PRE-DIABETES
Preventing the Type 2 diabetes epidemic

A Diabetes UK report 2009
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Introduction

An estimated seven million people in the UK currently have prediabetes.

Also known as Impaired Glucose Regulation (IGR), this often reversible and under-diagnosed precursor condition puts people up to 15 times more likely to develop Type 2 diabetes.

People with prediabetes often have the chance to reverse both the condition and their chances of going on to develop Type 2 diabetes by up to 60 per cent simply through losing even just a moderate amount of weight, adopting a healthy, balanced diet and increasing physical activity levels.

Once diagnosed with Type 2 diabetes people have a reduced life expectancy, are at increased risk of devastating long-term complications and will often need to take medication for the rest of their lives. There are currently 2.6 million people in the UK diagnosed with diabetes, the majority of which have Type 2 diabetes. Approximately 10 per cent of NHS spending goes on diabetes and its complications, this equates to £9 billion per year or £1 million an hour.

Diabetes UK wants to see the recognition, identification, diagnosis and effective treatment of prediabetes made a top-level priority for the Government, healthcare professionals and general public if we are to stand any chance of defusing the ticking timebomb of Type 2 diabetes.

Douglas Smallwood
Diabetes UK Chief Executive, October 2009
Impaired glucose regulation (IGR) – What is it?

Impaired glucose regulation (IGR) is a term that refers to blood glucose levels that are above the normal range but are not high enough for the diagnosis of Type 2 diabetes\(^1\).

IGR is used to describe the presence of impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT), which are intermediate states of abnormal glucose regulation that exist between normal blood glucose levels and Type 2 diabetes\(^2\). IGR is asymptomatic and can often go undiagnosed for many years\(^3\).

- IFG is diagnosed with a fasting plasma glucose (FPG) between 6.1-6.9 mmol/l\(^4\).
- IGT is diagnosed with a fasting plasma glucose (FPG) < 7 mmol/l and an OGTT \(\geq\) 7.8mmol/l and <11.1 mmol/l\(^4\).

IFG and IGT can occur as mutually exclusive conditions as above (isolated IFG or isolated IGT) or they can occur in combination (combined IFG and IGT) i.e. FPG between 6.1-6.9 mmol/l and an OGTT \(\geq\) 7.8 mmol/l and <11.1 mmol/l\(^5\).

The current definition of diabetes (and therefore IGR) is based mainly on cut-off points for glucose associated with future risk of microvascular complications (particularly retinopathy)\(^5\).

However, this may potentially be a grey area as individuals with IGR have shown evidence of microvascular and macrovascular complications\(^6-9\). It has been proposed that the definition and diagnostic classification of diabetes and IGR should be based on the level of subsequent risk of cardiovascular complications\(^10\).
Terminology – concerns and implications

IGR is characterised by insulin resistance and impaired insulin secretion, features that precede and predict the development of Type 2 diabetes, hence the term prediabetes.

The consensus group agreed that terms such as IGR and NDH could be used when talking to healthcare professionals, whilst a term, such as prediabetes, could be more useful to communicate messages to the public.

The term prediabetes is perceived by many as a clearer way of communicating IFG and IGT to patients\(^\text{11}\), whilst highlighting the increased risk of developing Type 2 diabetes and as a result the complications associated with diabetes\(^\text{5}\).

However, others view the term as potentially misleading, as not everyone with prediabetes will necessarily progress to diabetes\(^\text{12}\). Progression to Type 2 diabetes is not inevitable; some individuals, in the absence of any intervention may remain with IGR and some may revert to normoglycaemia\(^\text{7}\).

Individuals may react negatively to the label they are given and any intervention they are given to help prevent diabetes. There is potentially a danger that some may be discriminated against in the workplace or by insurers. Any intervention may cause anxiety and be socially disruptive\(^\text{1}\).

However, there are strong arguments for acknowledging and identifying this condition in practice. Before people develop Type 2 diabetes, they almost always have prediabetes\(^\text{13}\) and various studies have shown that intervention can significantly reduce the risk of developing diabetes.

If the condition is considered innocuous, it is questionable whether individuals will access health services or make lifestyle changes to prevent future complications\(^\text{14}\); therefore a term such as prediabetes may be more realistic to convey its seriousness and future risk.

Feedback from focus groups that included patient advisors showed that people identified with prediabetes felt that it was serious with a high risk of developing Type 2 diabetes and heart disease and that these risks were preventable with lifestyle changes\(^\text{14,15}\).

Overall, the identification of IGR provides a substantial opportunity for preventing the future burden of Type 2 diabetes on the NHS, the UK economy, as well as on patients and their families.

**Diabetes UK Care recommendation**

Diabetes UK recommends that the presence of IFG and/or IGT should be known as impaired glucose regulation (IGR) or non-diabetic hyperglycaemia (NDH) to healthcare professionals.

However, a term, such as prediabetes may be more appropriate to communicate IGR to the public. Importantly, the identification of IGR presents an opportunity to potentially delay or prevent Type 2 diabetes.
Prevalence

It is well established from a number of epidemiological studies in North America, Europe and Asia that approximately 15 per cent or 1 in 7 adults has either IFG or IGT based on the WHO criteria16-19 of which an estimated 5 to 12 per cent develop Type 2 diabetes annually19.

The DECODE study showed that more than half of Europeans may have IGR or diabetes during their lifetime16. However, the prevalence of IGR varies among the population depending on different ethnic backgrounds and age5,16. For example, there is UK data suggesting that South Asians progress to diabetes at three times the rate of White Europeans20.
Risk factors for IGR

As there have been no prospective studies comprehensively identifying the risk factors for IGR\(^2,21,22\), the clinical risk factors for IGR have been described as those for Type 2 diabetes on the basis of their similar cardiovascular profiles and their shared metabolic processes\(^{23}\). Therefore:

If you are white and over 40 years old, or if you’re black or South Asian and over 25 years old and have one or more of the following risk factors, then they may be at risk of IGR (and Type 2 diabetes):

- a close member of your family has Type 2 diabetes (parent or brother or sister)
- you’re overweight or your waist is:
  - 31.5 inches or over for women;
  - 35 inches or over for South Asian men; or
  - 37 inches or over for white and black men
- you have high blood pressure or you’ve had a heart attack or a stroke
- you’re a woman with polycystic ovary syndrome and you are overweight
- you’re a woman and you’ve had gestational diabetes
- you have severe mental health problems\(^{24}\).

The more risk factors that apply, the greater the risk of IGR (and Type 2 diabetes). IGR itself is a risk factor for Type 2 diabetes.

Diabetes UK Care recommendation

The risk factors for IGR should be considered to be the same as the risk factors for Type 2 diabetes.
Pathophysiology

IFG is associated mainly with hepatic insulin resistance, resulting in fasting hyperglycaemia, whereas IGT is associated predominantly with muscle insulin resistance.

Individuals with IFG and IGT manifest both muscle and hepatic insulin resistance. Among subjects with IGR, those with combined IFG and IGT most closely resemble subjects with Type 2 diabetes.

It has also been shown that there is progressive impairment of insulin secretion (or β-cell dysfunction) as well as worsening insulin resistance, in people with IGR, resulting in gradual increases in fasting and post-prandial plasma glucose concentrations.

Progression to overt diabetes from IGR probably occurs gradually over a period of many years.
Identifying people with IGR

Diabetes UK recommends a proactive and systematic approach to ensure the identification of the more than half a million people with Type 2 diabetes in the UK who remain undiagnosed\(^26\), as well as those with IGR.

Therefore, Diabetes UK welcomes diabetes risk assessment as part of the recent Government commitment to ‘Putting Prevention First’ through NHS Health Checks, assessing and managing vascular risk in England to deliver risk assessments and identify people at risk of IGR and Type 2 diabetes\(^39\).

Diabetes UK recommends that similar screening programmes should be established across the UK. Diabetes UK recommends that risk assessment for diabetes should occur at every available opportunity, whether it is as part of the NHS Health Check, record and register-based, self-assessment or opportunistic testing, including assessment at the workplace\(^18\).

However, Diabetes UK also recommends that consistent messages and good communication to the public are needed as well as feedback of the risk assessments to the GP.

Diabetes UK also recommends that the NHS Health Checks are not limited to 40-74 year olds, but extended to younger age groups especially for Black, South Asian and minority ethnic groups after the age of 25. Not only are these groups at increased risk, but the progression from IGR to Type 2 diabetes may also be up to two to three times greater in South Asians compared to white Europeans in the UK\(^20\).

There is currently no UK validated risk assessment tool for identifying people at high risk of Type 2 diabetes and/or IGR; however, a Diabetes UK funded study is in progress to develop and pilot one.

Risk assessment for IGR is fundamentally no different from risk assessment for Type 2 diabetes because, as already mentioned, the same risk factors are associated with both conditions\(^2,21\). Therefore, Diabetes UK recommends incidental detection when carrying out a risk assessment for Type 2 diabetes or as part of cardiovascular risk assessment procedures.

There are various different risk assessment tools available, that use different approaches.

For example, the Cambridge risk score is a practice-based risk assessment tool\(^27\), the QDScore is an algorithm used to estimate an individual’s 10 year risk of developing Type 2 diabetes and can be used in both clinical settings and by the public as a self-assessment tool\(^28\) and the FINDRISC is a questionnaire-based self-assessment tool\(^29\). The FINDRISC or a similar UK-based model has the potential to identify up to 88 per cent of cases of IGR\(^30\).

There is a good evidence based case for identifying people with IGR as part of diabetes risk assessment, with the aim of preventing diabetes and reducing the risk of CVD\(^31\).

A study by Hoerger et al\(^32\) showed that screening for IGR followed by lifestyle intervention is likely to be cost-effective. Similarly, Gillies et al came to a conclusion that the screening for both Type 2 diabetes and IGR is more cost effective than for screening for Type 2 diabetes alone\(^33\).
A combination of risk factors or a risk score with plasma glucose data is more predictive of future diabetes than glucose levels alone\[30,34,35\].

**Diabetes UK Care recommendation**

Diabetes UK supports the Governments plans (in England only) to identify people with undiagnosed diabetes and IGR with an initial risk assessment (taking into account risk factors for diabetes) then if deemed at elevated risk*, a stepped approach of a FPG or HbA1c followed by an OGTT or repeat HbA1c if indicated to diagnose Type 2 diabetes or IGR\[18,21,30,31\]. Therefore, blood tests will be targeted for those most at risk of developing Type 2 diabetes. Risk assessments should occur at every available opportunity. Diabetes UK recommends that similar screening programmes should be established across the UK.

*However, all individuals, even if they have a lower risk, should be given feedback based on their individual risk factors so that they can take action to reduce their overall risk of developing Type 2 diabetes.

Traditionally the HbA1c blood test has not been used to identify those with potential diabetes or IGR. However, there may be a role for HbA1c; HbA1c does not require people to be fasting, is reliable, is a good indicator of chronic glycaemia when compared to plasma glucose and relates well to the risk of long term complications\[36,37\].

Although not yet mainstream practice, the use of HbA1c to diagnose diabetes and IGR is currently being debated internationally\[38\]. The recent Best Practice Guidance from the Department of Health\[39\] suggests that an HbA1c concentration of between 6% and 6.5% (or 42-48 mmol/mol) may indicate the presence of IGR and should prompt further investigation with an OGTT, which is currently considered the gold standard.

People who are asymptomatic and have an HbA1c $\geq 6.5\%$ (48 mmol/mol) may also be at high risk of IGR and this too should prompt further investigation with a repeat HbA1c (between 6 and 6.5% or 42-48 mmol/mol to identify IGR) or an OGTT.

The American Diabetes Association (ADA) has also recently published a cut off for identifying individuals with IGR with an HbA1c of between 6.0 and 6.5%\[38\]. However, Diabetes UK is concerned as to whether this is the correct cut off level for screening individuals with IGR (as well as Type 2 diabetes).

The World Health Organisation (WHO) is also reviewing this issue and will publish their recommendations on HbA1c as a screening method later this year. Diabetes UK currently recommends the use of the current WHO diagnostic recommendations and will continue to do so until these are amended. Plans are being made to hold a consensus meeting to review the WHO recommendations when they come out.
Risk of developing Type 2 diabetes

Although not all people with IGR progress to diabetes, their risk of developing diabetes is significantly increased. People with IGR are 5-15 times more likely to develop Type 2 diabetes than are people with normal glucose values.

IGT is more sensitive than IFG for identifying people who will develop diabetes. However, both IFG and IGT are strong risk markers for the development of diabetes, with the highest risk in people with combined IFG and IGT. These have approximately double the risk of developing Type 2 diabetes compared with individuals with isolated IFG or isolated IGT.

The more additional risk factors (as mentioned earlier) an individual has the more like they are to develop diabetes. The progression to diabetes for people with IGT is 6-10% per year and for individuals with both IFG and IGT, the cumulative incidence of diabetes may be as high as 60% in 6 years.

Recent data from the US Diabetes Prevention Program (DPP) suggests that an HbA1c ≥ 6.0% approximately doubles the rate of progression to Type 2 diabetes in people with IGR.

Insulin resistance and impaired insulin secretion as well as dyslipidaemia, are key features preceding and predicting the development of Type 2 diabetes. The rate of progression to diabetes is likely to vary between individuals and between populations due to genetic and environmental factors. Diet, activity levels and obesity vary widely between populations, between individuals in a population and within individuals over time.

Individuals with more severe defects in insulin resistance and insulin secretion who have higher glucose levels are at increased risk of developing Type 2 diabetes.
Rationale for preventing Type 2 diabetes

In the absence of intervention the majority of individuals with IGR are likely to develop Type 2 diabetes within 5-10 years\(^2\). However, there is good evidence to suggest that Type 2 diabetes can be prevented or delayed in people with IGR (see section on Interventions later).

Since Type 2 diabetes is associated with an increase in CVD, prevention or delay of Type 2 diabetes may also reduce the risk of CVD. Both IFG and IGT are risk markers for cardiovascular disease and mortality\(^6,8,16,41\) with IGT being a stronger risk predictor of CVD\(^2\).

However, it is unclear whether IFG or IGT are independent risk factors in the development of CVD\(^6,41\) and this remains to be demonstrated from direct trial evidence, although it is known that lifestyle-based intervention to prevent Type 2 diabetes also improves cardiovascular risk factors\(^42-44\). Because CVD accounts for much of the morbidity and mortality associated with Type 2 diabetes, even small reductions in cardiovascular risk would be clinically significant\(^5\).

The benefits of preventing Type 2 diabetes therefore include the delay or prevention of diabetes and its complications, but also may extend to the prevention of morbidity and mortality from CVD, as well as consequent reductions in workload and costs for the NHS and reduced impact on carers and employers of people who are at risk of developing Type 2 diabetes\(^5,45\). Screening for Type 2 diabetes and IGR is cost effective through the early identification of IGR and subsequent lifestyle modification\(^32,33\).
Interventions

Due to the risk of developing Type 2 diabetes and associated cardiovascular disease in people with IGR several studies have looked at various interventions that may delay or prevent diabetes.

There is strong evidence that Type 2 diabetes can be delayed or prevented in people with IGR by both lifestyle and pharmacological interventions. By contrast, there are no specific trials targeting people with IGR with the aim of preventing CVD. However, even in the absence of direct data regarding the benefits of Type 2 diabetes prevention on long-term complications, the cost of intervention can be warranted based on the expectation that the delay of Type 2 diabetes would postpone the requirement for complex treatment regimens and the likelihood that microvascular and cardiovascular complications will be delayed or prevented.

Ideally, intervention should aim to improve insulin resistance thus preventing glycaemic deterioration, preserve or improve β-cell function and reduce other cardiovascular risk factors, such as dyslipidaemia and hypertension. Effective interventions would therefore slow the progression of IGR to Type 2 diabetes or even revert to normal glucose tolerance.

Diabetes UK Care recommendation

All people diagnosed with IGR (or otherwise identified being at risk of developing Type 2 diabetes) should be offered intervention – which takes into account their risk of developing diabetes and CVD and is tailored to the individual. Targets, such as weight reduction, changes in dietary habits and increased physical activity should also be assessed on an individual basis.
Lifestyle intervention

There have been several studies that have conclusively showed that lifestyle intervention can result in a significant decrease in Type 2 diabetes incidence\(^{42,48-52}\). The recent trials of lifestyle change interventions have shown that only relatively modest changes in lifestyle are required to delay or prevent Type 2 diabetes\(^{48}\).

Lifestyle modification involving weight loss strategies using dietary modification and/or physical activity or exercise appears to be the most effective intervention (compared to pharmacological intervention)\(^{50}\); a meta-analysis of prevention studies by Gillies et al showed that lifestyle interventions seemed to be at least as effective as pharmacotherapy\(^{53}\).

The DPP showed that lifestyle intervention had greater improvements than metformin in insulin sensitivity and \(\beta\)-cell function\(^{42}\). Furthermore, a modest reduction in CVD risk factors was seen - whether these changes will translate into meaningful reductions in CVD events and a reduction of microvascular complications remains to be demonstrated\(^{43}\). The lifestyle modification studies were associated with a favourable safety profile and virtually no serious negative effects\(^2\). In addition, lifestyle modification is likely to have other beneficial health-related effects as well as being more cost-effective\(^{12,33,42,48}\).

However, lifestyle interventions are often intense and require commitment from the individual with IGR as well as healthcare professionals. Availability of resources for participation in an intensive lifestyle program and an individual's commitment of time towards dietary and lifestyle need to be considered\(^2\). In addition, trials also assume that prevention programmes would be equally effective across diverse cultural and regional populations\(^{54}\). Therefore, further research is needed looking at how prevention programmes may translate to the wider population in a number of different settings.

Intervention to promote lifestyle change requires support at several stages of the behaviour change process, including:

a) establishing motivation;

b) making decisions and specific action plans; and

c) supporting the self-regulation/maintenance of new behaviours (e.g. through monitoring of outcomes/target behaviours, providing feedback, identifying barriers and solutions and revising plans accordingly)\(^{55}\).

Follow-up counselling, and engaging social support also appear to be important for success, even across diverse cultural groups\(^{21,54,56}\). A structured education programme which has a clear philosophy incorporates behavioural change and psychological support may be necessary for people identified with IGR to make sustainable changes. Group education may be a good method of providing educational support\(^{14}\). However, further research is needed to identify the most effective/cost-effective interventions for people with IGR.

Overleaf is a summary of the main studies looking at lifestyle intervention and effectiveness for the prevention of Type 2 diabetes in individuals with IGR.
<table>
<thead>
<tr>
<th>Study</th>
<th>Relative risk reduction (%)</th>
<th>Intervention/ Targets</th>
<th>Duration (years)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese Da Qing49</td>
<td>31</td>
<td>diet alone*</td>
<td></td>
<td>Individuals sustained a 43% reduction in diabetes incidence over a 20 year period57</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>exercise alone*</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>diet + exercise*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finnish DPS48</td>
<td>58</td>
<td>− Weight reduction of ≥5%</td>
<td>3</td>
<td>Risk reduction was directly related to the magnitude of the changes in lifestyle (particularly increased physical activity). Individuals who achieved at least four intervention goals by the first year did not develop diabetes during follow-up. There continued to be a 43 per cent reduction in risk of progression to diabetes for 4 years after intervention finished and a 36 per cent relative risk reduction of developing diabetes over the subsequent 3 years58,59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Fat intake &lt;30% (with saturated fat intake &lt; 10%) of total energy intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Dietary fibre intake ≥15 g/1000 kcal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Moderate intensity activity for 4 hours/week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US DPP42</td>
<td>58</td>
<td>− Weight reduction of ≥7%</td>
<td>3</td>
<td>Included diverse cohort; 68 per cent women and 45 per cent ethnic minorities. Lifestyle modification also reduced CVD risk, even though the study was not examining this43. Weight loss was the main predictor of reduced diabetes incidence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Moderate intensity activity for 150 min/ week</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Low kcal, low fat diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Monthly 1:1 counselling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese study52</td>
<td>67</td>
<td>− Aim for BMI &lt;22kg/m² in intensive lifestyle group as opposed to &lt;24 kg/m² in the standard group</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Indian DPP51</td>
<td>29</td>
<td></td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

*Diet group focused on increased vegetable consumption, reduced alcohol consumption and simple carbohydrates; individuals with BMI>25kg/m² were also advised to limit their energy intake. The exercise group had to increase their activity by the equivalent of at least 20 minutes of brisk walking/day.
Further follow-up of these prevention studies (see previous table) demonstrates that lifestyle intervention is not only effective at preventing Type 2 diabetes in the short term but also in the long term in people with IGR.

In addition, the research suggests that lifestyle interventions are effective across different ethnic groups\textsuperscript{42}.

**Diabetes UK Care recommendation**

Diabetes UK recommends that lifestyle modification thorough effective lifestyle programmes should be the first choice to prevent or delay Type 2 diabetes.

Diabetes UK recommends referring to NICE guidance for managing various lifestyle aspects relating to Type 2 diabetes and CVD prevention, such as obesity, physical activity, smoking cessation, behaviour change, blood pressure and lipid management. The consensus group also suggested that future NICE guidance on the primary prevention of Type 2 diabetes should review ways to deliver lifestyle intervention (to prevent or delay diabetes) that is leads to sustained long term behaviour change.
Pharmacological interventions

Several pharmacological interventions have shown to reduce the incidence of Type 2 diabetes in people with IGR\textsuperscript{25,42,51,60-68}.

Although several drugs successfully slowed progression to Type 2 diabetes in several studies, pharmacotherapy for the specific management of IGR is not currently approved or licensed for use in the UK. A meta-analysis showed that pharmacological interventions were less effective and cost-effective than lifestyle interventions in reducing the risk of developing Type 2 diabetes\textsuperscript{33}.

There are many issues that need to be considered before these interventions can be recommended. Future recommendations may include the use of medications to manage IGR if they prove to be effective, have a good safety profile, are tolerable, and are of relatively low cost\textsuperscript{2}. However further long term studies are needed, as there is limited data on the long term safety and health benefits of pharmacological intervention compared with lifestyle intervention. And there are questions whether drugs could ever be stopped\textsuperscript{40} or whether they require long term commitment to be efficient.

Research also needs to be carried out looking at the impact on CVD risk factors or events when pharmacologic agents are used to prevent/delay Type 2 diabetes\textsuperscript{2}. There are ongoing studies that will further consolidate the potential of pharmaceutical intervention as a measure to reduce the risk of developing Type 2 diabetes.

A common feature of most pharmacological interventions is that adherence to treatment is relatively poor and pharmacotherapy requires long term commitment. In part, low rates of compliance may be due to the poor tolerability of some of the drugs and in part, it might be that people with IGR who are otherwise well stop taking the medications because they fail to experience a tangible benefit\textsuperscript{5}.

Diabetes UK Care recommendation

Diabetes UK does not recommend the use of pharmacotherapy that is not currently licensed for use in the UK for the specific management of IGR.
Other weight loss interventions

Pharmacological interventions are often considered as an adjunct to lifestyle intervention – this is particularly true for weight loss interventions. The XENDOS study with orlistat showed a 45 per cent reduction in progression from IGT to Type 2 diabetes over and above that of lifestyle intervention. However, there are limitations of using weight loss medications, mainly due to the side effects. Nevertheless, pharmacological intervention for weight loss should be supported as an option for obese individuals as per NICE guidance on obesity.

Bariatric surgery may also have a role in preventing Type 2 diabetes; In the SOS study, the incidence of diabetes was related to the amount of weight lost. There are likely to be other mechanisms involved aside from weight loss. Bariatric surgery is not recommended as a first line treatment to losing weight and preventing Type 2 diabetes by Diabetes UK. However, it may be considered if serious attempts in obese individuals at lifestyle changes have not been successful.

Diabetes UK Care recommendation

Weight loss medications and bariatric surgery may be considered as an option for the management of obese individuals with IGR as per NICE guidance.
Communicating health messages

The way that messages of risk are communicated to a person with IGR is also important. Amongst people identified with IGR, there are uncertainties about their diagnosis, its physical consequences and subsequent management. Therefore, those delivering services should be aware of these uncertainties and needs and tailor care to support and shape perceptions to enhance health-maintaining behaviours. It is also important that healthcare professionals communicate consistent messages and information to patients about issues surrounding IGR in order to minimise misunderstandings14.

Healthcare professionals, including GPs may also be uncertain about the diagnosis of IGR and its management and need detailed guidance; the WAKEUP study successfully piloted an educational package to encourage effective communication of key ‘health alert’ messages between health professionals and people with IGR15. The key health messages for people with IGR and for practitioners are:

- IGR is a serious condition with a high risk of progressing to diabetes and heart disease.
- The good news is that these risks are preventable.
- To prevent progression, patients need to make lifestyle changes in terms of healthier eating (ideally losing weight) and increased physical activity.

Diabetes UK Care recommendation

IGR should be communicated by healthcare professionals in a clear and consistent manner to minimise misunderstandings, highlighting its seriousness, the risks if it is not managed and outlining ways to prevent progression to Type 2 diabetes.
Monitoring and follow-up

Troughton et al recommended that giving a diagnosis of IGR without planned follow up is not advisable. It was suggested individuals should be followed up and supported by a healthcare professional to ensure mutual understanding and accurate patient appraisals about the cause, consequences (including risks) and preventative management. It was felt that support was particularly pertinent after diagnosis and surrounding behaviour change\textsuperscript{14}.

Monitoring is important in individuals with IGR to re-evaluate an individual’s risk of diabetes and CVD and if necessary to detect deterioration of glycaemia - using this information to decide whether intervention should be amended\textsuperscript{15,47}.

The consensus group agreed that people identified with IGR should be followed up by their healthcare team on an annual basis; however, there is very little data on the frequency at which people with IGR should be re-assessed.

**Diabetes UK Care recommendation**

Diabetes UK recommends people identified with IGR should be followed up and monitored by their healthcare team on an annual basis (or sooner if they develop symptoms of diabetes).

At the annual review, individuals should have a repeat FPG or HbA1c followed by an OGTT to assess glycaemia\textsuperscript{18,21,30,31,35}. However, an individual may need to be monitored more often, for example, people identified at being higher risk, in this case discretion should be used.

The follow-up appointment is also an ideal opportunity to evaluate and support lifestyle changes, identify and discuss barriers encountered to lifestyle change and to reinforce lifestyle messages.

Cardiovascular risk should also be reviewed at follow-up.

Individuals who revert back to normoglycaemia at review should be encouraged and supported to maintain lifestyle and behaviour change and have a repeat FPG or HbA1c followed by an OGTT in 2-3 years.
Acknowledgements

Diabetes UK has developed this report in consultation with experts in the field, to provide consensus-based recommendations for healthcare professionals managing people with IGR.

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