Preventing type 2 diabetes: applying the evidence in nursing practice

An overview of the evidence on diabetes prevention, how to calculate and communicate risk, and practical interventions to reduce risk

**INTRODUCTION**
Type 2 diabetes mellitus is a long term and debilitating condition characterised by an inability to regulate blood glucose levels adequately. It is associated with serious co-morbidities and reduced life expectancy. The prevalence of the condition has risen so sharply over the past half century that it is now commonly referred to as an epidemic. It is estimated to be the fifth leading cause of mortality globally (Roglic et al, 2005).

In England alone, over two million people have been diagnosed with type 2 diabetes and it is estimated there are an additional 667,000 undiagnosed cases (Forouhi et al, 2006). Already, approximately 5% of total NHS and up to 10% of hospital inpatient resources are devoted to the care and treatment of type 2 diabetes (Department of Health, 2001). These figures are set to rise, posing a serious clinical and financial challenge to the UK’s health system.

Type 2 diabetes is not a distinct category, but sits at one end of a continuous glucose control spectrum with normal control at the other. In between, there is a condition of impaired glucose regulation (commonly referred to as prediabetes) where blood glucose levels are higher than the normal range but do not meet the criteria for type 2 diabetes. This intermediate state is defined as impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG) (World Health Organization, 2006).

In most countries, around 15% of adults have prediabetes based on the WHO criteria, of whom an estimated 5-12% develop diabetes each year (WHO, 2006; Santaguida et al, 2005).

Importantly, the risk of cardiovascular disease, a common co-morbidity in diabetes, is significantly higher in impaired glucose regulation (Unwin et al, 2002).

Given these factors, people with impaired glucose regulation will form a significant proportion of the healthcare burden associated with diabetes in the future and are a key target group for prevention initiatives.

**PRACTICE POINTS**
- Nurses have a key role in promoting physical activity and other lifestyle behaviours that reduce the risk of diabetes.
- Structured education is an effective and systematic way of providing self management and behaviour change strategies for those at risk of diabetes.
- The use of risk scores can accurately highlight risk status non-invasively with limited resources.
- Communicating risk is key to starting the behaviour change process.
- Pedometers are a cheap and effective tool for initiating physical activity behaviour change.
- Researching local behaviour change/lifestyle groups can provide nurses with information so they can point people in the appropriate direction.

In recent years, there has been a trend for the DH and primary care trusts to put more resources and expertise into preventing long term conditions. Identifying and treating those at risk of diabetes is now a stated priority both nationally and locally.

This shift in emphasis is likely to have a significant impact on usual healthcare practice in the near future and, as with management of diabetes, nurses will be at the forefront of implementing this new area of work.

**THE EVIDENCE**
**Lifestyle**

There is now clear evidence from diverse settings that lifestyle modification programmes promoting increased physical activity, dietary change and weight loss can substantially reduce the risk of type 2 diabetes in those with prediabetes (Gillies et al, 2007).

For example, data from large diabetes prevention studies in the US and Finland has shown that lifestyle modification programmes reduce the risk of diabetes by more than 50% (Knowler et al, 2002;
Tuomilehto et al, 2001). Further analyses of these studies revealed that the risk of diabetes was reduced by over 90% in people who achieved all their prescribed lifestyle change goals (Hamman et al, 2006; Tuomilehto et al, 2001).

The large reduction in the risk of diabetes observed in these studies is unsurprising given that its rising prevalence is attributable to “obesogenic” modern environments where energy-dense foods are plentiful and the link between physical activity and food procurement has been broken. Therefore lifestyle change directly targets the root cause of diabetes.

While many lifestyle factors contribute to risk, it is necessary to prioritise information given to patients during a time-limited consultation.

There is increasing evidence that physical inactivity and sedentary behaviour is the single biggest lifestyle factor contributing to the rising prevalence of diabetes and other long term conditions (Booth et al, 2000). Epidemiological evidence has consistently shown a powerful inverse association between levels of physical activity and risk of diabetes (Bassuk and Manson, 2005). Intervention studies have shown that a change in physical activity has a dramatic effect on the risk of developing type 2 diabetes (Yates et al, 2009; Laaksonen et al, 2005).

Furthermore, the benefits of physical activity are seen even without weight loss (Telford, 2007). For example, a recent UK randomised controlled trial found that people who increased activity by 2,000 steps per day compared with controls significantly improved glucose regulation, even though no weight loss or change in adiposity was achieved (Yates et al, 2009).

This means it is important to promote physical activity for its own sake rather than for the purpose of weight loss. For overweight and obese people who have tried and failed to lose weight on numerous occasions, this message will often find resonance: shifting the emphasis away from body image is frequently met with enthusiasm and relief.

**Drug treatment**

Several oral hypoglycaemic agents (metformin, rosiglitazone, acarbose) have been shown to reduce the risk of developing type 2 diabetes in double blind randomised controlled trials (Gerstein et al, 2006; Chiasson et al, 2002; Knowler et al, 2002).

However, with the exception of metformin, concerns remain about the safety of such products and there is limited evidence investigating their interaction with lifestyle change. It has also been shown that lifestyle change programmes are at least equally effective if not more effective than pharmaceutical intervention at reducing the risk of diabetes (Gillies et al, 2007).

Given these issues and the causal factors driving the diabetes epidemic, lifestyle modification programmes should remain the primary focus of prevention initiatives. This is not least because lifestyle changes, such as increased physical activity, are associated with numerous and wide ranging health benefits that also target the known co-morbidities of diabetes (Booth et al, 2000).

**IDENTIFYING THOSE AT RISK**

The first step to a successful prevention programme is a systematic strategy for identifying those who are at risk of developing type 2 diabetes.

Successful diabetes prevention studies have tended to include participants on the basis of their impaired glucose tolerance, which is diagnosed through the oral glucose tolerance test (OGTT). However, there are practical limitations and questions about the usefulness and clinical value of carrying out an OGTT. For example, its inclusion as a population based screening tool would represent a significant burden on healthcare resources and patient time.

As a non-invasive alternative to classifying diabetes risk status, several risk assessment tools have been developed and are used routinely in some European countries. The most widely validated and used risk score, FINDRISC, was developed in Finland and uses weighted scores from eight characteristics to calculate an overall score (Lindström and Tuomilehto, 2003) (Table 1).

This risk score can be used as a method of identifying those with undiagnosed type 2 diabetes or those at risk of developing it. Other risk scores using data routinely recorded on GP practice databases in the UK have been developed and validated in diverse populations, including a group in Cambridge and a multi-ethnic population in Leicester.

It is likely that the use of these types of pragmatic scores to classify diabetes risk status will become a routine part of usual healthcare, particularly as the DH has recommended them for use as part of the vascular checks programme. As with the classification of cardiovascular disease risk, the routine use of risk scores will allow nurses to quantify diabetes risk quickly and easily.

Those identified as being at a high risk can then have confirmatory blood tests if deemed necessary. However, all high risk patients detected by risk scores should receive some form of lifestyle counselling or be enrolled on long term condition

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**TABLE 1. FINDRISC SCORE**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>&lt;45 years</td>
<td>0</td>
</tr>
<tr>
<td>45-54 years</td>
<td>2</td>
</tr>
<tr>
<td>55-64 years</td>
<td>3</td>
</tr>
<tr>
<td>&gt;64 years</td>
<td>4</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
</tr>
<tr>
<td>≤25kg/m²</td>
<td>0</td>
</tr>
<tr>
<td>25-30kg/m²</td>
<td>1</td>
</tr>
<tr>
<td>&gt;30kg/m²</td>
<td>3</td>
</tr>
<tr>
<td>Waist circumference</td>
<td></td>
</tr>
<tr>
<td>Men &lt;94cm; Women &lt;80cm</td>
<td>0</td>
</tr>
<tr>
<td>Men 94cm to &lt;102cm; Women 80cm to &lt;88cm</td>
<td>3</td>
</tr>
<tr>
<td>Men &gt;102cm; women &gt;88cm</td>
<td>4</td>
</tr>
<tr>
<td>History of hypertension medication</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>Previously measured high blood glucose</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>Consumption of vegetables, fruits or berries</td>
<td></td>
</tr>
<tr>
<td>Every day</td>
<td>0</td>
</tr>
<tr>
<td>≤30 min/day</td>
<td>1</td>
</tr>
<tr>
<td>&gt;30 min/day</td>
<td>2</td>
</tr>
<tr>
<td>Family history of diabetes</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes, secondary degree</td>
<td>3</td>
</tr>
<tr>
<td>Yes, first degree</td>
<td>5</td>
</tr>
</tbody>
</table>

**Source:** Lindström and Tuomilehto (2003)
COMMUNICATING RISK
Once a person has been identified as being at risk of diabetes, the next challenge for healthcare professionals is communicating that risk. This is a critical point because the way in which this is communicated can have a large impact on the success of behaviour change programmes.

It is therefore important that practitioners communicate risk clearly, which means ensuring that individuals’ ideas, concerns and expectations of their condition and treatment are addressed.

To ensure that patients can fully appraise their at-risk status, they need to be given information on the causes, consequences, timeline, symptoms and treatments/controllability associated with their condition. Many educational programmes focus on psychological theories covering these areas and knowledge of these can help when talking about risk during individual consultations (Chaiken, 1987; Leventhal et al, 1980).

A recent qualitative study interviewed patients who had been given a diagnosis of prediabetes following an OGTT (Troughton et al, 2008). The patients were given their test results in a letter, with an information booklet. They said the booklet was not an adequate method of communicating risk and that they would rather have met with a healthcare professional soon after diagnosis. The majority expressed uncertainties about their diagnosis, were unsure how serious the condition was and whether there was any preventative action they could take.

Of particular concern were flawed appraisals of their condition, such as:

- “You’re not suffering physical symptoms, so you can’t be ill”;
- “When you don’t get a call in a day or two, you think, well, it can’t be all that bad”;
- “If I was really at risk they would have called me in”;
- “I can’t see I’ve got prediabetes because I don’t eat sugar”.

Patients’ views were influenced by a variety of factors, such as prior experience of diabetes, their own health beliefs, follow up they received following the OGTT and the healthcare professionals they had contact with. It is therefore vital that practitioners ensure they give accurate and consistent messages to minimise misunderstanding and false illness perceptions.

PRACTICAL INTERVENTIONS
National diabetes prevention initiatives
There is now growing recognition among governments and international organisations that a systematic approach to identifying and treating diabetes risk is needed. Finland and Germany, in particular, have led the way in developing, evaluating and implementing diabetes prevention programmes.

In the UK, the DH is planning to introduce a systematic vascular risk assessment and management programme for all those aged 40-74 (DH, 2008). As part of this, the University of Leicester and the UK National Screening Committee (2008) have published a comprehensive handbook for healthcare professionals, which provides evidence for the programme along with delivery strategies, resources and tools for those implementing it.

Although this is an encouraging first step, there is no national guidance on the type of lifestyle intervention that should be embedded in the vascular checks programme. This is a limitation because the majority of tested lifestyle intervention studies have used intensive behaviour change strategies that would be difficult to implement in the UK.

It is vital that diabetes prevention programmes are compatible with the resource and infrastructure limitations in national healthcare systems for successful implementation regionally or nationally (Yates et al, 2007).

Structured education
There is increasing evidence that group based education programmes are an effective and practical method of promoting behaviour change in many national healthcare systems, including the NHS.

Structured education refers to group based education that is usually delivered by nurses and allied health professionals; this type of intervention is typically more cost effective than traditional one to one counselling strategies.

NICE (2008) recommends structured group based education in type 2 diabetes and several documents have been published detailing the key components of a successful programme (DH et al, 2006; DH and Diabetes UK, 2005). In summary, structured education programmes should:

- Have a written curriculum underpinned by a patient centred philosophy;
- Be based on appropriate psychological theories;
- Be delivered by trained educators who are regularly quality assessed.

A good example of a gold standard structured education programme that meets these requirements is the DESMOND study for people with newly diagnosed diabetes, which has been implemented in half of all PCTs (Davies et al, 2008).

Group based education programmes that are intended to prevent diabetes have proved successful in Finland, Germany and Australia. Evidence from the UK has shown that a structured education programme, PREPARE, that aims to encourage pedometer use and walking, was highly effective at promoting behaviour change and improving glucose control in people at high risk of diabetes (Yates et al, 2009).

Also in the UK, several structured education programmes based on the DESMOND and PREPARE models and aimed at preventing diabetes are being run and evaluated in several PCTs in the Leicester area.

Considering the potential for using existing educator training and quality assurance infrastructures from education programmes for treating long term conditions, it is highly likely that many PCTs will commission such programmes aimed at prevention of type 2 diabetes in the future.

Physical activity
Regardless of whether or not systematic prevention strategies are run or planned in individual PCTs, many nurses already play an important role in delivering advice to people at high risk by opportunistically providing support or advice on lifestyle change.

It is important that nurses are encouraged to continue and expand on these brief interventions. One way of doing this is through opportunistic physical activity counselling, which NICE (2006) recommends in primary care.

As discussed earlier, physical activity is one of the most important factors in preventing long term conditions. Increasing physical activity in high risk groups can be challenging (Hillsdon et al, 2005), so it is particularly important to tailor advice to individuals’ needs.

It is of little practical benefit to promote gym based interventions or vigorous...
intensity physical activity if the majority of those with most to gain are unable or unwilling to visit their local gyms or undertake intensive exercise. A failure to consider the preferences and needs of target groups may explain the poor take up of and adherence to some exercise on prescription schemes (Thurston and Green, 2004).

Data from the UK and other developed countries has consistently shown walking to be the preferred physical activity in the general population as well as among those with health problems. Walking would therefore seem to be an appropriate form of exercise to promote in people identified with an increased risk of developing diabetes.

It is also likely that walking will be associated with fewer barriers than other forms of physical activity in black and minority ethnic groups.

Pedometers (simple step counters) are widely recognised as a cheap and useful aid to promote walking. They can be used to raise awareness of activity levels, provide objective feedback to wearers and help with clear and simple goal setting. In studies where pedometers have been a central component of an exercise intervention, participants have consistently increased activity levels (Bravata et al, 2007).

Before setting step-per-day goals, it is important for people to assess their usual activity levels by recording daily activity over a seven day period. Table 2 shows activity categories in relation to daily step counts.

Evidence has shown that risk of diabetes is reduced by increasing daily step count by as little as 2,000 steps (Yates et al, 2009). For example, if a person usually averages 4,000 steps per day over a seven day period, adding an extra 2,000 steps to total 6,000 could have a significant impact on their diabetes risk status.

For behaviour change to be effective, it is essential that realistic and personalised step-per-day goals are used; goals that are too ambitious can often be de-motivating and set people up for failure. For example, aiming for the popular target of 10,000 steps will seem unachievable for many.

Setting gradual goal increases to allow movement up the activity categories proposed by Tudor-Locke and Bassett (2004) (Table 2) can ensure that behaviour change is initiated and, as importantly, maintained. For example, people should be encouraged to increase their activity levels by a few hundred steps every fortnight until they eventually meet their personal target.

Evidence has shown that goal attainment is more likely in the long term where people are helped to form an action plan detailing where, when and how they intend to increase daily activity levels, along with identifying and solving any barriers to behaviour change. Once an action plan has been set, assessing how confident an individual feels to succeed with that plan will suggest whether or not it is too ambitious or needs reviewing.

Along with effective goal setting, it is important to remember that pedometers are most effective when people wear them and record their activity level every day.

**Other local support**

It is unrealistic to think that nurses alone can provide all the prevention initiatives that people at a high risk of diabetes need. Many groups have been set up to help people address lifestyle issues, such as walking clubs and weight loss groups. It is useful to give people details of these groups if appropriate. There will be different initiatives in each local area and some research in local libraries or other sources of information will often highlight these.

**Barriers to implementing prevention programmes**

The national service framework for diabetes recommends that people who have an increased risk of developing the condition should be offered advice and support to reduce their risk of progression.

Primary healthcare professionals are central in both delivering and advocating such interventions and their beliefs are likely to underpin acceptance and success.

Despite overwhelming evidence that type 2 diabetes can be prevented by modest lifestyle changes, qualitative studies have identified concerns among GPs and practice nurses about the feasibility of implementing such programmes in the UK without adequate resources and support.

Troughton et al (2009) recently interviewed GPs and practice nurses from Leicestershire to establish their views and experiences of screening and managing those detected at risk of diabetes. The majority of GPs and practice nurses felt that taking part in national screening programmes for prediabetes was too big a task for their practice, but that targeting those at risk through the chronic disease registers or opportunistic screening was a better policy. Many felt that little would change in primary care in terms of screening and managing diabetes risk unless contractual arrangements were implemented such as inclusion in the quality and outcomes framework. All participants suggested a need for a UK diabetes prevention intervention that would be realistic and cost effective for the NHS.

**CONCLUSION**

Modern lifestyles – characterised by energy-dense foods, physical inactivity and obesity – are the primary causes of the rising global epidemic of diabetes. As such, there is now clear evidence that diabetes can be prevented or delayed through lifestyle change in high risk groups.

Nurses have an important role in identifying diabetes risk, communicating that risk and implementing practical lifestyle interventions.

Preventing diabetes and other long term conditions is increasingly recognised as a priority by the DH and PCTs. It is likely that systematic initiatives aimed at prevention will be implemented in many primary care organisations in the future. This will hopefully enable nurses to receive the training and resources they need to run effective diabetes prevention programmes.
REFERENCES


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