who were treated with a combination of diet and tablets and insulin – 4.6% in 2003 to 13.4% in 2009. This, in addition to the 3.8% who were prescribed diet and insulin, indicates that 17.2% of patients with Type 2 diabetes are now prescribed insulin compared to 7.6% in 2003. This may be an indication of an increased clinical need with this group of patients or it could be a reflection of the increased availability of Insulin Initiation for Type 2 diabetes in primary care since 2003. The clinical nurse specialist in diabetes provides an insulin initiation service to all practices.

4.3 Process of Care Measures

This section reports on the documentation/recording of the key process of care measures including the recording of HbA1c, blood pressures, lipids including sub fractions – cholesterol and triglycerides, smoking status, body mass index and serum creatinine and albumin-creatinine ratio (ACR). In addition, there are a number of essential services that diabetic patients are referred to by their GP. These include a dietetic review, screening for retinopathy and a chiropody/podiatry review. It is also recommended that the patient sees their GP for an annual review and that the patient is vaccinated against influenza annually. The rates of annual review, vaccination and screening for diabetic complications are included in this section. In addition, the 2009 audit looked at for the first time, the prescribing of the recommended secondary preventative medications of aspirin and statins.

Recording of Process of Care Measures

Table 7 shows the trend in the recording of the process of care measures from the 1998/1999, 2003 and 2009 audits.

Table 7: Comparison of Recording Practices for Selected Process of Care Measures in the 1998/1999, 2003 and 2009 audits

Process of Care Measures	Audit 1998/1999 (%)	Audit 2003 (%)	Audit 2009 (%)
HbA1c	92	94.8	98
Blood Pressure	95	98.7	99.1
Total Cholesterol	85	95.9	98.3
Triglycerides	63	90.3	97.9
Smoking Status	82	74.2	77
Body Mass Index (BMI)	76	54.7	73.1
Creatinine	75	81.9	98.1
ACR	N/R	N/R	74.1

Improvements in the recording rates from the previous two audits are evident for HbA1c, blood pressure, total cholesterol, triglycerides and creatinine. Documentation of smoking status and BMI, while improving on the 2003 audit, are still behind the 1998/1999 audit figures.

Stratifying the 2009 audit data regarding the recording of the process of care measures by type of diabetes is shown in Table 8.

Table 8: Recording of the Process of Care Measures by Type of Diabetes – 2009 Audit

Process of Care Measure	Type 1 (%)	Type 2 (%)
HbA1c	100	97.9
Blood Pressure	98.8	99.1
Total Cholesterol	96.3	98.5
Triglycerides	96.3	98.0
Smoking Status	76.3	77.1
Body Mass Index (BMI)	68.8	73.5
Creatinine	96.3	98.3
ACR	71.3	73.5

The process of care measures were recorded slightly more frequently for patients with Type 2 diabetes except for HbA1c where all patients with Type 1 diabetes had this recorded.

Annual Review, Screening and Vaccination

The percentage of patients who attended their GP for an annual review was 90.5%. This is a substantial increase from 2003 (32.5%).

Table 9 shows the percentage of patients who attended their GP for annual review by diabetes type. This table shows that a statistically significant greater proportion of patients with Type 2 diabetes are attending their GP for their annual review compared to patients with Type 1 diabetes (p=0.017).

Table 9: Annual Review Attendance by Diabetes Type

	Type 1 (%)	Type 2 (%)
Annual Review	81.3%	91.1

Table 10 outlines the annual attendance rates at screening services for diabetes complications.

Table 10: Screening for Diabetes Complications

Process of Care Measures	Audit 1998/1999 (%)	Audit 2003 (%)	Audit 2009 (%)
Review By Chiropodist	75.5	32.6*	56.9*
Foot Assessment Recorded	81	56.4	77.6
Review by Dietitian	61.1	42.4**	41.8**
Ophthalmologist Examination	30.9	44.2	51.5***
Influenza Vaccination	N/R	N/R	60.8

* DNA rate of 1.7% in 2003 and 5.9% in 2009 for chiropody/podiatry review

** DNA rate of 3.7% in 2003 and 12.2% in 2009 for dietitian review

*** DNA rate of 3.7% for ophthalmologist examination

Chiropody/Podiatry

There has been an increase in the proportion of patients seeing a chiropodist in 2009 (56.9%) compared to 2003 (32.6%). This increase is mainly due to the increased numbers of chiropodists/podiatrists involved in the provision of the service. In 2003 there were only two chiropodists working with the Diabetes Structured Care Programme while currently there are seven – five chiropodists and two podiatrists. There was a lack of service provision in some practices for a period of time in 2008/2009 due to replacement of a chiropodist. This has now been resolved.

A similar improvement has been seen in the proportion of patients who had a foot assessment recorded. This has increased to 77.6% but there is still scope for improvement. However, data regarding who conducted the foot assessment was not collected and this is something that should be included for the next audit. As Table 10 shows, 56.9% of patients saw a chiropodist/podiatrist so it is clear that the practice nurses and GP are conducting foot assessments as a result of the development of foot assessment protocols based on the Tayside foot assessment protocol[91], and the education provided to them by the Diabetes Nurse Specialists. The DNA rate for attendance at chiropody/podiatry was 5.9% in 2009 which is an increase from 1.7% in 2003. It is worth commenting that in this audit there were 17 patients who declined chiropody/podiatry review after being offered it while there were nine patients who indicated that they saw a chiropodist privately.

Dietetic

There was little change in the attendance at a dietetic review in the 2009 audit (41.8%) compared with the 2003 audit (42.4%). The DNA rate for attendance at dietetic review was quite high at 12.2% compared to 3.7% in 2003. There may be scope for further study here to determine reasons for non attendance. It is

also worth mentioning that in this audit, 22 patients refused to see a dietitian after being given an appointment. This was noted in these particular cases but wasn't explicitly asked for in the audit and there may be additional cases of patients declining to see a dietitian.

Ophthalmology

There was a further increase in the proportion of patients attending for retinopathy screening in 2009 (51.5%) compared to 44.2% in 2003 and 30.9% in 1998/1999. There was a DNA rate of 3.7%. It is difficult to conclude if the increase in attendance rates is due to increased service provision as this tends to fluctuate as there is no regular cover for annual leave/long term sick/maternity leave which has led to expanding waiting lists in some areas while other areas have short waiting lists.

Influenza Vaccination

This was only added to this years audit so there is no comparator with previous audits available. The World Health Organisation, through the World Health Assembly, recommended a target for influenza vaccine uptake in people at health risk, i.e. those with diabetes, and those aged 65 years and over, of a 50% uptake by 2006 and a 75% uptake by 2010. They also recommended the implementation of strategies to increase vaccination coverage, with the goal of these strategies to increase vaccination coverage to 75% in the elderly population by 2010[92]. The Irish guidelines recommend that all people over 65 years and those in the designated risk groups receive the influenza vaccination.

For the 2009 audit, 58.4% of all patients with diabetes received the influenza vaccination which is above the WHO target of 50% by 2006 but well below the recommended target for 2010. Of the patients that were aged 65 years and older, the vaccination rate increases to 72.2%.

4.4 Outcome of Care Measures

The main outcome of care measures used in this audit were:

- Glycaemic control (HbA1c levels)
- Chronic complications:
    - i.e. percentage of patients with
        - diabetic retinopathy
        - foot ulcers
- Admission rates for:
    - Ketoacidosis
    - Hypoglycaemia
- Percentage of patients with new microvascular and/or macrovascular complications
- Percentage of patients with minor and/or major amputations

Glycaemic Control

There is conclusive evidence that good control of blood glucose levels, i.e. HbA1c, can substantially reduce the risk of developing complications and slow the progression of complications in all types of diabetes[93]. The median HbA1c values for patients with Type 1 and Type 2 diabetes, which were recorded within the last 12 months, are presented in Table 11.

Table 11: HbA1c levels by Type of Diabetes - Audit 2009

	Type 1	Type 2	All Patients
Median (IQR)	8.1 (7.4 – 9.1)	6.8 (6.2 – 7.6)	6.8 (6.2 – 7.7)
Range	5.2 – 14.0	4.5 – 13.9	4.5 – 14.0

Comparison with the 2003 audit is shown in Table 12 and it can be seen that there has been an improvement in glycaemic control for patients with Type 1 and Type 2 diabetes.

Table 12: Comparison of median HbA1c Levels 2003 and 2009

	Type 1		Type 2		All Patients	
	2003	2009	2003	2009	2003	2009
Median	8.4	8.1	7.1	6.8	7.3	6.8

Previous audit reports have stratified HbA1c level into three risk categories according to the ICGP guidelines in place at the time – Low Risk (< 6.5%), Medium Risk (6.5% - 7.5%) and High Risk (> 7.5%). Current guidelines set a target of HbA1c < 6.5%. For comparison this report will include the three risk categories and the current target of 6.5% will also be demonstrated.

Table 13: HbA1c risk categories by Type of Diabetes and for All Patients – Audit 2009

	Type 1 (%)	Type 2 (%)	All Patients (%)
Low Risk (<6.5%)	11.3	36.3	34.3
Medium Risk (6.5 – 7.5%)	16.2	38.1	36.6
High Risk (>7.5%)	72.5	25.6	29.1

Of the total sample, 29.1% were in the high risk HbA1c category. This is a big improvement on 2003 when 45.9% were in this category – see Table 14 and Figure 4. In 2003, there were 42.9% of patients with Type 2 diabetes in the high risk category and this has reduced to 25.6% in 2009. For patients with Type 1 diabetes, in 2003, a substantial majority of these patients (71.7%) were in the high risk category and this has not improved with 72.5% of patients with Type 1 diabetes now in the high risk category. Overall glycaemic control was better in patients with Type 2 diabetes with 36.3% in the low risk category compared to 11.3% of patients with Type 1 diabetes.

Table 14: Comparison of HbA1c Risk Categories by Type of Diabetes - 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	**2009**	**2003**	**2009**	**2003**	**2009**
<6.5%	10.9	11.3	28.6	36.3	26.8	34.3
6.5-7.5%	17.4	16.2	28.5	38.1	27.3	36.6
>7.5%	71.7	72.5	42.9	25.6	45.9	29.1

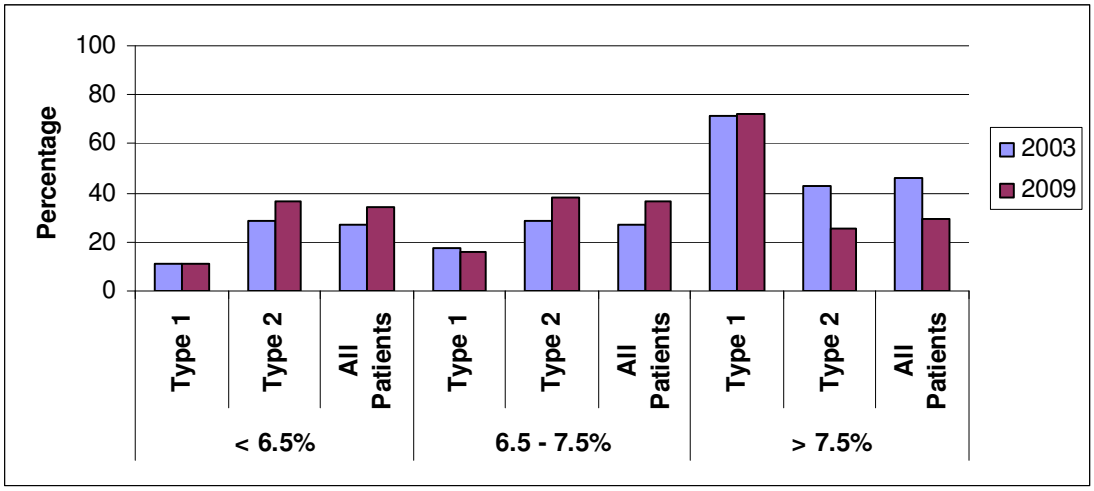


Figure 4: Comparison of HbA1c Risk Categories by Type of Diabetes - 2003 and 2009

Glycaemic Control according to duration of Diabetes

Table 15 shows the median HbA1c values for patients with Type 1 and Type 2 diabetes categorised by duration of diabetes. Patients with Type 2 diabetes who have been diagnosed for more than five years had a higher HbA1c than patients with Type 2 diabetes diagnosed for less than five years (6.6% compared to 6.9%). There was a similar trend seen for patients with Type 1 diabetes – 8.0 compared to 8.2.

Table 15: HbA1c by Type of Diabetes and Duration of Diabetes

	Type 1		Type 2	
	≤ 5 years	**> 5 years**	**≤ 5 years**	**> 5 years**
Median (IQR)	7.8 (6.6 – 9.6)	8.2 (7.8 – 9.1)	6.6 (6.0 – 7.2)	6.9 (6.3 – 7.7)
Range	5.2 – 11.6	6.0 – 12.5	4.8 – 13.9	4.5 – 12.4

Chronic Complications

Retinopathy

Table 16 shows the prevalence of retinopathy by type of diabetes from the 2009 audit with a comparison to the results from the 2003 audit.

Table 16: Retinopathy – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	**2009**	**2003**	**2009**	**2003**	**2009**
Diabetic Retinopathy	42.3	56.3	13.8	22.0	17.2	24.8

Similar to the 2003 data, patients with Type 1 diabetes have higher rates of retinopathy (56.3%) than patients with Type 2 diabetes (22%). There has been an overall increase in the prevalence of retinopathy for patients with Type 1 and Type 2 diabetes since the 2003 audit. This may be due to increased ascertainment with an increase in the percentage of patients who had a retinal examination in 2009 compared to 2003 (51.5% compared to 41.2%) but this also shows that nearly half of the sample did not have a retinal examination. The increased prevalence could also be due to the increased length of time since diagnosis for some of these patients – see Table 17. This shows that patients with diabetes who were diagnosed more than five years ago have much higher rates of retinopathy.

Table 17: Retinopathy by Type of Diabetes and Duration of Diabetes

	Type 1 (%)		Type 2 (%)	
	≤ 5 years	> 5 years	≤ 5 years	> 5 years
Diabetic Retinopathy	25	64.7	12.3	29.9

The 2009 audit captured the varying types of retinopathy diagnosed and these are shown in Table 18 by type of diabetes.

Table 18: Retinopathy Types by Type of Diabetes – 2009 Audit

	Type 1 (%)	Type 2 (%)	All Patients (%)
Background Retinopathy	59.3	62.2	61.6
Pre-proliferative	11.1	14.3	13.7
Proliferative	14.8	9.2	10.3
Advanced Diabetic Eye Disease	7.4	5.9	6.2
Maculopathy	0	7.6	6.2
Blind	7.4	0.8	2.1

The 2009 audit data also showed that 4.7% of patients for whom data was available were treated with laser therapy and 0.7% had a vitrectomy performed.

Foot Complications

The risk classification of the foot, recorded along with the prevalence of foot ulcers and other complications, are the main outcome of care measures related to chiropody/podiatry. When a foot assessment is carried out the chiropodist/GP/practice nurse assigns a risk classification with regard to developing diabetic foot disease. Table 19 shows the risk classification of the patients who were assessed by type of diabetes. One limitation to this analysis was that the risk classification was not recorded per foot, it was an overall risk. For future audits it is recommended that risk classification is reported per foot.

Table 19: Risk Classification of Foot by Diabetes Type

	Type 1 (%)	Type 2 (%)	All (%)
Low	75.4	67.1	67.8
Moderate	17.5	23.0	22.6
High	5.3	8.5	8.3
Active Foot Disease	1.8	1.3	1.4

Of the 70 patients assessed as being either 'high risk' or having 'active foot disease', 56 (80%) had seen a chiropodist/podiatrist in the previous year with one patient (1.4%) not attending after receiving an appointment. Those patients

who are assessed as being high risk are seen more frequently by the chiropodist/podiatrist and would generally be referred by their GP to specialist services such as vascular and orthopaedics as required.

Using this classification system, 'active foot disease' includes patients who have foot ulcers. As only 1.4% of patients are classified as having 'active foot disease' and 2.5% of patients were documented as having a foot ulcer (see Table 7), there may be an issue regarding inaccurate classification of the diabetic foot and perhaps there is a need for further education of assessors. Of those patients who had a foot ulcer, 25% were assessed as low risk, 16.7% as moderate, 8.3% as high and 41.7% as having active foot disease (8.3% not recorded). However, as noted earlier, for future audits risk classification should be assigned per foot.

Foot Ulcers

The incidence of foot ulcers decreased significantly for patients with Type 1 and Type 2 diabetes since 2003 – see Table 20. This decrease could be attributed to an overall differing level of risk in this cohort of patients as a result of:

- Earlier identification of those at risk of foot ulcers as evidenced by the increasing percentage of patients who had foot assessments carried out.
- Better access to review by chiropody/podiatry.
- Improved access to vascular assessment , through the 'fast-track' process.
- Continual foot care education through attending GP, practice nurse, diabetes nurse specialist and chiropodist/podiatrist.

Table 20: Foot Ulcers – 2003 and 2009

	Type 1		Type 2		All Patients	
	2003	**2009**	**2003**	**2009**	**2003**	**2009**
Foot Ulcers	16.0	3.9	4.8	2.4	6.1	2.5

Renal Function

The previous audit (2003) reported on renal function by using microalbuminuria/proteinuria and attendance at a renal clinic. Microalbuminuria is the earliest indicator of renal disease attributable to diabetes. However, according to the recently published ICGP guidelines, the albumin creatinine ratio (ACR) is the most consistent and reliable measurement of urine albumin excretion. A urine ACR between 2.5 and 25 is indicative of microalbuminuria and a urine ACR greater than 25 is evidence of macroalbuminura or proteinuria.

Table 21 shows the proportion of patients with abnormal ACR's by type of diabetes.

Table 21: Abnormal ACR by Type of Diabetes – 2009

	Type 1 (%)	Type 2 (%)	All Patients (%)
Abnormal ACR (> 2.5)	28.1	38.8	38.1
Microalbuminuria (ACR 2.5 – 25)	24.6	34.8	32.1
Proteinuria (ACR >25)	7.0	5.9	6.0

In 2003, the data on microalbuniuria and proteinuria were collected slightly differently in that it was recorded if it was positive or negative or present or not present respectively, as determined from the patient notes. Therefore, caution should be exercised when making a comparison between the 2009 and 2003 audits. In 2003, the incidence of microalbuminuria was 27.2% and this has increased, according to the ACR data, to 32.1% in 2009. Proteinuria was present in 25.1% of patients in 2003 and this has reduced to 6.0% in 2009.

In analysing the attendance at a renal clinic, it was seen that 5.1% of patients in 2009 were attending a renal clinic. This is an increase on the 2003 figure when only 1.4% of patients attended. There were slightly more patients with Type 2 diabetes attending a renal clinic compared to patients with Type 1 diabetes (4.9% v 3.9%) in 2009.

Admission Rates and Other Complications

This section outlines the admission rates for complications such as ketoacidosis and hypoglycaemia and also documents the rates of newly diagnosed complications such as micro and macrovascular complications, minor and major amputations. For this audit, as there were patients included who may have been previously audited, 'new' in their case was since the last audit. For patients who were enrolled onto the program since the last audit, 'new' meant since enrolment onto the programme. This led to an issue with calculating an appropriate rate for comparison with the 2003 audit as it reported on new complications in the year prior to the audit. For the 2009 audit there may be up to a five year gap since last audit. Therefore to account for this, an annual rate was calculated using the average number of years a person was enrolled to determine the total number of person years. The number of events was then divided into the total number of person years to get the rate. This was also stratified by type of diabetes. Table 22

shows the admission rates and other complication rates for the 2009 audit while Table 23 shows a comparison with the 2003 audit.

Table 22: Admission Rates and Other Complication rates by Type of Diabetes – 2009 Audit

	Type 1 (%)	Type 2 (%)	All Patients (%)
Admission Ketoacidosis	2.5	0	0.2
Admission Hypoglycaemia	2.5	0.6	0.7
Microvascular Complications	3.1	1.6	1.7
Macrovascular Complications	3.4	3.6	3.5
Minor Amputations	0	0.11	0.1
Major Amputations	0	0.14	0.13

Table 23: Comparison of Admission Rates and Other Complication Rates – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	**2009**	**2003**	**2009**	**2003**	**2009**
Admission Ketoacidosis	4.0	2.5	0	0	0.4	0.2
Admission Hypoglycaemia	4.0	2.5	0.6	0.6	1.0	0.7
Microvascular Complications	5.1	3.1	3.3	1.6	3.5	1.7
Macrovascular Complications	7.0	3.4	7.9	3.6	7.8	3.5
Minor Amputations	1.0	0	0	0.11	0.1	0.1
Major Amputations	0	0	0	0.14	0	0.13

There have been improvements in admission and complication rates for all patients compared to 2003 except for amputations which remained static for minor amputations and increased from none in 2003 to five patients in 2009.

Analysing the data for the five patients who had a major amputation in 2009 shows that they all had Type 2 diabetes, three patients were male and the length of time since diagnosis ranged from one to 24 years. However, only two patients had seen a chiropodist/podiatrist in the previous year, three had a foot assessment performed and of these, two were assessed as being of moderate risk. However, this risk classification could refer to the remaining foot as it may

have been carried out post amputation. As noted earlier, risk classification was assigned overall and not per foot.

Macrovascular complications have decreased from 7.8% in 2003 to 3.5% in 2009. The breakdown of these complications is shown in Table 24.

Table 24: Breakdown of Macrovascular Complications

	Type 1 (%)	Type 2 (%)	All Patients (%)
Myocardial Infarction	0.9	0.4	0.4
Heart Failure	0	0.3	0.3
Cerebrovascular Accident	0	0.6	0.5
Peripheral Vascular Disease	1.3	0.6	0.6
Ischaemic Heart Disease/Angina	1.7	1.5	1.5
Other	0.4	0.1	0.2

The only complications comparable with the 2003 audit are Myocardial Infarction (MI) and Cerebrovascular Accident (CVA). There has been a decrease in the incidence rate for MI from 1.2% in 2003 to 0.4% in 2009. A similar decrease was witnessed for CVA which was 2.7% in 2003 and is now at 0.5%.

While the Diabetes Structured Care Programme is mainly aimed at patients with Type 2 diabetes, it is clear from the figures presented in Tables 22, 23 and 24 that both patients with Type 1 diabetes and patients with Type 2 diabetes benefit from routine care in general practice.

4.5 Risk Factors for Cardiovascular Disease and Other Adverse Outcomes

In this section results are presented on the distribution of cardiovascular risk factors among patients included in the audit.

Smoking

The overall smoking prevalence in 2009 was 20.4%, a minor decrease on the 2003 audit (20.7%). In patients with Type 1 diabetes the prevalence was 37.7%, which is an increase on the 2003 figure of 30.9%, and for patients with Type 2 diabetes the prevalence was 19.1% which represents no change from the 2003 figure. It should be noted however, that as with the 2003 audit, smoking data were missing for a considerable portion of the audit sample – 23.2%.

Body Mass Index (BMI)

The link between overweight/obesity and the development of Type 2 diabetes is well established. It is also recognised that the obese patient with diabetes may find it difficult to control blood glucose and may become increasingly insulin resistant.[94] The risk of cardiovascular complications and cardiovascular disease mortality is increased for obese patients with Type 2 diabetes as obesity is a risk factor for dyslipidemia and hypertension. Overweight and obesity are common amongst patents with diabetes and this has been evident from this and previous audits. Weight loss is an important goal for those overweight and obese as it improves glycaemic control. Long-term weight loss is very difficult to maintain and strategies to maximise weight loss in those with Type 2 diabetes include dietary, physical activity and behavioural interventions.[95]

The main dietetic indicator of outcome of care is BMI. The World Health Organisation (WHO) has used BMI to classify underweight, overweight and obesity in adults[96] and further work has been published on the appropriate BMI for Asian populations[97].

Table 25 below shows the general WHO categorisation.

Table 25:WHO Classification 2000

Classification	BMI	Risk of Co-Morbidities
Underweight	<18.50	Low (but risk of other clinical problems increased)
Normal Range	18.50 – 24.99	Average
Overweight	≥ 25.00	
Preobese	25.00 – 29.99	Increased
Obese Class I	30.00 – 34.99	Moderate
Obese Class II	35.00 – 39.99	Severe
Obese Class III	≥ 40.00	Very Severe
* These BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to differences in body proportions. The table shows a simplistic relationship between BMI and the risk of co morbidity, which can be affected by a range of factors, including the nature of the diet, ethnic group and activity level. The risks associated with increasing BMI are continuous and graded and begin at a BMI below 25. The interpretation of BMI gradings in relation to risk may differ for different populations. Both BMI and a measure of fat distribution (waist circumference or waist:hip ratio (WHR)) are important in calculating the risk of obesity co morbidities.		

Source: World Health Organization. (2000). Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva: WHO, page 9*

The diabetes standards for comparison in this audit are drawn from the WHO and the 2008 Practical Guide to Type 2 Diabetes Care[98], which states that '*patients should be advised to maintain a healthy weight in order to maintain a BMI of between 20 and 24.99 kg/m$^{2'}$.* The target for all patients with diabetes is to maintain a healthy weight with a BMI of less than 25kg/m^2. The categories of Good/Acceptable/Poor/Very Poor were used in the 1998/1999 and 2003 audits and were based on the 1993 guidelines from the British Diabetic Association "Recommendations for the Management of Diabetes in Primary Care"[99]. For the current audit the WHO categories will be used.

The median BMI for the 2009 audit sample was 30kg/m^2, unchanged since 2003. BMI was significantly higher in patients with Type 2 diabetes (30.7 kg/m^2 compared to 27.3 kg/m^2, p = 0.000). Overall, 51.5% of patients are in the category of obese (>30kg/m^2). This was 52% in 2003 which shows that overweight and obesity continues to be a major challenge in the provision of diabetes care.

Table 26 and Figure 5 outline the percentage of patients in the defined BMI categories by type of diabetes for 2003 and 2009.

Table 26: BMI by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	**2009**	**2003**	**2009**	**2003**	**2009**
Underweight (<18.5kg/m^2)	0	1.8	0	0.3	0	0.4
Normal Range (18.5 – 24.99kg/m^2)	33.3	36.4	8.9	12.6	11.0	14.3
Preobese (25.0 – 29.99kg/m^2)	44.5	36.3	36.2	33.6	37.4	33.8
Obese Class I (30.0 – 34.99kg/m^2)	15.5	20	36.5	31.6	34.5	30.8
Obese Class II (35.0 – 39.99kg/m^2)	6.7	5.5	14.8	14.5	14.1	13.8
Obese Class III (≥ 40.0 kg/m^2)	0	0	3.6	7.4	3.3	6.9

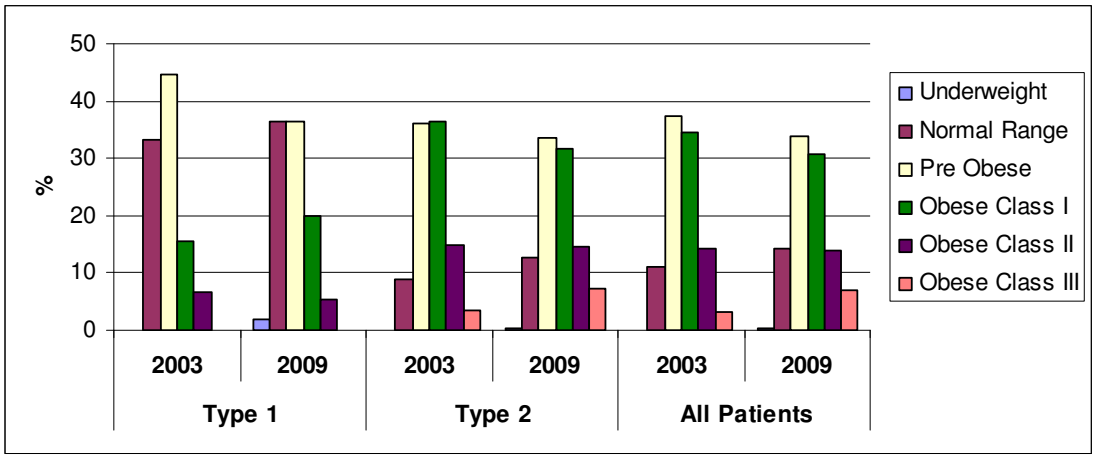


Figure 5: BMI by Diabetes Type – 2003 and 2009

The percentage of patients within the normal range for BMI increased for each diabetes type and overall, with the percentage of those in the Pre Obese and Obese Class II category decreasing. Class I Obesity increased in those with Type 1 diabetes and Class III Obesity increased in those with Type 2 diabetes.

Waist Circumference

Waist circumference was recorded in this audit and 728 patients (68%) had this recorded.

The audit results show the median waist circumference was 102cm with a range of 66cm to 167cm. The median waist circumference for patients with Type 1 diabetes was 94cm and patients with Type 2 diabetes measuring in at 103cm and this difference was statistically significant ($p = 0.000$). This audit shows that 81.7% of males and 93% of females have central obesity as defined by waist circumference.

These results serve as timely reminders of the input needed to encourage patients to modify behaviour in order to attain healthier lifestyles and better health.

Blood Pressure

Systolic Blood Pressure

The median systolic blood pressure for the 2009 audit sample was 134mmHg with a range of 80 – 200mmHg. The current recommended systolic blood pressure for diabetes patients is ≤130mmHg. In the 2009 audit, 45.1% of patients met this target compared to 37.5% in 2003.

Table 27: Systolic Blood Pressure Categories by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
≤130mmHg	47.9	67.1	36.4	43.3	37.5	45.1
≤140mmHg	70.2	83.5	62.1	70.7	62.9	71.7
≤160mmHg	89.4	98.7	90.5	93.9	90.5	94.3

Diastolic Blood Pressure

The median diastolic blood pressure for the 2009 audit sample was 80mmHg with a range of 50 – 115mmHg. The current recommended diastolic blood pressure for diabetes patients is ≤80mmHg. In the 2009 audit, 73.1% of patients met this target compared to 66% in 2003.

Table 28: Diastolic Blood Pressure Categories by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
≤80mmHg	73.4	82.3	65.2	72.3	66.0	73.1
≤90mmHg	93.6	96.2	92.0	95.8	92.2	95.9
≤100mmHg	100	100	98.9	99.7	99.0	99.7

These data show that blood pressure control has improved over the past number of years but it still remains a challenge, especially with regard to systolic blood pressure where less than half of patients audited met the recommended guideline.

The recent ICGP guidelines indicate a target blood pressure of ≤130/80mmHg in order to prevent the development of vascular complications in diabetic patients. However, only 38.1% had an overall blood pressure of ≤130/80mmHg which reflects the difficulty of achieving optimal blood pressure control in everyday practice with diabetes patients.

A concern in the 2003 audit was that the blood pressure data exhibited signs of terminal digit preference with over 70% of systolic and diastolic readings recorded to the nearest 10mmHg. The 2003 audit report commented that terminal digit preference is commonly observed in practice and it raised concerns over the quality of the data. A recommendation of the 2003 audit was to provide GP's participating in the programme with automated blood pressure monitors in conjunction with the provision of ongoing education to GP's and Practice Nurses.

These blood pressure monitors were supplied to GP's and looking at the 2009 data there appears to have been an improvement in the accuracy of recording with 47.8% of systolic and diastolic readings recorded to the nearest 10mmHg.

Lipid Profile

Cholesterol

The median cholesterol level for the 2009 audit sample was 4.0mmol/L with a range of 1.4 – 9.5mmol/L. The median cholesterol in 2003 was 4.9mmol/L. The recommended target cholesterol in 2003 was <5.0mmol/L – it is currently <4.5mmol/L, but a comparison is shown in Table 29 by diabetes type using the 5.0mmol/L target. This shows a large improvement in cholesterol reduction for patients with Type 1 diabetes and also patients with Type 2 diabetes using the 2003 target. The current target is <4.5mmol/L and 65.8% of patients have met that target – 58.4% of Type 1 and 66.6% of Type 2 patients.

Table 29: Cholesterol by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
<5mmol/L	48.9	79.2	55.3	80.7	54.6	80.6

Triglycerides

The median triglyceride level for the 2009 audit was 1.43mmol/L with a range of 0.4 – 12.7mmol/L. The median triglyceride in 2003 was 1.7mmol/L. The current recommended target triglyceride level is <2mmol/L but the recommended level in 2003 was <1.7mmol/L and this will be used to compare in Table 30. This shows a large improvement in triglyceride reduction for patients with Type 1 diabetes and also for patients with Type 2 diabetes using the tighter 2003 target.

Table 30: Triglycerides by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
<1.7mmol/L	73.4	85.7	46.5	59.3	49.0	61.3

LDL Cholesterol

The median LDL cholesterol level for the 2009 audit was 2.1mmol/L with a range of 0.41 – 6.38mmol/L. The median LDL cholesterol in 2003 was 2.8mmol/L. The recently published ICGP guidelines recommend a target LDL cholesterol of < 2.5mmol/L and this will be used to compare with the 2003 data in Table 31.

Again there is a major improvement in LDL cholesterol reduction for patients with Type 1 diabetes and also for patients with Type 2 diabetes.

Table 31: LDL Cholesterol by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
<2.5mmol/L	39.3	57.3	32.2	66.9	32.8	66.2

HDL Cholesterol

The median HDL cholesterol level for the 2009 audit was 1.2mmol/L with a range of 0.34 – 3.98mmol/L. The median HDL cholesterol in 2003 was also 1.2mmol/L. The recently published ICGP guidelines recommend a target HDL cholesterol of >1.0mmol/L and this will be used to compare with the 2003 data in Table 32. There has been very little change in HDL cholesterol levels between the two audits with a very slight percentage decrease overall in 2009.

Table 32: HDL Cholesterol by Diabetes Type – 2003 and 2009

	Type 1 (%)		Type 2 (%)		All Patients (%)	
	2003	2009	2003	2009	2003	2009
>1.0mmol/L	86.0	87.7	76.2	75.4	77.2	76.3

Prescribing of Recommended Secondary Preventative Medications

As discussed in section 2.6, the treatment strategy for diabetes has evolved and typically incorporates the use of statins, aspirin and hypertensive agents as well as smoking cessation. From an Irish context, the Cardiovascular Health Strategy of 1999 recommended that patients with diabetes should receive the same secondary preventative care as would be given to a patient who is known to have cardiovascular disease. Diabetes patients therefore should be targeted by secondary cardiovascular preventative medications which would include the prescription of aspirin and statins. The percentage of patients who were prescribed these two medications is recorded in Table 33.

Table 33: Percentage of Patients Prescribed Secondary Preventative Medications – 2009

	Type 1 (%)	Type 2 (%)	All Patients (%)
Statins	60.8	80.9	79.5
Aspirin	55.7	75.2	73.8

In relation to the prescription of aspirin, 5.9% were contraindicated with the majority of these already taking warfarin or plavix.

There has been ongoing discussion in the literature regarding the use of aspirin in primary prevention of the development of cardiovascular events in diabetic patients. A recently published study by Belch et al – The Prevention of Progression of Arterial Disease and Diabetes (POPADAD) trial, concluded that there is no evidence to support the use of aspirin in primary prevention of cardiovascular events and mortality in diabetic patients[63]. This is in addition to the evidence from the antithrombotic trialist meta-analysis that showed no benefit in antiplatelet therapy for primary prevention in people with diabetes[100]. Also, a recently published evidence based case report by Walsh and Spurling, published in the British Medical Journal, concluded that there was limited evidence of benefit to prescribing aspirin to outweigh the possible harms that it may cause[101]. However, aspirin has been recommended as a primary preventative medication for all diabetic patients over 40 years by the American Diabetes Association (ADA)/American Heart Association (AHA)[102] while the European Society of Cardiology/European Association for the Study of Diabetes does not mention aspirin at all as a primary preventative measure in its guidance[103]. Therefore, there is currently conflicting guidance on aspirin use in primary prevention for cardiovascular disease in diabetic patients. The ASCEND Trial may shed further light on the hazards of aspirin and the probable benefits in patients with diabetes but a meta-analysis of evidence from all relevant studies involving aspirin in primary prevention would provide more conclusive evidence. The recently published Irish guidelines[14] follow the ADA/AHA advice but guidelines by their nature need to be reviewed on a regular basis to ensure that they are up to date in light of emerging research and a review of these guidelines will be forthcoming.

Further analysis of the prescribing data shows that 83.8% of the patients greater than 65 years were prescribed a statin with 73.3% of this group prescribed aspirin. These prescribing levels for statins may be responsible for the improvements seen in the lipid profile of the patients in this audit sample. Analysis of the prescribing data for statins and aspirin by age group and gender is shown in Figures 6 and 7. There were no Type 1 patients greater than 85 years.

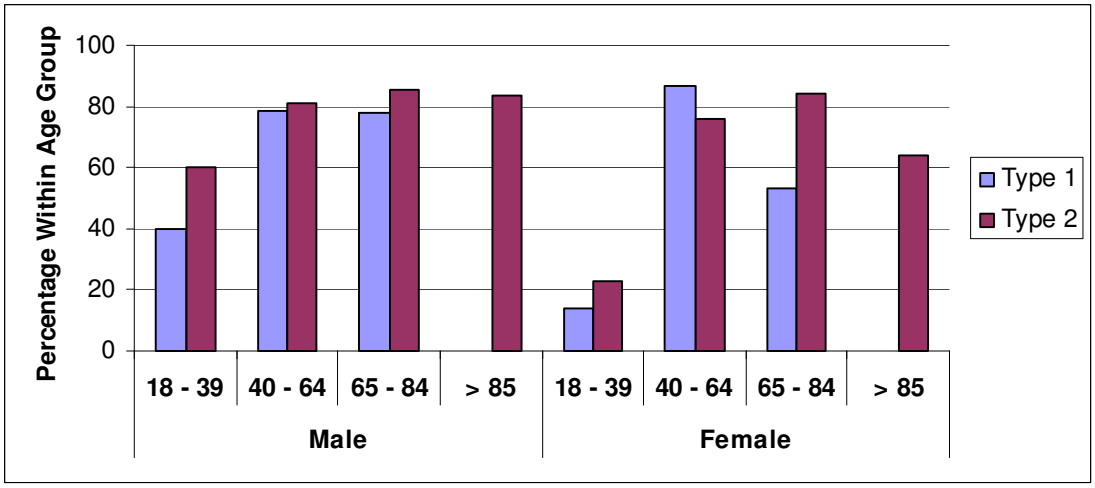


Figure 6: Prescribing of Statins by Diabetes Type, Age Group and Gender

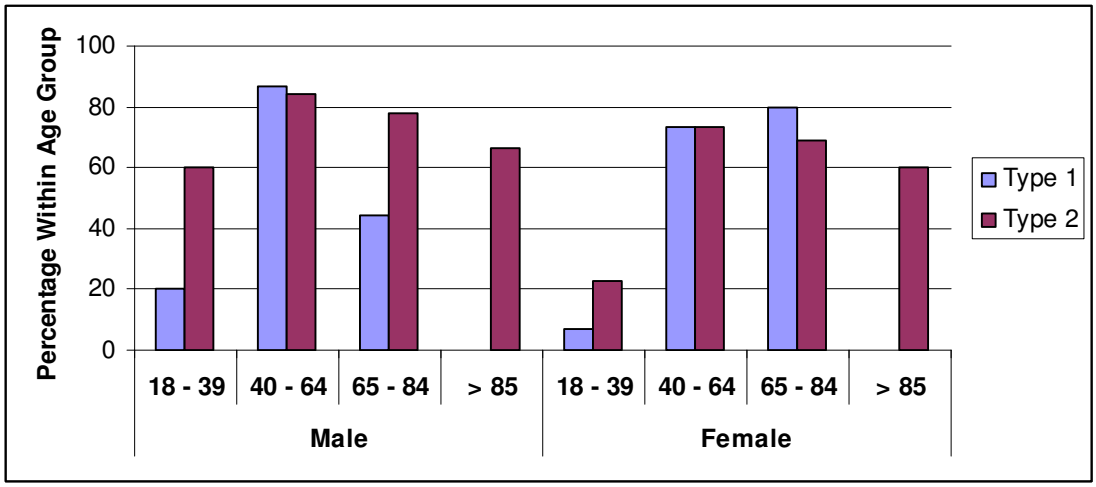


Figure 7: Prescribing of Aspirin by Diabetes Type, Age Group and Gender

Figures 6 and 7 and Table 34 show that there appears to be an underprescibing of both statins and aspirin in the females enrolled on the programme for patients with Type 1 and also for patients with Type 2 diabetes. However, this was only statistically significant in relation to aspirin [(p = 0.000), p = 0.471 for statins].

Table 34: Prescribing of Statin and Aspirin by Gender

	Male (%)	Female (%)
Statin	81.8	76.6
Aspirin	78.3	67.7

4.6 Comparison with Other Irish Audits and the National Diabetes Audit for England and Wales

This section presents a comparison of the results from the 2009 audit of the HSE Midland Diabetes Structured Care Programme, the recently published audit from the Diabetes Interest Group in Cork (2009), the recently published preliminary results from the Diabetes Watch Programme from the North East area (2009) and the National Audit of England and Wales (2007/2008). It should be noted that there are some instances where comparable data were not available. The availability of data for comparison from other audits carried out around the country adds to our overall knowledge of diabetes care in Ireland.

Diabetes Interest Group Cork Audit 2009

The Diabetes Interest Group (DIG) is a General Practice led initiative in the HSE South area and it was established in 2001. It comprises 26 practices incorporating 79 GP's and 48 practice nurses. The DIG promotes a model of care that is consistent with the national policy move towards integrated primary care diabetes management and in that regard is quite similar to the HSE Midland Diabetes Structured Care Programme. The audit consisted of 1,360 patients and audited similar key processes of care and key outcomes of care.

Diabetes Watch – HSE North East Area Audit 2009

Diabetes Watch is also a general practice led initiative in the North East Area that was initiated in 12 practices in 2004 and had been extended to 23 practices in 2006. Diabetes Watch enrols Type 2 patients only. This current audit was based on 20 of the 23 practices and data were available for 1,015 patients. The data are self reported by the practices and submitted to the Department of Population Health for analysis.

National Diabetes Audit for England and Wales 2007/2008

The National Diabetes Audit collects data from primary and secondary care and specialist paediatric units in England and Wales providing an overview of the care for adults, children and young people with diabetes. The first published audit covered was period 2003/2004 and was used as a comparator for the HSE Midland Diabetes Structured Care audit of 2003. The most recent full report was published for the period 2005/2006. There has been an executive summary published for the 2007/2008 period but a full report has not yet been published. The 2007/2008 audit covered 5,359 GP practices and incorporated 1.42 million

people with diabetes in England and a further 73 GP practices and 22,494 people with diabetes in Wales.

Comparison of Processes of Care

Table 35 presents the recording of processes of care across the four audits for all patients with Type 2 diabetes. These data show that the recording of the processes of care in the HSE Midland Diabetes Structured Care Programme compares extremely well with the other three audit reports. The recording of process of care was higher in the HSE Midland Diabetes Structured Care Programme compared to the DIG practices for all comparable process of care except for retinopathy screening (51.4% v 65%). Compared to the National Diabetes Audit England and Wales, the Midlands practices have better recording of all process of care except for smoking status (77.1% v 84.8%), BMI (73.5% v 86.8%) and retinopathy screening (51.4% v 62.8%). The Diabetes Watch programme has demonstrated excellent recording rates for BMI (99.7%) while their recording of HbA1c, blood pressure and cholesterol are slightly better than the HSE Midland Diabetes Structured Care Programme.

Table 35: Comparison of the Recording of the Processes of Care for Patients with Type 2 Diabetes

	HSE Midlands Audit 2009 (%)	Diabetes Watch Audit 2009 (%)	DIG Audit 2008 (%)	National Diabetes Audit England & Wales 2007/2008* (%)
HbA1c	97.9	99.7	73	88.8
Blood Pressure	99.1	99.8	82	91.6
Cholesterol	98.5	99.5	79	88.4
Triglycerides	98.0	N/A	64	N/A
Creatinine	98.3	N/A	77	89.4
Smoking Status	77.1	N/A	50	84.8
BMI	73.5	99.7	38	86.8
Foot Assessment	77.4	N/A	N/A	70.9
Retinopathy Screening	51.4	N/A	65	62.8

* The NDA 2007/2008 data are contained on the NDA 'Dashboard' and is broken down into England and Wales. The data here are the average of the two countries.

Comparison of Outcome of Care

Treatment Targets

Table 36 outlines the achievement of core treatment targets for patients with Type 2 diabetes in the HSE Midland Diabetes Structured Care Programme benchmarked against the other three audits. Treatment targets compared are glycaemic control, cholesterol, blood pressure and body mass index.

Table 36: Comparison of Treatment Targets for Patients with Type 2 Diabetes

	Treatment Target	HSE Midlands Audit 2009 (%)	Diabetes Watch Audit 2009 (%)	DIG Audit 2008 (%)	National Diabetes Audit England & Wales 2007/2008 (%)
HbA1c	Low Risk (<6.5%)	36.3	38.6	25	26.3
	Medium Risk (6.5 – 7.5%)	38.1	36.1	42	37.6
	High Risk (>7.5%)	25.6	25	33	36.1
Cholesterol	<5mmol/L	80.7	80.5	79	77.9
Blood Pressure	≤130/80 mmHg	38.1	44	34	27.7*
Body Mass Index*	Good (<25kg/m^2)	12.9	17.3	11	N/R
	Acceptable (25 – 29.99kg/m^2)	33.6	37.6	37.2	N/R
	Poor (30 – 34.99kg/ m^2)	31.6	44.7†	51.8†	N/R
	Very poor (>35kg/m^2)	21.9			N/R

* NICE guidance for UK is ≤135/75

† DIG and Diabetes Watch categorised data for patients with BMI >30kg/m^2

Glycaemic Control

Table 36 shows the comparison of the percentage of all patients with Type 2 diabetes in each of the HbA1c risk categories across the four audits. As noted earlier in the report, the proportion of patients with Type 2 diabetes in the HSE Midland Diabetes Structured Care Programme that are now in the low risk category has improved from the previous audit - 28.6% to 36.3%. There is a slightly larger proportion of patients in the Diabetes Watch programme in the low risk category (38.6% v 36.3%) while both these audits are showing significantly better results than the DIG and the National Diabetes Audit England and Wales in relation to the proportion of patients in the low risk HbA1c category.

At the other end of the scale - the patients with Type 2 diabetes in the high risk category, the HSE Midland Diabetes Structured Care Programme has shown a large improvement here also – 42.9% to 25.6%, since the last audit in 2003. This result compares very favourably with the National Diabetes Audit England & Wales figure of 36.1% and with the DIG audit figure of 33% of patients in the high risk category and is on a par with the Diabetes Watch programme.

Cholesterol

The HSE Midland Diabetes Structured Care Programme compares excellently on cholesterol control with 80.7% of patients with Type 2 diabetes having a total cholesterol reading of <5mmol/L. The other three audits also have reported good cholesterol control varying between 77.9% and 80.5% of patients with Type 2 diabetes having a total cholesterol of <5mmol/L.

Blood Pressure

Regarding blood pressure, the comparison is based on an overall blood pressure reading of ≤130/80mmHg. Earlier analysis of the HSE Midland Diabetes Structured Care Programme separated out systolic and diastolic blood pressure data and this showed significant improvements. The HSE Midland Diabetes Structured Care Programme lags behind the Diabetes Watch programme regarding blood pressure control – 38.1% v 44%, but is better than both the DIG and the National Diabetes Audit England & Wales findings – 34% and 27.7% respectively. However, it should be noted that the relevant guidance in the UK is for a target blood pressure reading of ≤135/75mmHg.

Body Mass Index

It can be seen from Table 34 that over half of the patients with Type 2 Diabetes from the HSE Midland Diabetes Structured Care Programme and the DIG Programme are obese (> 30kg/m^2) with 44% from Diabetes Watch in this category. The evidence from previous audits from both the HSE Midland Diabetes Structured Care Programme and from Diabetes Watch shows that there has been very little change in levels of obesity. In light of the National Obesity Strategy which was published in 2005, this is of concern[104].

Chronic Complications

Due to the enormous burden that diabetes complications place on the individual it is important that they are prevented where possible and patients are managed effectively afterwards. Table 37 outlines the annual incidence rate of chronic complications highlighted earlier in this report and compares the HSE Midland Diabetes Structured Care Programme and the National Diabetes Audit England and Wales. The DIG audit calculated an actual incidence rate which would not be comparable and the Diabetes Watch preliminary results did not have any data regarding chronic complications.

Table 37: Incidence of Chronic Complications

	HSE Midlands Audit 2009 (%)	National Diabetes Audit England & Wales 2007/2008 (%)
Ketoacidosis	0.2	0.5
Major Amputation	0.13	0.07
Minor Amputation	0.1	0.13
Myocardial Infarction	0.5	0.6
Heart Failure	0.3	1.4
Stroke/CVA	0.5	0.6

5. Discussion

Clinical audit is essentially a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the subsequent 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[105]. For audit to make a difference to quality of care and patient outcomes, it needs to be embedded in a wider quality assurance/quality management framework. It should be supported by an organisational culture that is open, transparent and willing to acknowledge and address the gap between aspiration and reality in the provision of health services. This current audit of the HSE Midland Diabetes Structured Care Programme should be viewed in this context. This report follows on from the previous audit report in 2003 in demonstrating that significant progress has been made in the care of patients with diabetes in the region since the initiation of the programme in 1998. It shows what can be achieved by a group of committed GP's and practice nurses working together with the HSE in implementing an evidence based model of care in the community. However, this audit also shows the ongoing challenge of managing diabetes effectively in the community with regard to the provision of screening services for the eye and foot in addition to addressing the problem of obesity through dietetic review and tackling smoking cessation.

Quality Cycle

GP's and practice nurses are involved from the outset of the data collection process for this audit cycle. Targeted reports were provided to each practice within four weeks of data collection. The facility to identify high risk patients was provided to the GP's through the Clinical Nurse Specialist Diabetes and the 2009 education programme was tailored to address the issues emerging from the preliminary data.

In this audit, the national guidelines for diabetes care in the community – *"A Practical Guide to Integrated Type 2 Diabetes Care"*[14] produced by the Irish College of General Practitioners (ICGP), the HSE and the Irish Endocrine Society/Department of Health and Children in 2008, were used to define the benchmark standards of care. In reviewing the findings of the audit, the areas of

care being delivered in line with national guidelines are highlighted, in addition to the areas in need of improvement. Comparisons are made with data from other areas in Ireland and internationally with the National Diabetes Audit of England and Wales.

Patient Profile

A total of 2,275 patients with diabetes were identified in the 30 practices that participated in the audit. A random sample of 1,071 patients was selected for inclusion in the audit. Of the total sample, 7.5% had Type 1 diabetes with 92.3% having Type 2 diabetes. There has been a substantial reduction in the proportion of patients with Type 1 diabetes enrolled in the programme from 15% in 1998/1999 to 7.5% of the current audit sample. Twelve percent of the DIG sample had Type 1 diabetes and UK estimates from Diabetes UK indicate 15% of people with diabetes have Type 1[106]. As expected, the age profile of patients in this audit was in line with international norms with 36.3% of patients with Type 1 diabetes under 40 years and over half of patients with Type 2 diabetes greater than 65 years. Regarding gender, the proportion of males has increased steadily over the past ten years with 56.5% of the audit sample male compared to 50% in 1998/1999. This is in line with UK data reporting that the prevalence of diabetes is higher in males than females[90]. However, recent estimates of prevalence in the Irish population indicated that the prevalence of diabetes was higher in females than males[17].

5.1 Process of Care

Diabetes Management

Just over 12% of patients were managed by diet alone, 64.3% with diet and oral hypoglycaemic agents, 10.9% with diet and insulin and the remaining 12.5% treated with a combination of diet, insulin and oral hypoglycaemic agents. The use of insulin in patients with Type 2 diabetes has increased since 2003 – 17.2% in 2009 compared to 7.6% in 2003. This provided further evidence that Type 2 diabetes is a progressive disease requiring a 'stepped care' approach to treatment with progression from diet and lifestyle change through monotherapy to medication combinations including insulin. In the 2003 audit report it was noted that the use of insulin in patients with Type 2 diabetes may have been inappropriately low at 7.6% and that an insulin initiation programme was to commence in some practices. Due to the development of practice guidelines in partnership with the hospital service, Type 2 patients needing to commence on

insulin therapy can now do so through their local GP practice and do not have to attend hospital for this service. This insulin initiation programme is working well with approximately 50 patients with Type 2 diabetes having commenced insulin treatment to date. These patients were naïve to insulin and were commenced on a basal insulin regimen. Insulin therapy is only commenced when treatment with oral hypoglycaemic agents has been exhausted. In recent years there has been a delay in the necessity for insulin therapy in patients with Type 2 diabetes due to advances in new oral treatment therapies. However, due to the progressive nature of Type 2 diabetes, the programme has still recognised a sharp increase in the number of patients who now require an additional meal time insulin regimen. A study carried out by HSE Midland Diabetes Structured Care Programme, presented at the Primary Care Diabetes Europe conference in 2007, showed that insulin initiation can be successfully managed at general practice level provided the appropriate support mechanisms are in place. There was a mean HbA1c reduction of 1.6 (9.7 to 8.1) in the six months post insulin initiation and 21.4% had achieved a HbA1c level of ≤7%[107].

Documentation of Key Audit Variables/Knowledge of Key Risk Factors

Recording of HbA1c, blood pressure, serum cholesterol and triglycerides were all in excess of 97.9% and all have improved from the previous two audits. Recording of serum creatinine had also improved from the previous audits (75% in 1998, 81.9% in 2003) to 98.1%. The rate of recording of smoking status had improved to 77% from 74.2% in 2003 but was still less than the 1998 figure of 82%. Two studies, one from the US and one from the UK, reported GP medical chart documentation of smoking status of 78.4% and 74% respectively[108,109]. The opportunity to address smoking as a risk factor may be lost at consultation if smoking status is not recorded although the study by Boyle and Solberg concluded that more consistent identification of tobacco use alone will not lead to changes in cessation support actions by clinicians.

A similar picture was evident for the recording of body mass index (BMI) which was 73.1% in 2009, up from 54.7% in 2003 but again down on the 1998 figure of 76%. So there is clearly some room for improvement. There is a need for stable and robust IT systems for routine data capture at General Practice level to support GP's in the recording of these key variables. The ICGP have set up a group investigating the introduction of a common diabetes dataset and have

liaised with the IT software providers to ensure that data can be collected and extracted for audit purposes.

Annual Review and Screening

The proportion of patients who attended for annual review with their GP increased significantly to 90.5% from 32.5% in 2003. This demonstrates how the provision of diabetes care in primary care can be of significant benefit to the acute hospital system when nine out of every ten patients receive their total diabetes care from their GP now compared to two out of every ten patients ten years ago[3].

Less than half of all patients (41.8%) had received a dietetic review in the year leading up to the audit – this was a decrease from 42.4% in 2003. However, it should be noted that the DNA rate increased to 12.6% in 2009 from 3.7% in 2003 and there were a small number of patients who refused to see a dietitian when offered an appointment. A similar rate of attendance (43%) was observed over a four month period in the dietetic out-patient setting in Ireland[110]. This increase in non-attendance is worrying given the growing problem of obesity particularly evident among patients with Type 2 diabetes in this sample.

Just over half of all patients (51.5%) had an ophthalmology review and while there has been a steady improvement in the screening rate since the initial audit in 1998 this falls far short of the recommendation that all patients should be screened annually. It also compares very poorly with the target of 86% reached in the UK[50] and highlights the need for a national retinopathy screening programme to be rolled out to capture any potential eye disease as soon as possible after diagnosis.

Chiropody/podiatry review took place for 56.9% of patients in the previous year and this was an increase on 32.6% from 2003 but falls far short of the 75.5% seen in 1998/1999. In 2003 there were only two chiropodists working with the Diabetes Structured Care Programme while currently there are seven – five chiropodists and two podiatrists. There have been some issues recently with the provision of chiropody/podiatry services with some practices having no access to a chiropodist/podiatrist for approximately seven months between August 2008 and February 2009 but this has now been resolved. Due to increased education and training of practice nurses and GP's, the proportion of patients who had a foot assessment increased to 77.5% compared to 56.4% in 2003. Those patients

who are assessed as being high risk are seen more frequently by the chiropodist/podiatrist and would generally be referred by their GP to specialist services such as vascular and orthopaedics as required.

Overall, the level of screening for diabetic complications falls far short of current guidelines. These highlight the need for substantial increases in resources to manage diabetes care in the community.

5.2 Outcomes of Care

Glycaemic Control

There is conclusive evidence that good control of blood glucose levels, i.e. HbA1c, can substantially reduce the risk of developing complications and slow the progression of complications in all types of diabetes[93]. The data from this audit have shown that, overall, glycaemic control has improved. However, based on ICGP guidelines, there has only been a slight improvement for patients with Type 1 diabetes, with 11.3% having good metabolic control (HbA1c <6.5%) compared to 10.9% in 2003. There has been a slight increase in the proportion of patients with Type 1 diabetes at high risk (HbA1c >7.5%) with 72.5% now in this category compared to 71.7% in 2003. The situation is considerably better for patients with Type 2 diabetes with 36.3% in the low risk category compared to 28.6% in 2003 and there are now 25.6% in the high risk category compared to 42.9% in 2003.

It should be noted that these figures have not been adjusted for age or sex. Therefore a level of caution should be used when interpreting these figures but on the whole, improvements in HbA1c levels must be welcomed. These findings emphasise the challenge of optimising glycaemic control in diabetic patients, the need to work with individual patients to implement current best practice with regard to dietary management and intensive therapy, without an unacceptable increase in the risk of hypoglycaemia or adverse effects on patient's quality of life. This is where the availability of the Diabetes Nurse Specialists to patients in this programme is crucial.

The recently published UKPDS study, on the 10 year follow up of patients with Type 2 diabetes who underwent intensive glucose control reported that while the intervention group had lost the differential of improved HbA1c over the conventional treatment group, this cohort of patients had maintained their

cardiovascular risk reduction. The authors concluded that good glycaemic control early in the disease process confers cardiovascular risk reduction into the future which supports the importance of early diagnosis and enforces the importance of good glycaemic control[111].

Chronic Complications

Just over 56% of patients with Type 1 and 22% of those with Type 2 diabetes had retinopathy. There has been an increase in the recorded ascertainment of retinopathy since 2003 when 42.3% of patients with Type 1 and 13.8% of patients with Type 2 diabetes were diagnosed with retinopathy. As noted earlier the increased ascertainment could be due to the increased length of time since diagnosis for some of these patients. Patients with Type 1 or Type 2 diabetes who were diagnosed more than five years ago have much higher rates of retinopathy than those diagnosed in the last five years. However, the increased ascertainment noted in this audit could also be as a result of a poor screening service over the past number of years with increasing numbers of patients being screened in recent years. The 2003 audit report indicated that the prevalence of retinopathy in patients with Type 1 diabetes was as expected but that the low documented prevalence rate in patients with Type 2 diabetes was lower than expected. The report indicated that there needed to be a higher uptake in annual retinopathy screening in these patients. While this report shows that the screening rate has increased, it has only increased slightly and there may be patients with Type 2 diabetes who are asymptomatic but would benefit from the early diagnosis that screening would facilitate.

The 2003 report indicated that the data on the incidence of foot ulcers, at 6.1% for all patients, were difficult to interpret due to the under-recording of this variable (53% of data were missing). In this audit the proportion of missing data have reduced significantly to 8.4%, therefore we can be more confident regarding the accuracy of the current incidence rate of 2.5% for all patients. Generally it is reported that the prevalence of diabetic foot ulcers ranges from 4 to 10%, with annual population based incidence of between 1 and 4% and a lifetime incidence of up to 25% so the current figure of 2.5% for this audit seems to be lower than expected[112]. Using data from a retrospective cohort study of 8,905 Type 1 and Type 2 diabetes patients, Ramsey et al found an incidence of foot ulcers of nearly 2% per year and a cumulative incidence over three years of observation of 5.8%[113]. Lavery et al, in an American study on a cohort of 1,666 diabetic patients enrolled in a disease management programme, reported an annual incidence rate

of 68.4 per 1,000 people (6.84%)[114]. One of the recommendations from these studies was more patient education and foot ulcer prevention programmes, which is something that has been done in the HSE Midland Diabetes Structured Care programme and perhaps the low incidence is evidence that the programme is working.

5.3 New Complications and Hospital Admissions

Hospital admission rates for hypoglycaemia and ketoacidosis were, as would be expected, higher in patients with Type 1 diabetes. The admission rates for these complications have decreased since the 2003 audit. In relation to new complications since the last audit or since enrolment, 0.5% of patients had an MI, 0.6% had a cerebrovascular accident (CVA) with 0.3% having been diagnosed with heart failure. As the data collected in 2003 were on new macrovascular complications in the previous year it is difficult to make accurate comparisons although an annual incidence rate was calculated and reported on in the results section. This showed that there have been improvements in the annual rate of new micro and macrovascular complications. It is difficult to make comparisons with the UK audit as they collect the data as an annual prevalence rate and not as new complications. This is something that should be taken into account for the next audit. Cardiovascular disease mortality data were not collected in this audit but this also should be included in future audits particularly as mortality amongst patients with diabetes tends to be as a result of cardiovascular events or renal disease rather than causes unique to diabetes[27]. These findings on new cardiovascular complications have shown improvements in the past few years but as only new complications since last audit/enrolment are recorded an overall prevalence rate is not available. Again this is something that should be addressed in future audits in order to evaluate the long term impact of the programme.

5.4 Lifestyle/Behavioural Risk Factors

Smoking

There was a slight decrease in the smoking rates for all patients in this audit (20.4% to 20.7%). The smoking rate for patients with Type 1 diabetes, 37.7%, was higher than the smoking rate for the general population at 29% but patients with Type 2 diabetes had a lower smoking rate (19.1%)[115]. The high smoking rates in patients with Type 1 diabetes are striking but are in line with the fact that smoking is more common among younger adults – 35% of the 18-29 age group

currently smoke. Given the cardiovascular risk for diabetic patients and the link between smoking and increased cardiovascular risk it is obvious that there is a need for intensive and sustained intervention to support patients in their efforts to quit smoking. The SLAN report on smoking reported that only 38% of current smokers who attended their GP or other health professional indicated that the professional had discussed quitting smoking with them during the consultation. It appears that identification of mechanisms for encouraging better use of opportunities in primary care to deliver smoking cessation advice needs to be pursued[115].

Body Mass Index (BMI)

Similar to the 2003 report, overweight and obesity amongst patients with diabetes is evident again. There had been no change in the median body mass index (BMI) score between 2003 and 2009 (30kg/m^2). BMI was significantly higher in patients with Type 2 diabetes with over half of these patients (53.5%) clinically obese. This figure was 35% in 1998/1999 and 47% in 2003. The National Task Force on Obesity report that 18% of the general population are clinically obese with a figure of 25% reported from an independently measured sample from the SLAN survey[104,116] and these figures are rising. These figures bear out the evidence that obesity is a predisposing factor to the development of Type 2 diabetes and obesity remains a significant risk factor post diagnosis for over half of all patients with Type 2 diabetes. There were 93 recommendations from the National Task Force on Obesity of which 24 were focussed on the health sector incorporating items such as the regular recording of BMI, education of healthcare staff in sensitive management of weight issues, identifying points of contact with the health services where awareness of weight and healthy eating can be encouraged etc.

Recording of BMI has increased to 73.1% in the current audit so there is still some work to do in this regard. Analysing which health professional recorded the BMI showed that the practice nurse measured BMI in 81.3% of the patients with the dietitian accounting for 11.5% of the patients for whom data was available. The remainder were calculated by the GP or other health professionals, usually the Diabetes Nurse Specialist. Overall, only 41.8% of patients saw a dietitian in the last year and of the Type 2 patients that were assessed as being clinically obese (BMI > 30kg/m^2) only 43.8% of these were seen by a dietitian.

Waist Circumference

There is ample evidence to support the use of waist circumference (WC) as a predictor of risk of diabetes and some would argue cardiovascular disease. However, Janiszewski et al conclude that WC predicted diabetes but not CVD *'beyond that explained by traditional cardiometabolic risk factors and BMI'*.[117]

Its measurement in the clinical care of patients with diabetes is unclear except maybe in the identification of those patients with 'metabolic syndrome' and this will depend on the definition used. There are no widely accepted criteria for diagnosing metabolic syndrome but the two most commonly used come from the WHO and National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) in the US.[118] For example, the WHO does not include WC in its definition, whereas the definition commonly used in the US includes waist circumference >102cm in men and >88cm in women as a criteria. In 2005, a joint statement from the ADA and the European Association for the Study of Diabetes questioned the scientific basis for the use of the term 'metabolic syndrome' to describe a clustering of specific CVD risk factors and insulin resistance and called on clinicians to *'evaluate and treat all CVD risk factors without regards to whether a patient meets the criteria for diagnosis of the metabolic syndrome.'*.[119]

The IDF indicate that a waist circumference of ≥ 94cm for males and ≥80cm for females are indicative of central obesity[120]. The recognition of central obesity in patients with diabetes, in addition to the other risk factors, indicates a need for aggressive cardiovascular disease risk factor reduction but the value of WC measurement over and above BMI measurement is unclear.

The audit results show the median waist circumference was 102cm with a range of 66cm to 167cm. The median waist circumference for patients with Type 1 diabetes was 94cm and patients with Type 2 diabetes measuring in at 103cm and this difference was statistically significant ($p = 0.000$). This audit shows that 81.7% of males and 93% of females have central obesity as defined by waist circumference.

The results for these risk factors serve as timely reminders of the input needed to encourage patients to modify behaviour in order to attain healthier lifestyles and better health.

5.5 Blood Pressure and Lipids

The control of blood pressure is seen as being of equal importance as tight metabolic control in the management of diabetes[22]. The recent ICGP guidelines indicate a target blood pressure of <130/80mmHg in order to prevent the development of vascular complications in diabetic patients. Approximately 67% of patients with Type 1 diabetes and 43.3% of patients with Type 2 diabetes achieved the target of ≤130mmHg for systolic blood pressure and 82.3% of patients with Type 1 and 72.3% of patients with Type 2 diabetes achieved the target of ≤80mmHg for diastolic blood pressure. However, only 38.1% had an overall blood pressure of ≤130/80mmHg which reflects the difficulty of achieving optimal blood pressure control in everyday practice with diabetes patients. There are still a number of patients whose blood pressure is a concern; approximately 1% have a blood pressure ≥ 160/100mmHg with 5.7% having a systolic blood pressure greater than 160mmHg. As the UKPDS study indicated the importance of tight blood pressure control, this is an ongoing priority issue for the HSE Midland Diabetes Structured Care Programme.

A concern in the 2003 audit was that the blood pressure data exhibited signs of terminal digit preference with over 70% of systolic and diastolic readings recorded to the nearest 10mmHg. The 2003 audit report commented that terminal digit preference is commonly observed in practice and it raised concerns over the quality of the data. Looking at the 2009 data there appears to have been an improvement in the accuracy of recording with 47.8% of systolic and diastolic readings recorded to the nearest 10mmHg.

Just over 58% of patients with Type 1 and 67% of patients with Type 2 diabetes have achieved the ICGP cholesterol target level of 4.5mmol/L. This is a large improvement on the 2003 audit and may be as a result of the large use of statins in the sample with just under 80% of all patients prescribed a statin. In 2003, a substantial proportion of patients with Type 2 diabetes had hypertriglyceridemia. In this audit an improvement was seen with 59.3% of Type 2 patients meeting the tighter 2003 target of 1.7mmol/L. The current target is <2.0mmol/L and 70.7% of Type 2 patients have met this target. A recommendation in the ICGP guidelines for patients that have hypertriglyceridemia is for the prescription of second generation statins followed by Omega 3 fish oils and fibrates as a third line therapy. These data were not collected in this audit but it may be useful to assess the prescription of these therapies in future audits.

Gender Disparity in Treatment of Cardiovascular Risk Factors

Gender disparity in the treatment of cardiac risk factors in patients with diabetes has been described in a number of studies. Ferrara et al, as part of the Translating Research Into Action for Diabetes (TRIAD) study, analysed data on 8,847 diabetic patients with and without a cardiovascular disease (CVD) history. They concluded that women were significantly less likely to use aspirin than men, with or without a CVD history. The use of lipid lowering medications was significantly less frequent in women among those with CVD and lipid profile testing was significantly less frequent in women without CVD[121].

Wexler et al, in a study on 3,849 diabetes patients with and without coronary heart disease (CHD), concluded that women were significantly less likely than men to receive recommended treatments for several major modifiable CHD risk factors and, when treated, were less likely to achieve recommended goals of therapy[122]. They noted that women did not uniformly receive as good care as men in both unadjusted analyses and after adjusting for differences in age, race, clinic site and other variables. Among the patients who did not have CHD, women were less likely than men to be prescribed lipid-lowering medications and aspirin and were less likely to have HbA1c and LDL at target levels. Among patients with CHD, women were less likely than men to be taking aspirin or to have their HbA1c, blood pressure or lipids controlled to recommended levels.

A further study by Gouni-Berthold et al, looked at a German sample of 44,893 Type 2 diabetic patients of which 51% were women[123]. Similar to the two previous studies they concluded that women with a history of CVD were more likely to have all three risk factors (blood pressure, LDL cholesterol and HbA1c) uncontrolled and that women were less likely to receive lipid lowering medications. Among patients without a history of CVD, women were more likely to have uncontrolled LDL cholesterol.

An Irish study that was focussed on regional variation in the prescribing of medications for diabetes also indicated that men were more likely to receive aspirin than women[124]. This study also noted a large variation between regions (health board areas) for the prescribing of secondary preventative therapies with the highest variability observed for statin prescribing (1.5 to 1.6 fold). Consistently high rates were observed for all secondary preventative therapies for patients with Type 1 and Type 2 diabetes in the Midland Health Board region where HSE Midland Diabetes Structured Care Programme is in place. Usher et al

indicated that there was no explanation for this prescribing variability but that it may be due to differences in screening and health promotion between regions, prescriber uncertainty, variability in clinical need, or may be derived from a socioeconomic disparity among regions[124].

5.6 Performance of the HSE Midland Diabetes Structured Care Programme in a National and International Context

One of the main tenets of quality assurance and quality improvement in health care is the process of open and critical reflection on current practice. The HSE Midland Diabetes Structured Care programme team are committed to the provision of high quality care for people with diabetes in the primary care setting based on objective criteria and benchmarked against national and international guidelines. This current audit, similar to the two previous audits, was rigorous, labour intensive and independent and it provides clear evidence of the team's commitment to providing excellent diabetes care. As with any audit, problems are identified with some aspects of the provision of care and it is important that any issues are discussed with clinicians and other members of the team as soon as possible to address any shortcomings.

It is important to put the findings from this audit in context by comparing the performance of the HSE Midland Diabetes Structured Care programme with similar programmes nationally and internationally. The data provided by the recent Diabetes Watch and the Diabetes Interest Group (DIG) provide important national comparators for the HSE Midland Diabetes Structured Care programme with similar numbers of patients involved. The findings from the current audit compare very favourably with the Diabetes Watch and DIG findings in relation to processes and outcomes of care as discussed earlier.

An international perspective is also of value in appraising the findings from this audit. In the UK, the National Diabetes Audit recently reported on its 2007/2008 audit and the HSE Midland Diabetes Structured Care programme compares extremely well in the areas of recording of process of care, achievement of treatment targets, risk factor targets and glycaemic control.

It is important that the HSE Midland Diabetes Structured Care programme does not get complacent regarding the excellent performance as reported here. This audit has highlighted some areas in which improvement is required if diabetes

patients are to get quality care that is consistent with national and international standards.

6. Recommendations

Based on the findings from this audit report, we make the following recommendations:

1. The HSE Midland Diabetes Structured Care Programme has demonstrated how care for Type 2 diabetes can be effectively managed in primary care. This should be considered by the HSE as an appropriate and cost-effective model for delivery of care for Type 2 diabetes to the whole population within an integrated services approach.

2. The renewed focus to the delivery of diabetes care, through the Quality and Clinical Care Directorate, is welcomed. The experience gained over the past 10 years by the Diabetes Structured Care programme and shared through audit and research should inform future work.

3. The HSE Midland Diabetes Structured Care Programme should be expanded to include all General Practices and Primary Care Teams in the Local Health Office Areas of Laois/Offaly and Longford/Westmeath.

4. Regarding education, the HSE Midland Diabetes Structured Care Programme should promote the development of a multidisciplinary diabetes module on the management of the patient with diabetes in primary care. This module would be open to all service providers within the Diabetes Structured Care Programme and would greatly assist in ensuring the consistent implementation of the Diabetes Integrated Care Guidelines.

5. The HSE Midland Diabetes Structured Care Programme should provide support to GP's to enable their practice nurses to attend the five-day diabetes programme - Nursing Management of Individual with Diabetes, which is accredited by Dublin City University.

6. The HSE Midland Diabetes Structured Care Research Group should review the current audit data collection tool with a view to collecting additional data on mortality from cardiovascular disease in addition to overall incidence rates for complications.

7. The foot care risk assessment protocol should be modified to classify risk assessment per foot. This should give a more accurate reflection of risk of

developing foot complications. Also, who conducted the foot assessment should be noted for future audits.

8. The HSE Midland Diabetes Structured Care Programme should continue to work with the National Diabetes Register Project.

9. There is a further need to develop the Information Technology infrastructure to allow for real-time collection of audit data, annual reporting of audit findings and long-term follow up of all patients participating in the project. The output from the National Diabetes Dataset project will influence this development.

10. The issues identified regarding the retinopathy screening process need to be addressed.

7. Appendices

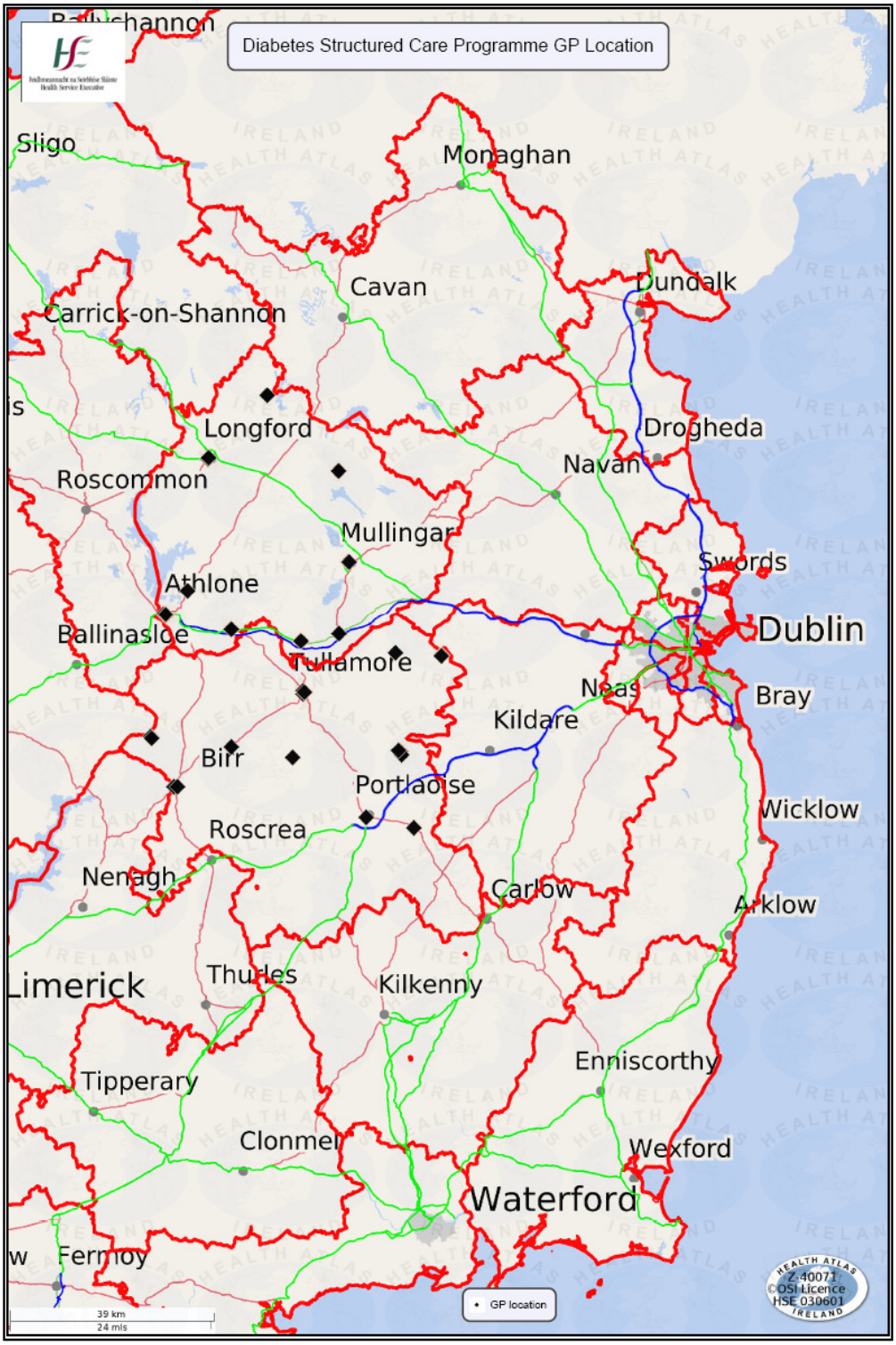
Appendix 1 Audit Form

HSE Midland Diabetes Structured Care Project Patient Details Data		Categories	
1	GP		
2	Patient's Name		
3	Patient's Number		
4	Sex	1 = Male, 2 = Female	
5	Date of Birth		
6	Ethnic Group	0=Not Recorded , 1=Irish, 2=Irish Traveller, 3=Other White, 4=African, 5=Other Black, 6=Chinese, 7=Other Asian, 8=Other including mixed,	
7	Classification of DM	0=Not recorded, 1=Type 1, 2=Type 2, 3=Gestation	
8	Date of Diagnosis		
9	DM controlled on	0=Not recorded, 1=Diet, 2=Diet+Tabs, 3=Diet+Insulin, 4=Diet+Insulin+tabs	
10	Year of Insulin Commencement		
11	Self Monitoring Type	0=Not recorded, 1=Urine, 2=Blood, 3=Both	
12	Date of enrolment		
13	Smoke now	0=Not recorded, 1=Yes, 2=No, 3=Occasionally	
14	Weekly units of Alcohol	NR=Not recorded	
15	HbA1c	0=Not recorded DATE:	
16	Serum Creatinine	0=Not recorded DATE:	
17	ACR NPT LAB	0=Not recorded DATE:	
18	Microalbumin	0=Not recorded DATE:	
19	Cholesterol	0=Not recorded DATE:	
20	Triglycerides	0=Not recorded DATE:	
21	HDL	0=Not recorded DATE:	
22	LDL	0=Not recorded DATE:	
23	BMI	0=Not recorded D GP PN Other (Circle one)	
24	Waist Circumference	0=Not recorded	
25	Systolic BP	0=Not recorded DATE:	
26	Diastolic BP	0=Not recorded DATE:	
27	Seen Ophthalmologist in past 12 mths	1=Yes, 2=No, 3=DNA	
28	Was eye referral letter sent	1=Yes, 2=No, 3= N/A	
29	Retinopathy present	0=Not known,1=No Retinopathy,2=Background Retinopathy,3=Pre-Proliferative,4=Proliferative,5=Advanced Diabetic Eye Disease, 6= Maculopathy, 7=Blind	
30	Ever treated with laser	0=Not known, 1=Yes, 2=No	
31	Had Vitrectomy	0=Not known, 1=Yes, 2=No	
32	Seen Chiropodist/Podiatrist in past year	0=Not known, 1=Yes, 2=No, 3=DNA	

33	Was chiropodist/Podiatrist referral letter sent	1=Yes, 2=No, 3=N/A	
34	Foot Assessment recorded	1 = Yes, 2 = No	
35	Foot Ulcer	1 = Yes, 2 = No	
36	Risk Classification of Foot	0=Not recorded, 1=low, 2=moderate, 3=high, 4=active disease	
37	Seen Hospital/Community Dietician in past yr.	0=Not Known, 1=Yes, 2=No, 3=DNA	
38	Was dietician referral letter sent	1=Yes, 2=No, 3=N/A	
39	Acute Hospital	0=Not recorded, 1=PGH, 2=TGH, 3=LW, 4=P/Unc, 5=other, 6 = > 1 hospital	
40	Attending Renal Clinic	0=Not Known, 1=Yes, 2=No	
41	Admit with **DKA** in past year	1=Yes, 2=No	
42	Admit with **hypos** in past year	1=Yes, 2=No	
43	New Minor Amputations (below ankle)	1=Yes, 2=No	
44	New Major Amputations (leg)	1=Yes, 2=No	
45	New Microvascular Complications	1=Yes, 2=No	
46	New Macrovascular Complications	0=None, 1=MI, 2=CVA, 3=MI & CVA, 4=Angina, 5=Heart Failure, 6=PVD	
47	New Autonomic Neuropathy Complications	0=None, 1=ED, 2=Other*, 3=ED+Other*	
48	Treatment for Macro complications	0=None, 1=ESRF, 2=PTCA, 3=CABG, 4=PTCA+CABG, Other**	
49	Influenza Vaccine in the last year	0=Unknown, 1=Yes, 2=No	
50	Cardiac Drugs ACE1	1=Yes, 2=No, 3=Contraindicated	
51	Cardiac Drugs ACE2	1=Yes, 2=No, 3=Contraindicated	
52	Cardiac Drugs Statins	1=Yes, 2=No, 3=Contraindicated	
53	Cardiac Drugs Aspirin	1=Yes, 2=No, 3=Contraindicated	
54	Has the patient seen the Diabetic Nurse Specialist	1=Yes, 2=No, 3= Patient DNA	
55	What was the purpose of the DNS visit	1=Insulin Initiation, 2=Improve patient glycaemic control on insulin, 3=Improve patient overall diabetic care, 4=Preconceptual Care, 5=Other	
56	Was Insulin Initiated	1=Yes, 2=No, 3=Not Applicable	
57	Did the patient attend the GP for annual review	1=Yes, 2=No, 3=DNA, 4=Not Applicable	

Appendix 2

Geographic Location of GP Practices/Primary Care Teams in Laois/Offaly and Longford/Westmeath



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