NHS
London
Strategic Clinical Networks

Health
Innovation
Network

Right Insulin, Right Time, Right Dose for Type 2 diabetes

A toolkit for optimal delivery

Enter the toolkit >

www.hin-southlondon.org

Foreword

The Health Innovation Network (HIN) is a membership organisation, driving lasting improvements in patient and population health outcomes by spreading the adoption of innovation into practice across the health system.

As the Academic Health Science Network for South London our work prioritises health challenges for local communities across a number of clinical areas; including diabetes, dementia, musculoskeletal, cancer and alcohol. Our work incorporates cross-cutting innovation themes to generate wealth and increase the quality of care in our communities.

We are proud to be collaborating with our partner and member organisations to align; education, clinical research, informatics, innovation, training and education in healthcare. We support knowledge exchange networks to ensure the patient is at the heart of healthcare delivery and to support early adoption of healthcare innovations.

Introduction

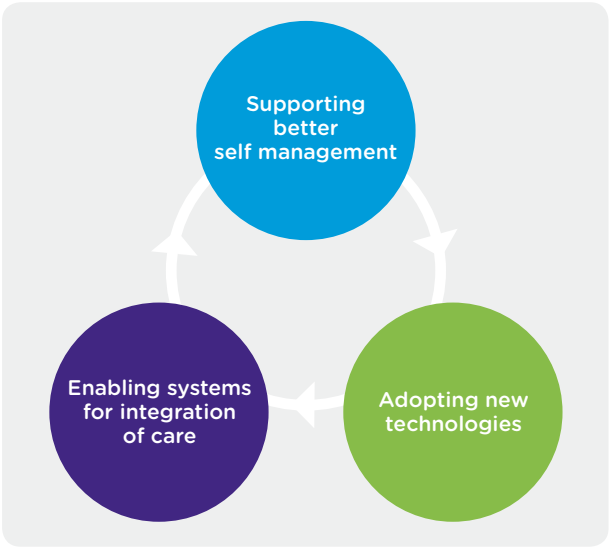
Dr Charles Gostling, Clinical Director (Diabetes Programme), Health Innovation Network South London and GP, Lewisham

Contents and context >

Contents

Our approach to diabetes

Our team has used the Joint Strategic Needs Assessments of South London boroughs to identify key areas of variation and risk. We have developed and refined, in consultation with a range of stakeholders, our high level priorities below.



Projects 2014-15

1 Improving self-management of insulin therapy by improving access to and appropriate use of technologies.

2 Improving the integration of care pathways for management of unscheduled care in hypoglycaemia and hyperglycaemia.

3 Right Insulin, Right Time, Right Dose.

4 Structured education and related support for self-management.

Guide to symbols

Important information

Downloads

What people are saying

This toolkit was informed by a representative group of service users, medicines optimisation teams, commissioners, academic colleagues and providers who have generously contributed resources and shared their experiences and expertise with the Health Innovation Network to help support change in South London.

Why a toolkit?

We have known for some time how to effectively treat Type 2 diabetes and how to achieve good glycaemic control using lifestyle interventions and timely use of therapeutic agents.

Unfortunately, despite this knowledge, large numbers of people fail to achieve personalised optimal control. In addition there are large inequalities across different care settings and between populations. This puts many people at higher risk of diabetes-related complications and can be demoralising for healthcare professionals. There are many underlying reasons for this failure which this toolkit seeks to address.

The toolkit provides a background to the importance of early and appropriate medication intensification and use of the Right Insulin at the Right Time at the Right Dose. It exposes the myths about insulin therapy and considers why, for the vast majority of people, human intermediate acting insulins are preferable for initiation compared to long and intermediate acting analogue insulins.

The toolkit also explores what can go wrong in the intensification pathway and suggests ways in which this could be improved.

Who is the toolkit for?

- Healthcare professionals in primary care and secondary care
- Commissioners
- Medicines Optimisation Teams
- Community Pharmacists

Using the toolkit

Links to useful resources can be found within the toolkit. These include exemplar prescribing guidance, audits, evidence reviews, responsible prescribing messages, useful case studies and examples of good practice.

A number of our resources are from within our local network where colleagues have agreed to share best practice. The resources offer a menu of options for you to tap into to support patients with early and appropriate dose escalation and insulin management to optimise glycaemic outcomes in a clinical and cost effective way.

Although this toolkit focuses on optimisation of glycaemic control, it is important not to forget the importance of reducing cardiovascular risk to improve outcomes for people with Type 2 diabetes[1,2].

Diabetes: the national picture

£10 billion per year

Diabetes costs the NHS £10 billion per year, accounting for 10% of the NHS budget[3].

£16.9 billion by 2035

Public health forecasting predicts that an aging population and rising prevalence of obesity will increase NHS spending on diabetes to £16.9 billion by 2035, accounting for 17% of the NHS budget[3].

80% preventable

It is a leading cause of blindness in the UK[4] and over 100 amputations are carried out each week in people with diabetes due to complications – 80% of which are preventable.

24,000 die prematurely

Each year 24,000 people with diabetes die prematurely[5].

Biggest risk groups

Type 2 diabetes is more common in people of black and south Asian origin, and tends to present at a younger age in these ethnic groups.

Acting early to prevent the development of complications can both reduce the impact on an individual's life and save the NHS money[6].

The picture in London

There is a rise in both prevalence and the incidence of diabetes in London. In the last decade there has been an astonishing 75% increase in people recorded with diabetes by their GP![7] This rise is believed to be due to a change in demography and unhealthy lifestyles leading to obesity.

The picture in South London

The diabetes prevalence model for local authorities shows that in 2014 there were 174,627 people over the age of 16 on GP diabetes registers in South London and this is expected to rise to 249,848 by 2030[7].

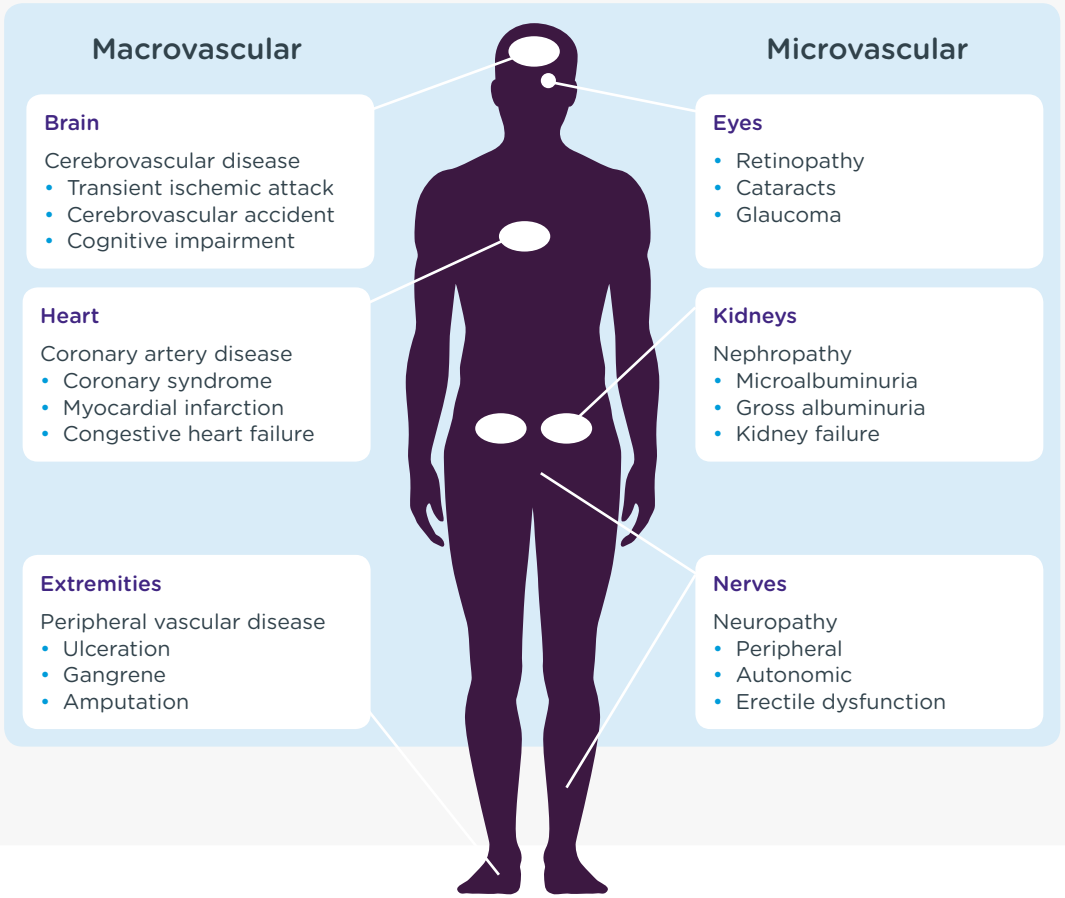
Further information

For more information on diabetes prevalence modelling for your borough please use the tool provided by Public Health England. You can download it here.

Why a toolkit?

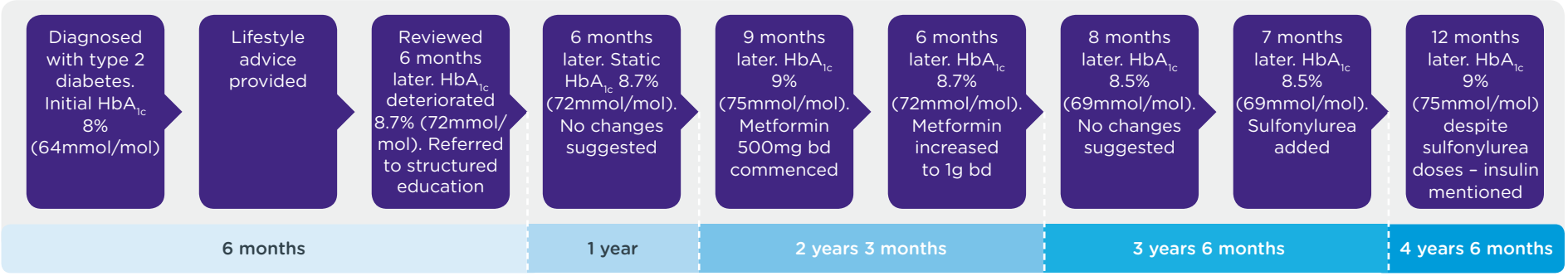
- Type 2 Diabetes is a progressive long term condition. Management involves optimising glycaemic levels and appropriately managing cardiovascular risk through a combination of interventions such as lifestyle changes and use of appropriate pharmacological agents.
- 50% of people with a long term condition do not take their medication as prescribed[8].
- Optimising non-insulin therapies and initiating insulin at the right time ensures good early glycaemic control and improves outcomes for patients. There is significant evidence that good glycaemic memory reduces patients' risk of developing complications for the rest of their life[9].
- Acting early to prevent complications limits the impact on people's lives and saves the NHS money[6].
- Local and national studies highlight that there can be a delay of approximately five to seven years between somebody requiring insulin therapy and insulin being started[10,11].
- Involving users in decisions about their care and implementation of evidence-based cost-effective guidance across a population helps to ensure we achieve value based healthcare for our population.
- Self management is a key factor in improving outcomes in Type 2 diabetes.

Potential complications of diabetes



How are people with Type 2 diabetes currently managed?

Below is an example of a patient journey.



Numerous studies have shown that there can be considerable delays in treatment intensification in people with Type 2 diabetes where the average sub-optimal control is between 5–7 years prior to insulin initiation[10,11]. One study showed at the time of insulin initiation, an individual would have experienced high glycaemic burden for 5 years with an HbA_{1c} >8% and for 10 years with an HbA_{1c} >7%[12].

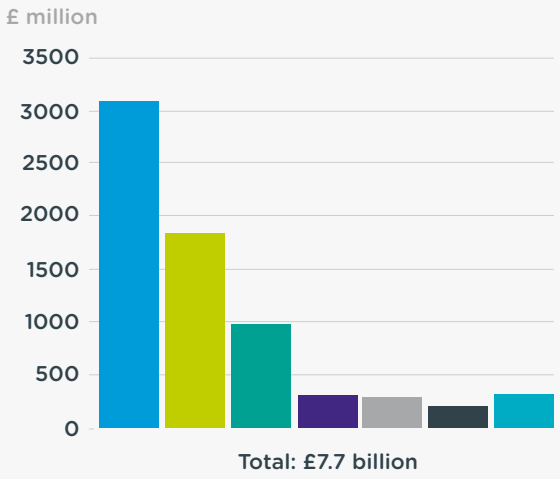
What is wrong with this?

Delaying optimisation of HbA_{1c} increases the risk of both microvascular and macrovascular complications. This has significant financial costs for both the patient and the NHS. In order to achieve the best outcomes for our patients with diabetes a target HbA_{1c} of 7% (53mmol/mol), where appropriate, should be agreed early in each individual's diabetes history.

In patients with both microvascular and macrovascular complications, the total cost of management is increased by up to 250% compared to those without complications[13].

The United Kingdom Prospective Diabetes Study (UKPDS) showed reducing HbA_{1c} by 1% reduces the risk of developing microvascular complications by 37% and death related to diabetes by 21%[14]. Further evidence shows that early good control results in a 'metabolic memory' effect that reduces the risk of complications later in the natural history of diabetes[9,14].

The costs of complications of diabetes



Cost of Diabetes Report, **Diabetes UK, 2014**

What is the ideal way to manage a person with Type 2 diabetes?

Diabetes is a progressive condition and therefore people with diabetes should be reviewed regularly to ensure they have optimal glycaemic control and a reduction in their cardiovascular risk factors. Jointly agreeing a care plan between the person with diabetes and the health professional will support timely optimisation of lifestyle and pharmacological interventions. Each patient should be set a personalised HBA_{1c}, blood pressure and lipid target and should be working with their healthcare professional towards achieving them.

Summary

Rising costs of diabetes care are placing considerable pressure on an already constrained NHS budget. Acting early and ensuring appropriate and timely interventions for people with diabetes can reduce the risk of developing complications. Care planning, intensification of lifestyle interventions and pharmacological therapies, can reduce the cost pressure on the NHS. Acting early improves quality of life and health outcomes for people with Type 2 diabetes.

Key messages

1. Diabetes costs the NHS £10 billion per year with 24,000 people with diabetes dying prematurely
2. Diabetes is a progressive long term condition
3. Currently there is a delay in optimising glycaemic control in many people
4. A delay in the intensification of therapy is expensive for the NHS and for individuals

Why does blood glucose matter?

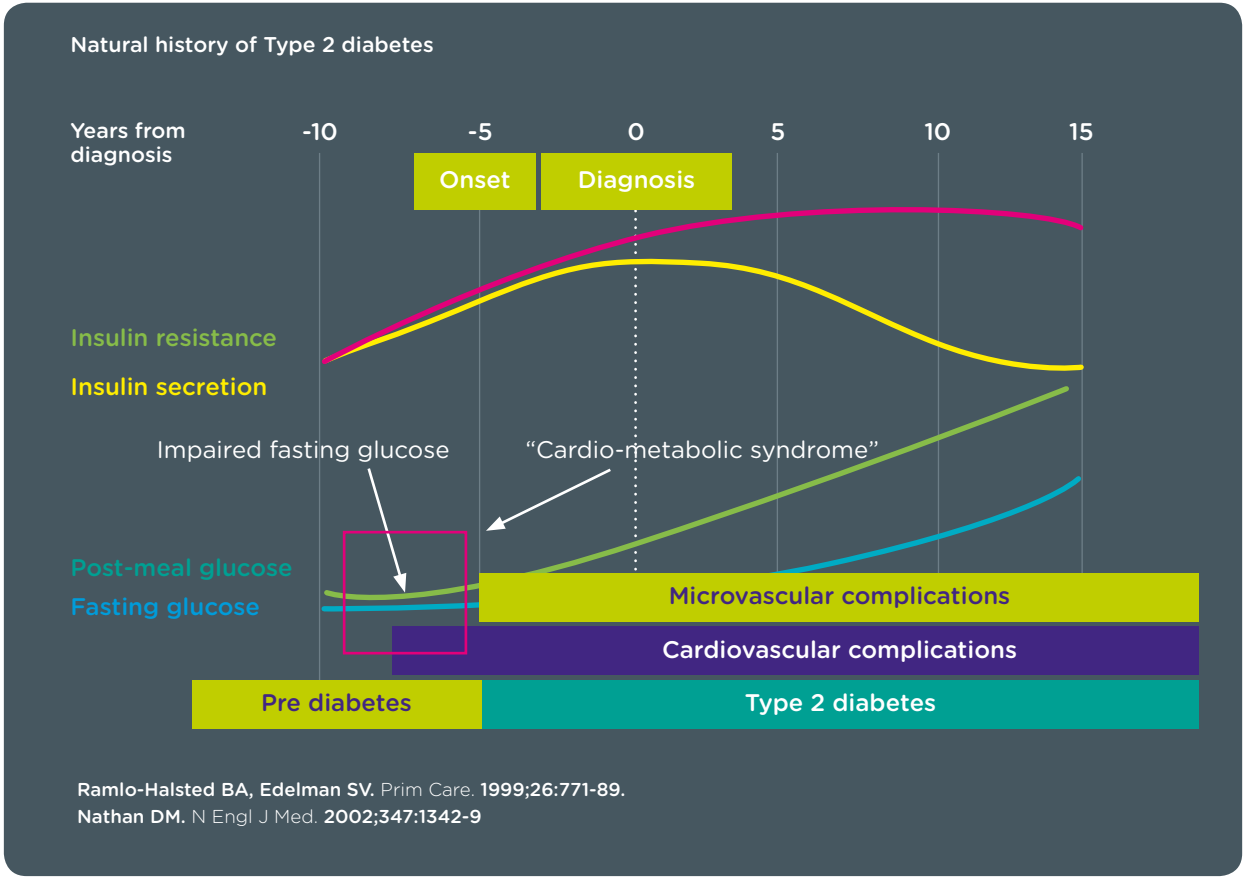
Type 2 diabetes is a progressive condition characterised by resistance to the physiological effects of insulin and compounded by a relative insulin deficiency. These two factors mean individuals are unable to control their blood glucose levels effectively. As insulin is an anabolic hormone, Type 2 diabetes also leads to altered fat and protein metabolism.

Usually the onset of Type 2 diabetes is gradual, with many opportunities to delay or prevent onset before diagnosis. The threshold for diabetes diagnosis reflects a blood glucose level that is associated with increased risk of microvascular complications such as retinal disease.

Type 2 diabetes is associated with:

- development of microvascular disease affecting nerves, eyes and kidneys.
- an increased risk for macrovascular disease including coronary heart disease, stroke and peripheral arterial disease.

Whilst the focus in treating Type 2 diabetes is often centred on blood glucose control, in most people effective blood pressure[1] and lipid[2] control are of greatest benefit through reduction in macrovascular disease. However, we are focussing here on the benefits of appropriate and effective blood glucose control.



Ramlo-Halsted BA, Edelman SV. Prim Care. **1999;26:771-89.**
Nathan DM. N Engl J Med. **2002;347:1342-9**

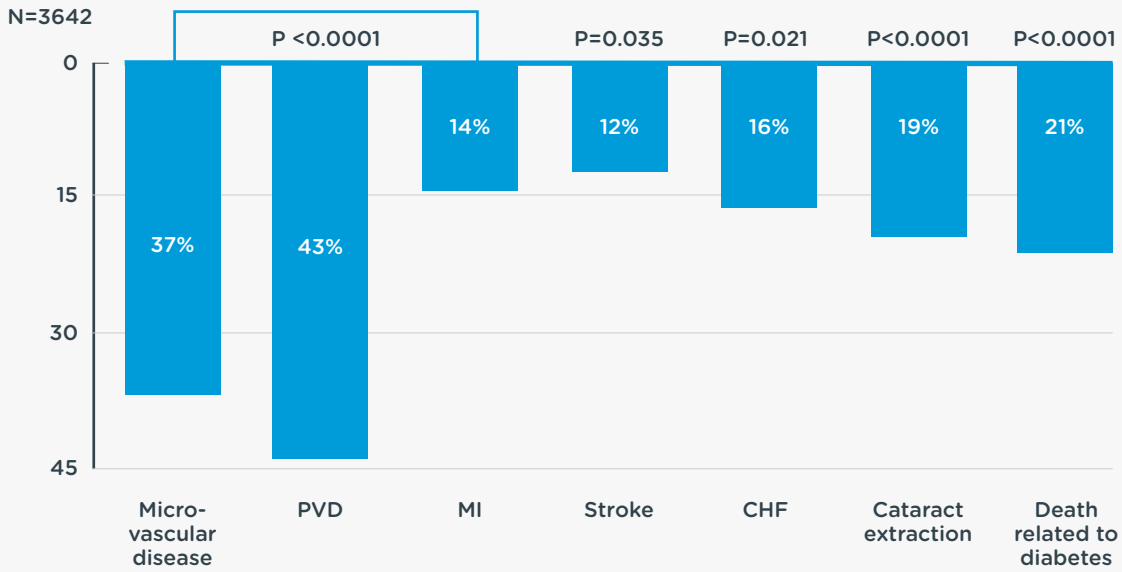
What HbA_{1c} levels should we be aiming for to reduce complications?

In the early 1990s the Diabetes Control and Complications Study (DCCT) showed the benefits of good glycaemic control for people with Type 1 diabetes[15]. Later in the decade the first results began to flow from the United Kingdom Prospective Diabetes Study (UKPDS), demonstrating a statistically significant reduction in development and progression for microvascular complications in people with Type 2 diabetes, as well as a reduction in myocardial infarction (although non-significant) between groups allocated to usual care and intensive blood glucose control[16].

In 2000, a post hoc analysis from UKPDS[14] demonstrated a 37% risk reduction for microvascular disease and a 14% risk reduction in incidence of myocardial infarction for each 1% reduction in HbA_{1c} (both statistically significant) for people with newly diagnosed Type 2 diabetes.

These results led some clinicians to aim for glycaemic control that was as 'low as you could safely go'.

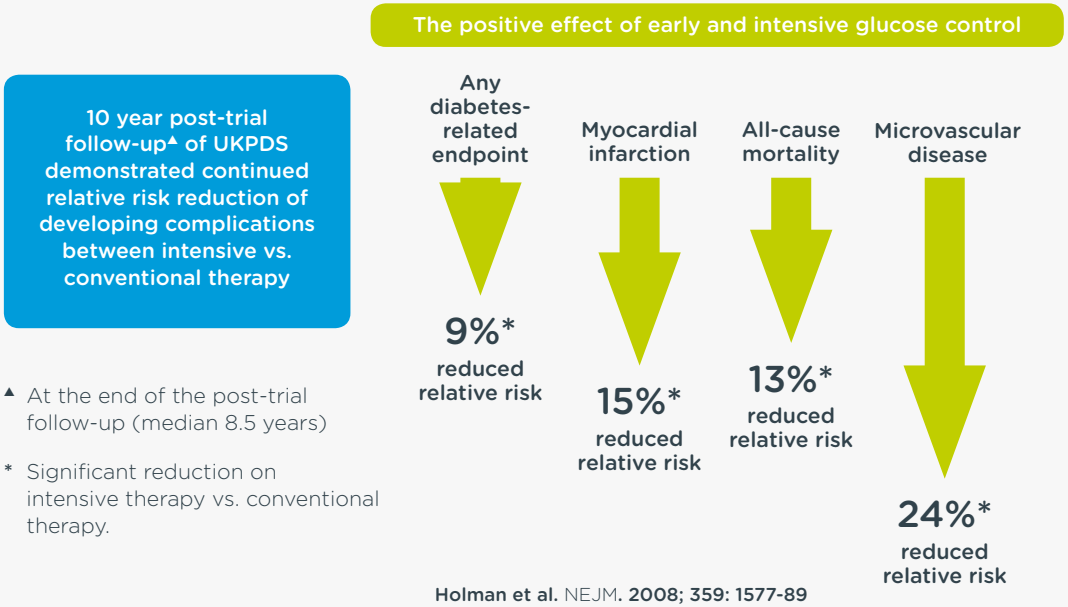
UKPDS 35: Significant risk reduction for T2DM complications with each 1% reduction in mean HbA_{1c}



Adapted from Stratton IM, et al. BMJ. **2000: 321: 405-412**

What HbA_{1c} levels should we be aiming for to reduce complications?

Legacy effect: Early and aggressive control has long term benefits



Holman et al. NEJM. **2008; 359: 1577-89**

The idea of 'tight' early control became even more compelling following further analysis of UKPDS data. This showed that good glucose control in the years after diagnosis implanted a **'metabolic memory'** that was associated with a lower risk of diabetes related complications[9] (including myocardial infarction) irrespective of subsequent control. We now know that in terms of glycaemic control the early years are the important years!

Are there pitfalls for lowering blood glucose too far?

The 'low as you could go' approach led to several further studies to identify whether intensive glucose lowering could reduce macrovascular disease in those at high cardiovascular risk[17,18,19]. Whilst a reduction in incidence and progression of microvascular disease was demonstrated, the approach had no bearing on macrovascular outcomes. Indeed, one study demonstrated an increased death rate in those treated intensively and an increased incidence of hypoglycaemia[18].

Should we be trying to achieve tight control for all?

There are a number of factors that we need to take into consideration that are largely dependent on individual patient circumstances. **Treatment should be individualised to take into account patient preference, length of diabetes and presence or absence of complications.**

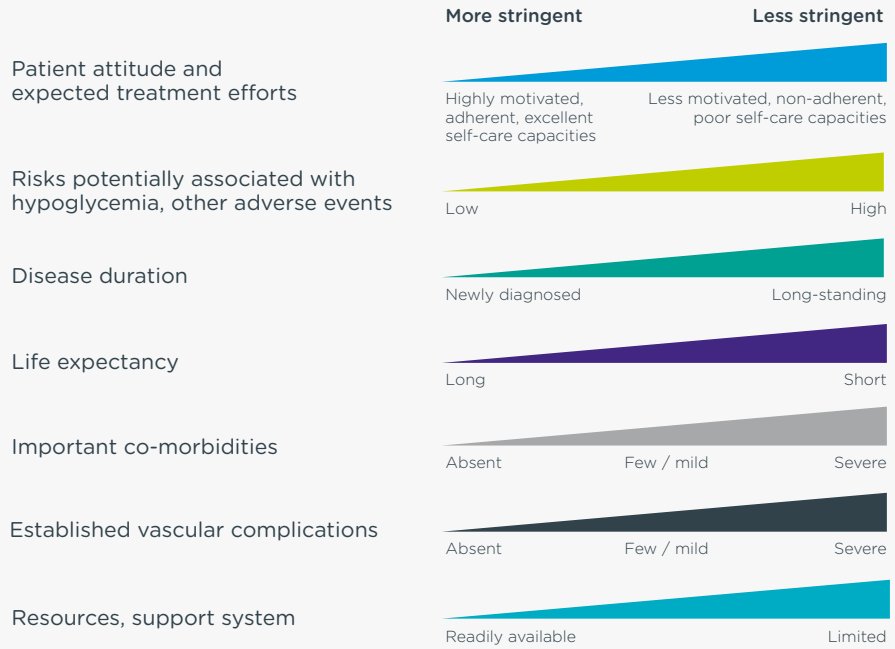
Individual treatment goals should consider the following:

- reducing symptoms caused by high blood glucose such as thirst, polyuria, lethargy and increased infections.
- reducing the risk of life threatening illness through severe hyperglycaemia.
- achieving tight glycaemic control for those with newly diagnosed Type 2 diabetes to reduce the development and progression of both microvascular and macrovascular complications – where it is safe to do so.
- achieving safe, but less tight, blood glucose levels in those with longer duration Type 2 diabetes or those who are at higher cardiovascular risk, frail or elderly.

The diagram on the right highlights the checks and balances that must be made in setting personalised glycaemic targets[20].

All these factors highlight that we need to strike a delicate balance that will be different in each person and sometimes difficult to achieve. The National Institute for Health and Care Excellence (NICE) advises avoiding pursuing highly intensive management to levels to less than 48mmol/mol (6.5%)[21].

Approach to management of hyperglycemia



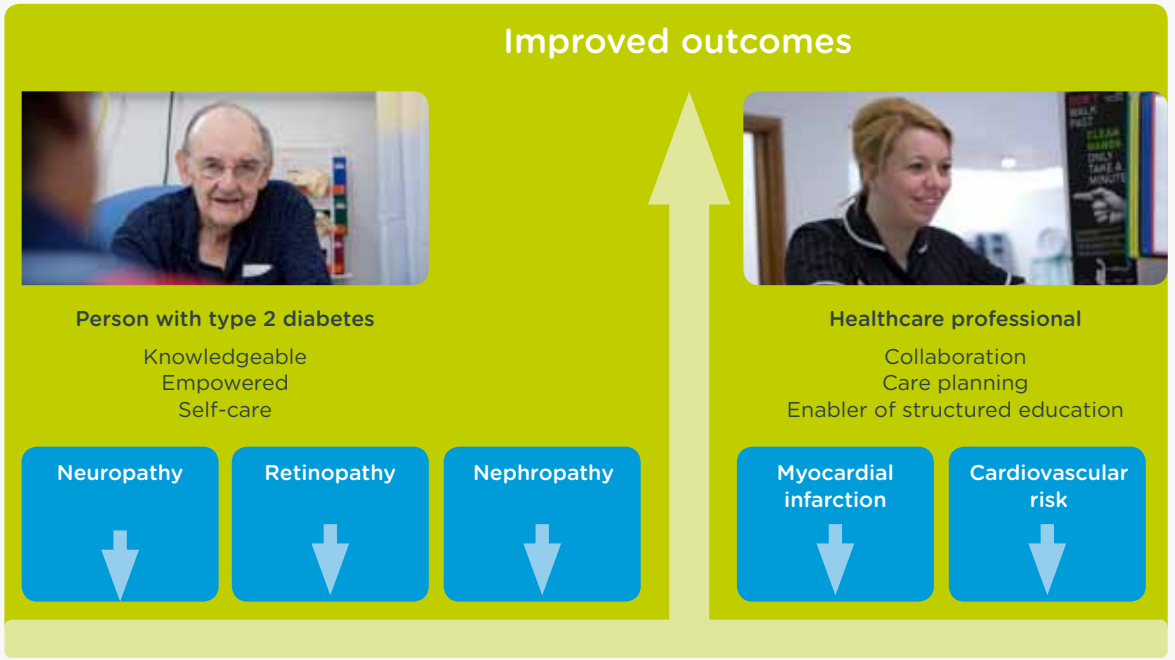
Inzucchi et al, 2012, Diabetes Care 35 **(1364-1379)**

Intensification to reduce future risk

For many people with newly diagnosed Type 2 diabetes we should aim to achieve 'tight' glycaemic targets. If we fail to do so we can increase the risk of diabetes related complications in the future. Achieving personalised targets requires a collaborative approach between an empowered person with diabetes and their skilled and knowledgeable healthcare team.

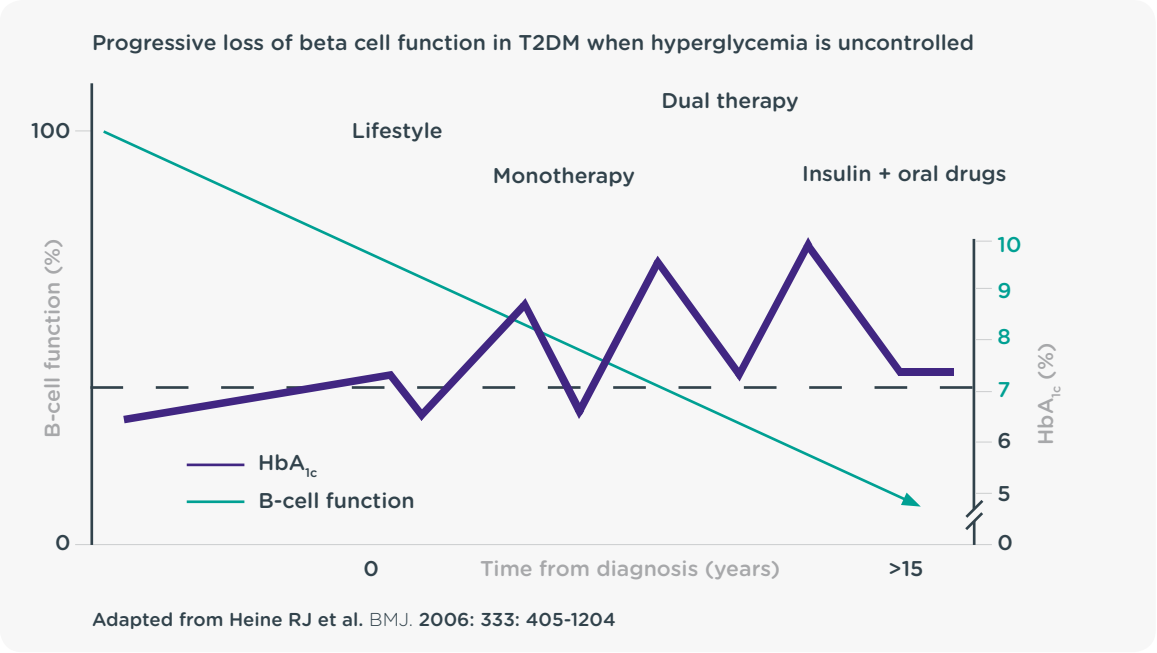
Both the joint American Diabetes Association and European Association for the Study of Diabetes guidance[20] and NICE guidance[21] support consideration of early lifestyle measures alongside metformin (where possible) in the first instance. If this is not successful then treatment is escalated, initially with non-insulin therapies, according to HbA_{1c} response and patient factors. We should review and intensify treatment promptly, regularly and assertively when glycaemic control deviates significantly from target.

Effective structured education interventions following diagnosis are an essential ingredient of good diabetes care. When people are diagnosed with diabetes there is so much information to absorb and this is a huge challenge. Signposting to local support groups, such as Diabetes UK, and written information, for example the 15 healthcare essentials is invaluable.



Intensification sounds easy – so what's the problem?

Some healthcare professionals are not good at educating people with Type 2 diabetes about the progressive nature of the disease. Whilst weight loss, lifestyle change, crash diets and bariatric surgery can bring about remission, this is not the story for most of the people we look after. Ageing, high blood glucose, dyslipidaemia and hypoglycaemic drugs all contribute to the progressive destruction of insulin secreting β cells. This means therapy will need to be escalated regularly and will usually progress to insulin therapy.



Adapted from Heine RJ et al. BMJ. 2006: 333: 405-1204

'Treating to fail'

We are also poor at titrating medication and initiating insulin at the **Right Time**[22]. 'Therapeutic inertia' is one of our biggest challenges and we often wait for treatment to fail. This can have a big impact on treatment of Type 2 diabetes where progressive loss of β cell function leads to an increase in HbA_{1c} as seen on the right.

A review undertaken by Khunti[10] showed that:

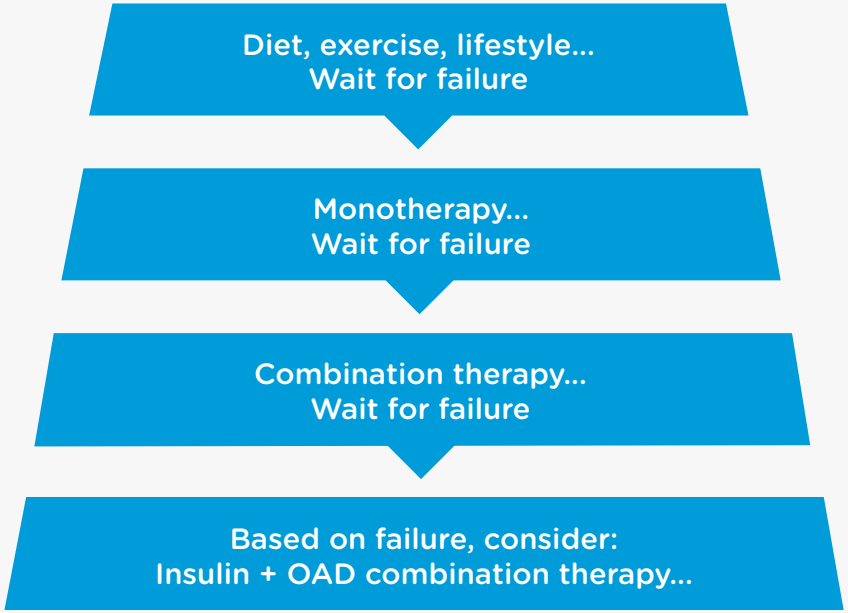
In people with Type 2 diabetes taking one oral antidiabetic drug (OAD) and with an HbA_{1c} of:

- ≥7.0% (≥53mmol/mol) median time to intensification with an additional OAD was 2.9 years
- ≥7.5% (≥58mmol/mol) median time to intensification with an additional OAD was 1.9 years
- ≥8.0% (≥64mmol/mol) median time to intensification with an additional OAD was 1.6 years

For those taking two OAD, median time to adding another OAD was >7 years.

Median time for intensification with insulin was >7.1, >6.1 and >6 years for those taking one, two or three OADs.

Stepwise management of T2DM:
'Treat-to-Failure Approach' – clinical inertia

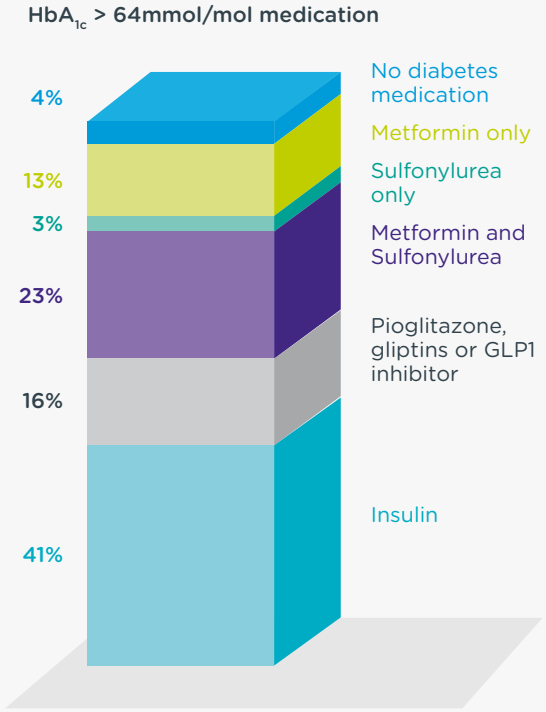


'Treating to fail'

The Diabetes Modernisation Initiative (DMI) was a Guy's and St Thomas' Charity funded project across Lambeth and Southwark working to bring about system-wide change for people living with diabetes through transforming and improving services[23].

The DMI undertook a local audit in 2012/13 which showed that of 23,945 on GP diabetes registers, 32% had an HbA_{1c} higher than 64mmol/mol. Of these 4% were on no diabetes medication, 13% were on metformin only, 3% were on a sulfonylurea only, 23% were taking metformin and a sulfonylurea, 16% were taking pioglitazone, gliptins or GLP-1 analogue and 41% were prescribed insulin.

This data highlights there is huge scope for improvement at each stage of the prescribing guidance and not just at 3rd and 4th line therapy. More intensive therapy with metformin and sulfonylurea in this sample would result in an improvement in control of up to 41% and an absolute increase of up to 9% in HbA_{1c} of less than 64mmol/mol.



Diabetes Modernisation Initiative,
2014 Diabetes UK conference poster

Both people with diabetes and healthcare professionals can suffer from a '**psychological insulin resistance**'[24]. This is characterised by:

- Lack of knowledge about insulin therapy accompanied by erroneous beliefs and misconceptions.
- Negative self-perceptions and attitudinal barriers.
- Perception of increased burden and stress due to required lifestyle adaption and restrictions.
- Perception of social stigma.

It is important to try to avoid negative associations with insulin therapy. Have we honestly never threatened and said something like:

> "If you don't change your lifestyle and take your tablets on time we will have to consider insulin!"

Alternatively we can collude:

> "Well let's just add this extra tablet and see if you can eat less and we'll see you in six months – I'm sure we can put off insulin for a bit longer."

Oral hypoglycaemics

As discussed earlier, intensification of medication is not always as timely as it could be due to a number of reasons. The DMI reviewed local audit data of QOF achievement and variation, alongside current prescribing guidance and concluded that, in line with both national and international data, there was a delay in intensification of therapy across Lambeth and Southwark.

In response to this problem they developed and published guidelines for the management of HbA_{1c} in Type 2 diabetes in early 2012. The guidelines were designed to encourage timely optimisation of medication. Education events were held to share and embed learning so that all healthcare professionals in Lambeth and Southwark worked to a common algorithm for optimisation of HbA_{1c}. These ensured key treatment and prescribing messages were reinforced by all healthcare professionals, making every contact count.

The Lambeth and Southwark management of HbA_{1c} guidance can be downloaded from here.

For a word copy to adapt locally or for further information on the DMI approach, please contact lamccg.medicinesoptimisation@nhs.net

Please contact your Clinical Commissioning Group (CCG) medicines optimisation team for local guidelines or preferred medications.

Click on the audio symbol below to hear Drs Mark Chamley (GP with Special Interest and GP Lead, Lambeth Diabetes Intermediate Care Team), Jane Doherty (GP) and Stephen Thomas (Consultant Diabetologist and Chair of the London Strategic Clinical Network for Diabetes) explain the case for change, some of the feedback they received on the guidance below and the outcomes achieved across Lambeth and Southwark by taking a different approach to intensification.

As described by Drs Chamley, Doherty and Thomas, choosing the right treatment for the right level of HbA_{1c} is one of the most important decisions for timely and effective optimisation. The table below shows the different effects that commonly prescribed agents in Type 2 diabetes have on lowering HbA_{1c}.

HbA_{1c} reductions with different agents

NICE guidance is clear on the HbA_{1c} reductions expected from the majority of the newer agents used in Type 2 diabetes after 6 months of therapy and are summarised below in the table:

Intervention	NICE expected decrease in HbA_{1c} (%) for continuation of therapy
Pioglitazone	0.5 percentage points after 6 months[21]
Glucagon like peptide 1 analogue	1.0 percentage point after 6 months[21,25,26]
Dipeptidyl peptidase-4 inhibitor (DPP-4 inhibitor)	0.5 percentage points after 6 months[21]
Sodium glucose transporter 2 inhibitor (SGLT-2 inhibitors)	0.5 percentage points after 6 months[27,28,29]

For some of the other interventions and medications used, the American Diabetes Association note the following expected decreases in HbA_{1c} with monotherapy:

Intervention	Expected decrease in HbA_{1c} with monotherapy (%)[30]
Lifestyle interventions	1.0-2.0
Metformin	1.0-2.0
Insulin	1.5-3.5
Sulfonylurea	1.0-2.0

Summary

We need to work better with each person with diabetes to optimise their lifestyle interventions and medication to achieve the best outcomes. We need to be more proactive in intensifying treatment options including insulin therapy. We need to discuss the progressive nature of diabetes and the need for insulin from diagnosis and at every review to support people with diabetes manage their care as best as they can.

If we make all these changes our pathway will significantly improve and support the use of the **Right Insulin, Right Time, Right Dose** as shown below.

Diagnosis	Structured education	Glycaemic control deteriorates	Patient barriers to initiating insulin	Referred to initiate insulin	Sees primary care healthcare professional for review	Self titration	Success: improved control
• Discussion that diabetes is a progressive condition	• Discussion about insulin with patient	• GP starts discussing insulin and tackling the barriers • Need to understand both healthcare professional and patients' barriers to insulin • Support adherence to current medication	• Peer support to deal with the barriers of commencing insulin	• Refer to your local insulin initiation pathway	• Support primary care in titration of insulin	• Support tools to encourage self-titration of insulin	

Key messages

1 Discuss the need for insulin early in the pathway

2 Early control of HbA_{1c} is important for longer term 'metabolic memory'

3 Personalise HbA_{1c} targets to strike the balance between safety and tight control

Right insulin – the evidence

The current NICE clinical guideline 87 (CG87)[21] recommends that human isophane (NPH) insulin is prescribed firstline if insulin is initiated in Type 2 diabetes at bedtime or twice daily, i.e. as a basal insulin. Long Acting Insulin Analogues (LAIA), eg. insulin detemir or insulin glargine, should only be used in specified circumstances, i.e. if:

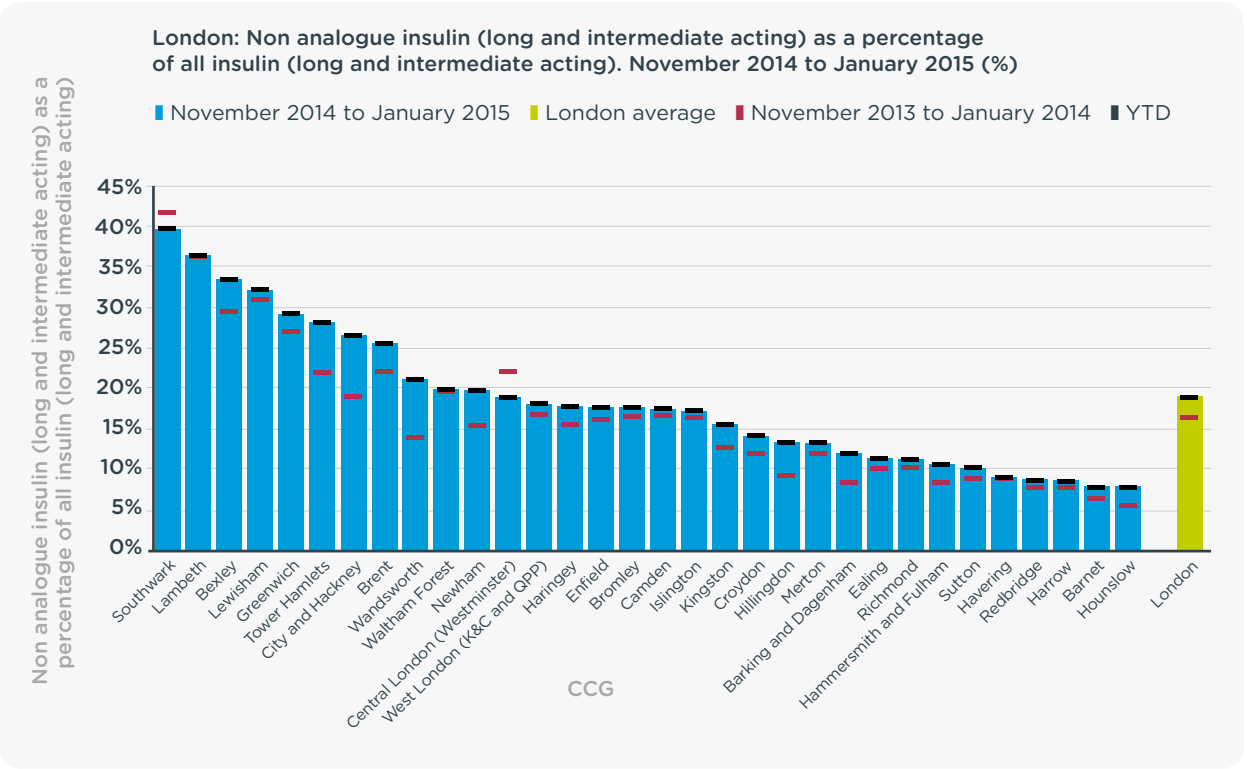
- The person needs assistance from a carer or healthcare professional to inject insulin and use of LAIA would reduce the frequency of injections from twice to once daily, or
- The person's lifestyle is restricted by recurrent symptomatic hypoglycaemic episodes, or
- The person would otherwise need twice-daily NPH insulin injections in combination with oral glucose-lowering drugs, or
- The person cannot use the device to inject NPH insulin.

It then goes on to add that we should consider switching to a LAIA from NPH insulin in people:

- who do not reach their target HbA_{1c} because of significant hypoglycaemia, or
- who experience significant hypoglycaemia on NPH insulin irrespective of the level of HbA_{1c} reached, or
- who cannot use the device needed to inject NPH insulin but who could administer their own insulin safely and accurately if a switch to a LAIA were made, or
- who need help from a carer or healthcare professional to administer insulin injections and for whom switching to a LAIA would reduce the number of daily injections.

What is happening across London?

Due to the significant financial implications of intermediate and long acting analogue prescribing, the London Procurement Partnership (LPP) and medicines optimisation teams have monitored prescribing levels since NICE CG 87 was issued. In 2014/15 the LPP target for increasing intermediate and long acting non-analogue insulins as a proportion of all insulins was 17.5%[31]. In 2014 the LPP data shows clear geographical variation, with CCGs in South East London achieving a much higher proportion of NPH insulin being prescribed.



Why isn't isophane (NPH) insulin being used first line?

Many people are sceptical about the use of NPH insulin as first line choice of basal insulin in Type 2 diabetes. There is a common belief that NPH insulin is ineffective and might lead to higher rates of hypoglycaemia. Many healthcare professionals are more familiar and comfortable with the use of medium and long acting analogue insulins as many of the training programmes focussed on analogue use.

What is the evidence that supports the use of NPH insulin first line?

NICE Clinical Guideline 87[21] is based on evidence from two systematic reviews with meta-analysis that review NPH insulin but come to different conclusions. The Cochrane review[32] concluded:

> "Our analysis suggests, if at all only a minor clinical benefit of treatment with long-acting insulin analogues for patients with diabetes mellitus Type 2 treated with 'basal' insulin regarding symptomatic nocturnal hypoglycaemic events. Until long-term efficacy and safety data are available, we suggest a cautious approach to therapy with insulin glargine or detemir."

This review included six studies comparing NPH to glargine and two studies comparing NPH to detemir.

> "Metabolic control, measured by glycosylated haemoglobin A1c (HbA_{1c}) as a surrogate endpoint, and adverse effects did not differ in a clinical relevant way between treatment groups. While no statistically significant difference for severe hypoglycaemia rates was shown in any of the trials, the rate of symptomatic, overall and nocturnal hypoglycaemia was statistically significantly lower in patients treated with either insulin glargine or detemir. No evidence for a beneficial effect of long-acting analogues on patient-oriented outcomes like mortality, morbidity, quality of life or costs could be obtained."

Rosenstock's findings[33] were somewhat different, suggesting that analogue insulins might favour tighter, safer blood glucose control. However, the data presented in their meta-analysis shows only a very small reduction in severe hypoglycaemia (although statistically significant).

> "These results confirmed that insulin glargine given once daily reduces the risk of hypoglycemia compared with NPH insulin, which can facilitate more aggressive insulin treatment to a HbA_{1c} target of 7.0% in patients with Type 2 diabetes."

This review was based on four randomised open label studies comparing once daily glargine with once or twice daily NPH. There was no difference in overall glycaemic control between those treated with NPH insulin and insulin glargine. However:

> "The incidence of overall symptomatic hypoglycemia, nocturnal hypoglycemia, and severe hypoglycemia was significantly lower with insulin glargine compared with NPH insulin."

Further analysis of severe hypoglycaemic events showed that the rate of severe documented hypoglycaemic events was 2.6% in the NPH group compared to 1.4% in the glargine group (p=0.044). The rate of severe documented nocturnal events was 0.9% in the NPH group compared to 0.8% in the glargine group is not statistically significant (p=0.73).

Summary

The NICE guidance for insulin initiation in Type 2 diabetes[21] is well constructed. NPH insulin is recommended for first line use, but clear exceptions are identified particularly where hypoglycaemia is recognised as being an issue. As part of the toolkit development, we commissioned a further review[34] to consider evidence produced since the publication of NICE clinical guideline 87. The review also included real world and economic data. The review concluded that:

> Based on the currently available evidence to date, NPH insulin should remain the first choice when initiating insulin in people with Type 2 diabetes. To ensure the best value for money from limited resources, when initiating insulin in Type 2 diabetes the use of long-acting insulin analogues should be reserved for specific individual patients who would be most likely to benefit as defined by NICE criteria[34].

A link to the full review can be downloaded here.

Right insulin – the economics

£280,000 to £320,000

Cost per Quality Adjusted Life Year for NPH insulin compared with glargine.

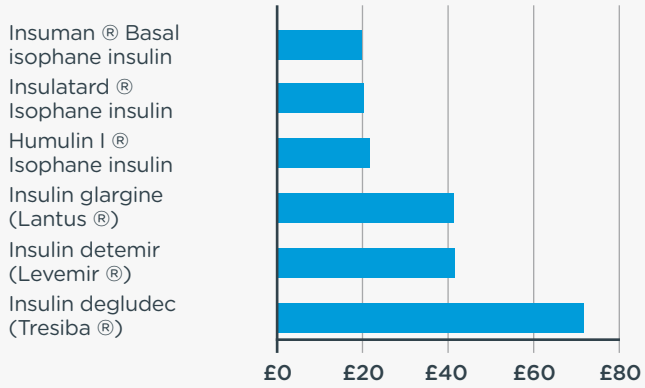
£188,000 to £412,000

Cost per Quality Adjusted Life Year for for glargine compared with detemir.

NPH insulin has a lower acquisition cost than analogue insulins as shown in the graph on the right[35]. However, can this be translated into clinical and quality of life benefits for people with type 2 diabetes and overall economic benefit to our health service?

The Health Technology Assessment[36] supporting NICE CG 87 showed that the cost per Quality Adjusted Life Year (QALY) for NPH insulin compared with glargine was £280,000 to £320,000. The cost per QALY was £188,000 to £412,000 for NPH compared with detemir.

Both of these are substantially greater than the **£20,000 to £30,000 threshold** usually considered in NICE's cost effectiveness evaluation.



The use of NPH insulin is clearly attractive in terms of prescribing costs, although this must not be the sole determinant for prescribing choice. Data considering medium and long acting insulin prescribing and cost from Lewisham CCG shows the potential cost that could be avoided through increased use of NPH insulin in the right people as outlined by the NICE guidance.

Data extracted from EMIS web in 37 Lewisham CCG practices (courtesy Medicines Optimisation team, Lewisham CCG)

Insulin type	Number of Type 2 patients on insulin	% patients	Assumed average monthly cost	Annual cost (monthly cost x 12)	Spend per year – annual cost x patients
NPH	500	46%	£15	£180	£90,000
LAIAs	582	54%	£30	£360	£209,520
					£299,520

The above data highlights that a cost avoidance of £180 per year per patient can be made when using NPH insulin rather than LAIA in the right patient. Overleaf are examples of where avoiding costs by using NPH insulin first line in line with NICE guidance have been used to finance improved diabetes care.

An example of where avoiding costs by using NPH insulin first, in line with NICE guidance, have been used to finance improved diabetes care

NICE Shared Learning Awards 2013

NHS Corby Clinical Commissioning Group

NHS Nene Clinical Commissioning Group

How evidence-based insulin prescribing enabled a redesign of diabetes services

Services for patients with diabetes in Northamptonshire were redesigned based on NICE guidance.

A multidisciplinary team (MDT) of clinicians was created to manage the support and services required. The MDT was funded through savings made by using NICE-recommended human NPH insulin for treatment, as opposed to analogue insulin.

"An increase in the use of NICE-recommended human insulin resulted in savings of more than £600,000."

Sue Smith, Head of Prescribing and Medicines Management, Nene and Corby Clinical Commissioning Groups

Remodelling services for type 2 diabetes

Information from a variety of sources suggested that services offered for type 2 diabetes could be improved in Northamptonshire. The aim was to redesign these services so that they could provide greater consistency of care, and reduce dependency on treatment in secondary care.

A clinical reference group (CRG) was set up to design and deliver a new best practice model of care, providing information, support and care to patients so they could make informed choices about their conditions.

The CRG identified the creation of a MDT, to manage the support and services associated with diabetes, as a priority action. The CRG drew up a 'wishlist' of all the services and types of professionals that an MDT might include such as consultants, specialist nurses, podiatrists, dietetics, services for psychological support, and ways of providing care closer to the homes of patients.

However, the group soon realised that there would be no extra funding available to resource such a team, and that existing resources would have to be used differently. In order to overcome the problem, it took recommendations from NICE's guidance on type 2 diabetes, and came up with a novel method of generating the income required to fund the MDT.

Using savings from implementing NICE guidance to redesign services

The CRG observed that current treatment with insulin in Northamptonshire contrasted with NICE guidance. NICE recommends that treatment should begin with human NPH human insulin, and that this should be taken at bedtime or twice daily according to need.

Yet the CRG found that treatment with human NPH insulin only accounted for 15 per cent of the total amount of long and intermediate acting insulin used; almost the opposite of what would be expected if NICE guidance was being followed.

The group identified that the first-line use of analogue insulin cost an estimated additional £1 million per year in Northamptonshire. In addition, an audit of practice nurses found that the majority had only received training in implementing analogue insulin.

It consequently set up a one-day training course for practice nurses run by diabetes specialist nurses and a medicines management pharmacist. This course runs every 6-8 weeks on an ongoing basis, and explains the practical aspects of initiating human NPH insulin and the evidence base behind its use.

Multi-disciplinary team brought several improvements

When the course started in September 2010, human insulin accounted for 15 per cent of all long and intermediate acting insulin.

By July 2012, this had grown to 25 per cent, resulting in savings of more than £600,000.

These savings were used to fund the MDT, which in turn has achieved several improvements.

These include a 48 per cent reduction in admissions, which has resulted in savings of £301,000, mentoring and support for primary care clinicians to avoid unnecessary referrals, and the use of 'diabetes specialist workers' to support hard to reach patient groups.

The MDT has also implemented greater integrated working, with 55 primary care practices and clinics involving a range of specialists, including a consultant diabetologist.

A learning point was the impact that having input from specialists from a range of disciplines had on the project. The team also believe that it was helpful for clinicians to see that the savings made from following NICE guidelines were ring-fenced and reinvested in diabetes services.

Increasing the use of human insulin in Tower Hamlets

The Medicines Management team in Tower Hamlets engaged broadly with stakeholders. Over a period of 24 months both the cost and volume of prescribed analogue insulins has come down. Joint working between primary and secondary care continues, with regular review of prescribing. **Download the report.**

Contact: Sue Smith
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Telephone: 01604 651360

www.nice.org.uk

Right Insulin – outcomes

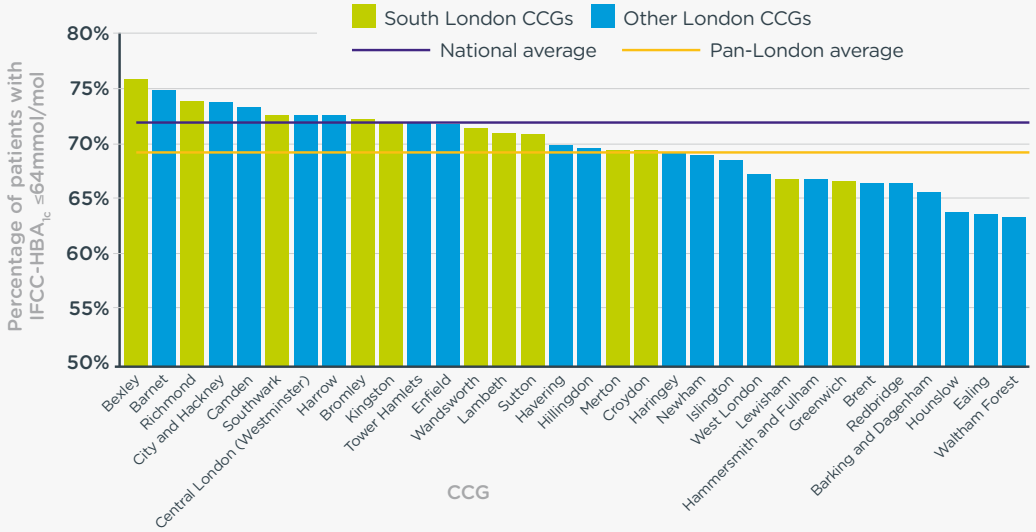
What are the London outcomes when NPH insulin is used in line with NICE guidance?

We have reviewed the evidence and looked at the financial benefits but it is important to review the outcomes for our local patients. Datasets available from LPP[31] and the Quality and Outcomes Framework[37] (QoF) suggest that use of NPH insulin is not associated with poorer outcomes in terms of glycaemic control. The graphs below show NPH insulin use for the year 2013/14 and the QoF indicator for proportion of people with diabetes achieving an HbA_{1c} of less than 64mmol/mol for the year 2013/14. Many CGGs with high NPH use are also amongst those with best performance against QoF.

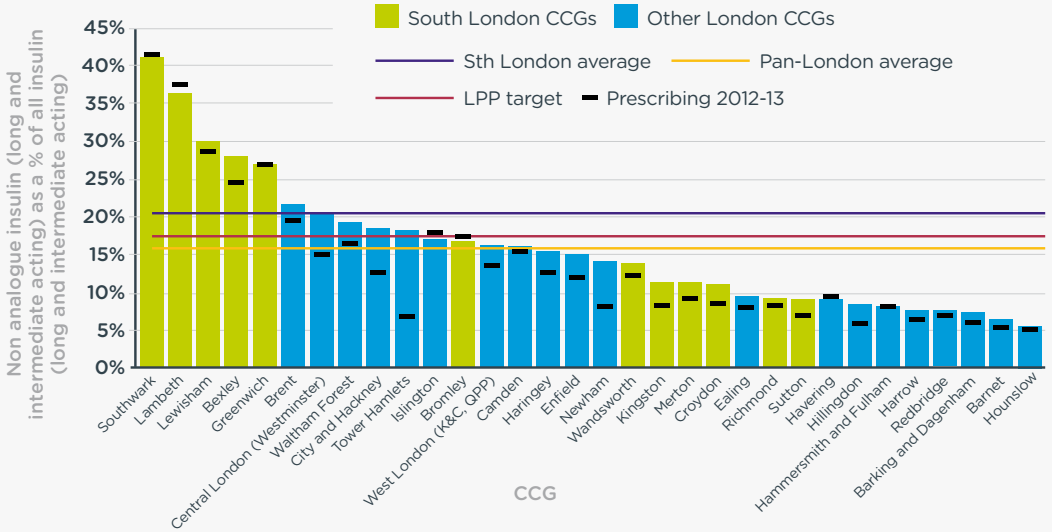
Key messages

1. NPH has been shown to be an effective first line treatment for the majority of people with Type 2 diabetes starting insulin therapy
2. Use of NPH insulin as first line treatment (when insulin is required) in line with NICE CG 87 can contribute to effective use of resources in diabetes
3. Use of NPH insulin first line in line with NICE CG87 does not affect population control of HbA_{1c}

The percentage of patients with diabetes, on the register, in whom the last IFCC-HBA_{1c} was ≤64mmol/mol in the preceding 12 months across London in 2013-14 (excluding exceptions)



Prescribing non analogue insulin (long and intermediate acting) as a percentage of all insulin (long and intermediate acting) across London in 2013-14



Myths and barriers (healthcare professionals)

Each individual healthcare professional has different experience and beliefs about insulin and a number of myths exist around both the use and choice of insulin. Despite the evidence that early use of insulin has long term benefits there are significant barriers to initiation and titration. This can result in healthcare professionals and patients colluding to delay starting or titrating insulin which can have an impact on complications and patient outcomes.

The reasons behind these barriers can be multi-factorial. Healthcare professionals' previous experience with insulin, confidence and competence to initiate or titrate insulin, as well as clinical inertia, can all play a part. It is important to address these myths to prevent a delay in starting and titrating insulin in the right patients.

Some of the healthcare professional myths that we have come across are listed below. Click on the link to uncover the evidence and decide whether the following statements are actually truth or myths!

Further myths and myth busting statements developed in conjunction with the Medicines Information Team at Guy's and St Thomas' Hospital can be found in the Medicines Optimisation tab.

Myth: "We don't need to start insulin early now we have new drugs like GLP-1 analogues."

Click here to see the evidence

Myth: "Analogue insulins are better at controlling HbA_{1c} than the older isophane insulins."

Click here to see the evidence

Myth: "For most people long and medium acting analogue insulins cause less hypoglycaemia and cause less weight gain."

Click here to see the evidence

Myths and barriers (healthcare professionals)

> Myth: "We don't need to start insulin early now we have new drugs like GLP-1 analogues."

- GLP-1 analogues work on different pathways within the body. They can reduce appetite, regulate gastric emptying and enhance glucose dependent insulin secretion[38]. When combined with diet and exercise interventions, reductions in HbA_{1c} and weight can be achieved however in practice we do not see this in all patients[40]. Insulin on the other hand is effective at reducing HbA_{1c} levels irrespective of the level beta cell function[40]. Studies have shown that after nine years of diagnosis, a substantial number, possibly the majority of patients will need the addition of insulin therapy[39].
- No published studies were identified that compared liraglutide/lixisenatide with NPH insulin. The comparative data below are for exenatide and insulins:
  - **Glycaemic control**: When glycaemic control with exenatide is compared with various insulin regimens, the results are similar, suggesting noninferiority, although very few studies evaluated NPH insulin and the issue of non-optimisation of the insulin treatment remains a concern. Furthermore, long term data are not available[36].
  - **Weight**: Most studies have reported weight loss with exanatide compared with insulin although in routine care, this has not always been demonstrated[36].
  - **Other outcome data**: No studies evaluating other mortality or cardiovascular data were identified[36].
  - **Hypoglycaemia**: Hypoglycaemia is perceived to be less of a problem with exanatide, but the differences in the trials were not marked[36].
- Both insulin and GLP-1 analogues have their individual place in the pathway of the management of hyperglycaemia and choice of agent should be directed by patient factors[40].
- In the right patient at the right time, GLP-1 analogues are important adjuncts to other oral hypoglycaemic agents (and insulin in some patients), and can support both weight loss and HbA_{1c} reduction[40].
- However, GLP-1 analogues cannot be used instead of insulin in those patients that require insulin. Thinking about the principles of the right time and the right patient, it is incredibly important that we identify the right diabetes treatment to be given to the patient and review on a frequent basis in order to ensure optimal outcomes[40]. SIGN guidance emphasises the need to apply careful clinical judgement in those people with a long duration of type 2 diabetes on established oral glucose-lowering drugs with poor glycaemic control (>10 years) as these individuals are poorly represented in published studies, and to ensure insulin therapy is not delayed inappropriately for the perceived benefits of GLP-1 analogues[41].

Back to myths

Myths and barriers (healthcare professionals)

> Myth: "Analogue insulins are better at controlling HbA_{1c} than the older isophane insulins."

A systematic review found no difference in HbA_{1c} level between insulin glargine and NPH insulin, and only a small non-significant difference in trials of insulin detemir versus NPH insulin (HbA_{1c} level was higher with detemir by 0.08%; 95% CI –0.03 to 0.19). Overall, the systematic review concluded that "insulin glargine and insulin detemir are equivalent to NPH in terms of glycaemic control as reflected in HbA_{1c} level"[36].

> Myth: "For most people long and medium acting analogue insulins cause less hypoglycaemia and cause less weight gain."

- **Hypoglycaemia** – No differences in the frequency of severe hypoglycaemia between the insulin analogues and NPH insulin were found, but, overall, hypoglycaemia was less frequent with both insulin glargine (OR 0.74, 95% CI 0.63 to 0.89) and insulin detemir (OR 0.51, 95% CI 0.35 to 0.76). The systematic review concluded that insulin analogues have modest advantages in terms of hypoglycaemia, especially nocturnal[36].
- **Weight** – Insulin therapy is likely to increase body weight by 2-4kg on average and usually greatest during early stages of insulin use[16]. Strategies to minimise weight gain should be discussed at insulin initiation and periodically throughout therapy to minimise weight gain. Weight gain in patients on insulin glargine was slightly less than in patients on NPH insulin (0.28 kg; 95% CI –0.72 to 0.15) but this was neither clinically nor statistically significant. On detemir, the difference was a little greater (1.2 kg; 95% CI –1.6 to –0.8) but again unlikely to be clinically significant[36].

Back to myths

Myths and barriers (healthcare professionals)

This film shows a scenario you may be familiar with. Different interactions between patients and clinicians may lead to very different outcomes. **What approaches and tactics are most likely to achieve positive change?**

1. Argue and reiterate the rationale for change
2. Give lots of suggestions how to go about change
3. Point out the dangers of not changing
4. Listen reflectively to why it is undesirable to this patient at this time
5. Listen reflectively to the difficulties the patient foresees
6. Ask them how **they** see the pros and cons of changing
7. Acknowledge that they have a choice whether to change or not

Myths and barriers (patient perspective)

Common patient barriers and perceptions regarding insulin therapy and suggestions of how to address

Medication is one aspect of diabetes self-management and for many people, diabetes is one of several long-term conditions they have to deal with day to day.

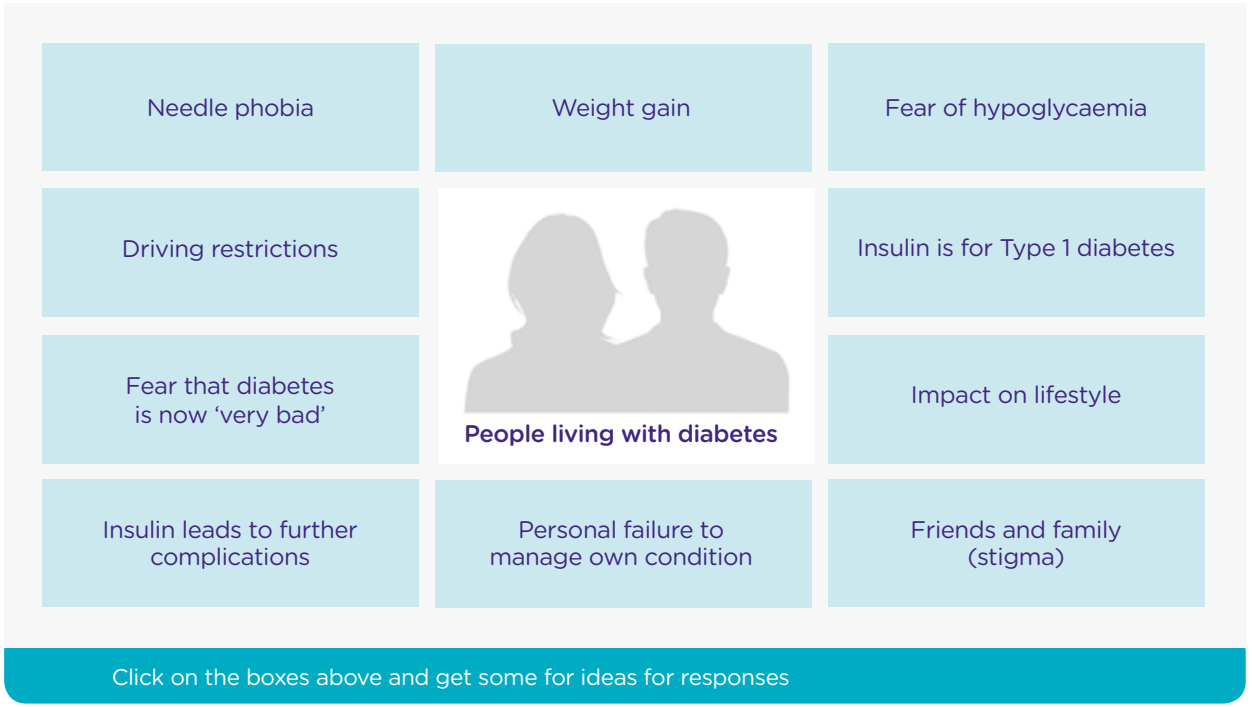
For patients, barriers may include fear of hypoglycaemia, needle phobia, friends or family's previous experience with insulin, fear that their diabetes is now 'very bad' or a fear of a negative impact on their lifestyle[42,43,44]. All of these are important factors and must be identified and addressed to ensure insulin therapy will be effective.

Patient feedback

Feedback from South London patient engagement groups[45] concluded that people with Type 2 diabetes want to feel that they have received all the information they need to understand their diabetes and self-manage effectively.

They want to talk about the options from the beginning. "I'd like to be able to 'look ahead' to see what's coming next." – Person living with diabetes

When starting new medication, they want to be told about the benefits to controlling their diabetes as well as the possible side effects.



Needle phobia

Concern or fear about injecting insulin is common but true needle phobia is rare. Advise patients that insulin injections are not considered painful and are usually less uncomfortable than the finger-pricking performed for blood glucose monitoring[46].

Insulin is for Type 1 diabetes

Oh no it's not! Type 2 diabetes is a progressive condition and the underlying cause is insulin resistance, the body initially attempts to compensate for this by producing more insulin, however ultimately it can become tired and it's at this time when the body is unable to produce sufficient insulin, that insulin is required. There is a limit to what medication can do and for some patients insulin is all that we have to combat the insulin resistance.

Weight gain

This is a common adverse effect of insulin treatment and can increase the person's body weight by 2–4 kg. Weight gain can be minimised by appropriate lifestyle and dietary changes and continuing with metformin (if tolerated)[46]. A number of studies have shown there is less weight gain when started on a basal insulin regimen than on a biphasic or basal bolus regimens[47,48].

Fear of hypoglycaemia

Offer reassurance that most episodes of hypoglycaemia can be self-managed. Additionally hypoglycaemia is minimised as patients are initiated on a low dose of insulin, with gradual dose titration. An education package provided to individuals who start insulin may also go through management and prevention of hypoglycaemia[46].

Driving restrictions

The Driver and Vehicle Licensing Agency (DVLA) highlight the regulations in place for those people with type 2 diabetes and who use insulin. Using insulin does not automatically mean people with Type 2 diabetes won't be able to drive. A number of factors are taken into consideration including the type of licence held, frequency and severity of hypoglycaemia and presence or absence of any eye complications[49]. The healthcare professional initiating the insulin will discuss current driving needs and provide individual advice on DVLA requirements. A guide for healthcare professionals can be found here.

Fear that diabetes is now 'really bad'

Fear that diabetes is now really bad AND personal failure to manage own condition – discussion points:

- Type 2 diabetes is a progressive disease and over time the body produces less insulin. As less insulin is produced by the body, more medication and lifestyle changes will need to be made to control HbA_{1c} levels.
- There are many effective therapies for the management of type 2 diabetes, including insulin[21].
- Insulin treatment is the next logical step in treatment when other diabetes therapies are not controlling glucose levels or where we think insulin would be the best option for the patient. Therefore the right time for insulin will differ in each individual.
- Insulin should not be seen as the last resort in optimising glycaemic control or as failure by the patient to control their diabetes. Insulin should be seen as an option in care to optimise glycaemic control to prevent longer term complications.

Insulin leads to further complications

Discussion points:

- Complications are caused by high blood glucose levels along with other adverse metabolic factors over a long period of time[52].
- Insulin, along with other medications used to reduce HbA1c levels help to reduce the complications by controlling blood glucose levels.
- If we can control blood glucose levels effectively over time, we can reduce complications[14].

Impact on lifestyle

Discussion points:

- There are lots of different insulin preparations and regimes available[50].
- The healthcare professional starting insulin will look at the appropriate insulin regime for the individual, taking into account their lifestyle, driving requirements and occupation[38,46].
- It is likely that insulin will be started as a once-daily insulin at night time with minimal need for blood glucose testing[47,48].

Stigma/friends and family

Discussion points:

With consent from the person with Type 2 diabetes, carers and family members would be welcome to attend appointments and education sessions to learn more about Type 2 diabetes and how to support family members/ people they care for.

Insulin management – key facts

We have talked a great deal about the importance of optimisation of both medication and lifestyle interventions and as discussed by Dr Thomas, Dr Doherty and Dr Chamley we need to ensure we use the **Right therapy** at the **Right time** at the **Right dose**. Insulin is no exception to this. But, how do we know when it's the **Right time** is to start insulin?

In this section we cover indications for insulin initiation, individualisation of insulin treatment and the practical aspects of supporting a person with Type 2 diabetes with their insulin therapy.

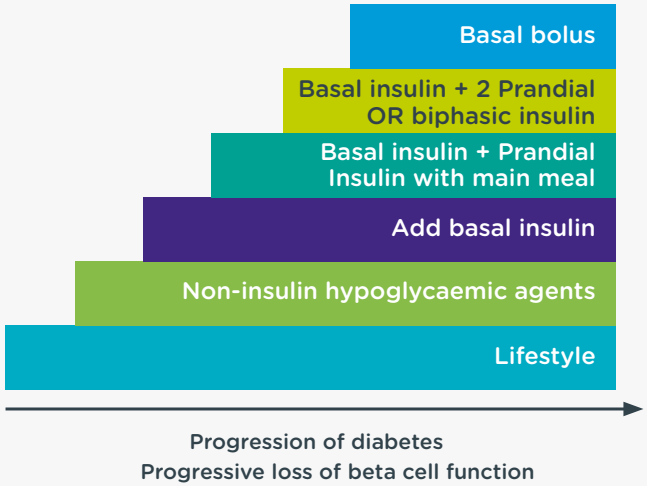
Clinically insulin may be the most appropriate choice in a number of circumstances including:

1. Patients who have symptomatic hyperglycaemia e.g weight loss, polydipsia, polyuria , blurred vision, recurrent infections or tiredness, or marked hyperglycaemia[20,21,35]
2. Patients unable to control blood glucose levels despite dual therapy, who are markedly hyperglycaemic and the patient agrees to start insulin[21]
3. Patients who are unable to adequately control blood glucose levels despite triple therapy with oral glucose lowering drugs[21,46]
4. When other hypoglycaemic agents will not reduce baseline HbA_{1c} to personalised HbA_{1c} levels[40]
5. Patients who cannot tolerate/have allergies with non-insulin hypoglycaemic medication[38]
6. Patients who are limited with other hypoglycaemic medication due to renal or hepatic function decline[50]
7. In patients who have progressive microvascular complications[38,50]
8. When concomitant therapies that cause hyperglycaemia such as steroids are prescribed[51] (depends on type of steroid – please discuss with diabetes team)
9. Women who are pregnant or planning pregnancy[38,50]
10. Where the patient preference is to start insulin[38]

Stepwise management of diabetes

Now we know who may require insulin, then the next question we ask is, what type of insulin do they need? There are now so many different types of insulins and possible regimens, where do you start?

It is important to remember that diabetes is a progressive condition, and just like there is a stepwise approach to managing diabetes, there is also a stepwise approach to initiating and titrating insulin.



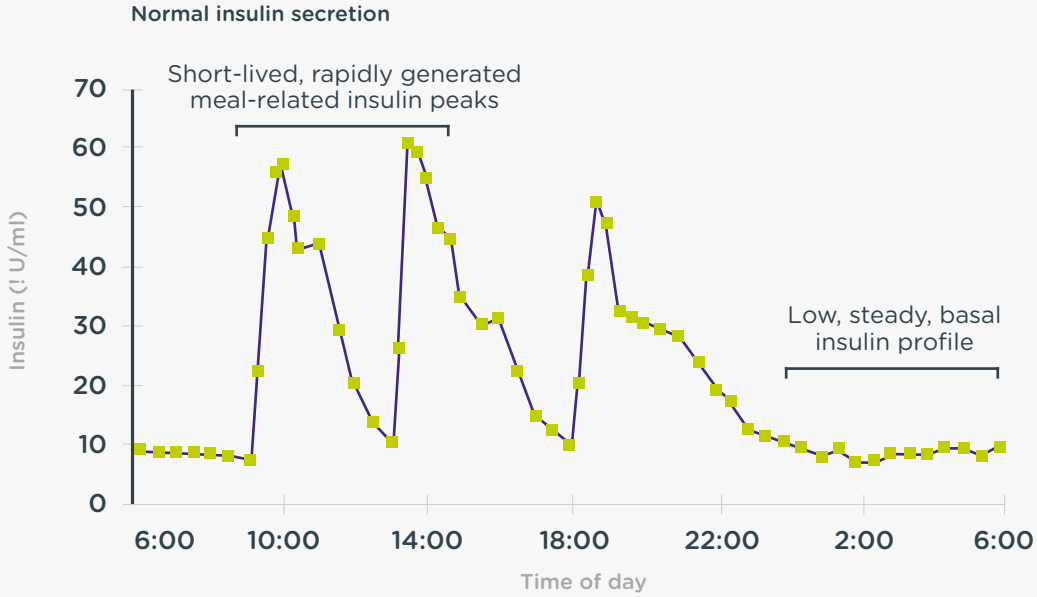
Aims of insulin therapy

The overall aim of insulin treatment in Type 2 diabetes is to mimic normal insulin secretion in order to achieve normoglycaemia without causing weight gain or hypoglycaemia[20]. In order to decide which insulin regime may be best for your patient, it is important to consider a number of factors including:

Pathophysiology factors

Normal insulin secretion and underlying defects in Type 2 diabetes

In healthy adults, normal insulin secretion has two key elements: rapidly secreted insulin in response to food intake, alongside a low level of basal insulin to control glucose between meals. The amount of insulin secreted depends on a number of factors including activity, eating, stress and hormones[52]. In Type 2 diabetes, there are problems with both elements of insulin secretion: the rapidly secreted insulin as well as the basal insulin secretion which results in hyperglycaemia[53].



Polonsky KS et al. J Clin Invest. **1988;81: 442-8**

Individualising treatment

A Individualised glycaemic target

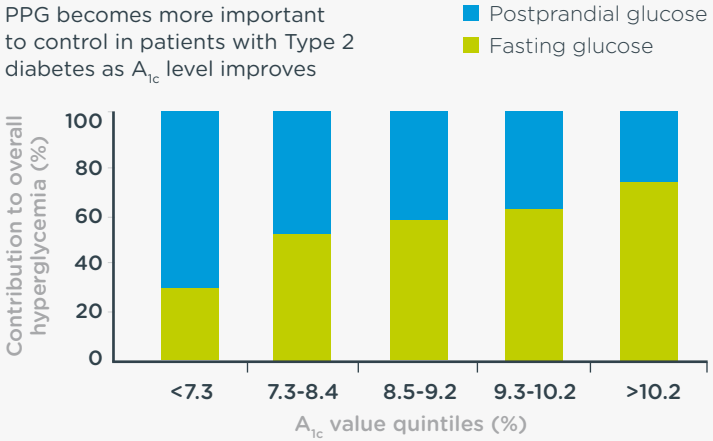
NICE Quality Standards[54] state that people with diabetes should agree with their healthcare professional a documented personalised HbA_{1c} target, usually between 48 mmol/mol and 58 mmol/mol (6.5% and 7.5%) and receive an ongoing review of treatment to minimise hypoglycaemia. In certain groups such as the elderly or those with pre-existing cardiovascular disease, higher levels may be more appropriate when you bear in mind co-morbidities, life expectancy and biological age[20]. The aim of drug and insulin therapy is to achieve the optimal glycaemic control without frequent or severe hypoglycaemia or hyperglycaemia. The incidence of hypoglycaemia and/or hyperglycaemia should be frequently monitored and therapy adjusted as appropriate[55].

B Contribution of prandial and basal hyperglycaemia to overall HbA_{1c} level

As shown by the slide below, Monnier et al (2003)[56] highlighted that as the HbA_{1c} levels change, there is also a change in the amount that both prandial and basal hyperglycaemia contribute towards the overall HbA_{1c} level.

Contribution of postprandial glucose is greater as A_{1c} level improves

PPG becomes more important to control in patients with Type 2 diabetes as A_{1c} level improves



Monnier L, et al. Diabetes Care, **2003; 26: 881-885**

Aims of insulin therapy: individualising treatment

C Blood glucose profile

Optimal glucose control should consider fasting glucose, post-prandial glucose and the HbA_{1c} levels to obtain a baseline profile of glucose patterns throughout the day. This allows us to individualise the insulin regime for the patient. For most patients we would aim for a fasting glucose level of 4-7mmol/L, or pre-meal 5-7mmol/L, pre-bedtime of 6-8mmol/L and a post-prandial (i.e. 2 hours after a main meal) level between 6-8.5mmol/l/l but this will depend on the individual[16,20,55,57]. Patients with overall higher HbA_{1c} targets as described earlier in the toolkit will also have higher blood glucose target levels too[20].

D Co-morbidities

Co-morbidities such as renal impairment and the presence of cardiovascular disease can all have an impact on diabetes management. As discussed earlier our aim is to achieve safe, but less tight, blood glucose levels in those with longer duration Type 2 diabetes or those who are at higher cardiovascular risk, frail or elderly[20]. Renal impairment is also an important factor to consider. Not only are we limited by the choice of therapies we can use but we also have to take into consideration that those who have renal impairment have a higher risk of hypoglycaemia[20]. Insulin is renally excreted, so in individuals with chronic kidney disease (CKD), the insulin will hang around for longer, resulting in subsequent hypoglycaemia. Do not be surprised that as renal function deteriorates, insulin requirement drops and in some cases the patient can find themselves on no medication for their diabetes.

E Patient factors[55]

- Patient preference
- Capability of patient and carer to understand insulin regime
- Complexity of insulin regime e.g. number of injections per day
- Flexibility of insulin regime
- Usual meal times
- Travel requirements
- Occupational requirements e.g. shift work or driving requirements
- Side effects such as hypoglycaemia and weight gain
- Dexterity
- Health beliefs
- Cultural beliefs

F Co-interventions

There are some restrictions on the use of some of the non-insulin hypoglycaemic agents when combining with insulin. Treatments may need to be reduced or stopped due to the risk of hypoglycaemia or licensing restrictions. In general, metformin should be continued indefinitely[20], unless contra-indicated as it increases insulin sensitivity and cardiovascular benefits. The licensing documents for co-interventions found at www.medicines.org.uk and the Leicester guideline highlights some of the considerations that need to be taken into account when starting insulin. Healthcare professionals who initiate insulin will advise on continuation, cessation or a change in dose of co-interventions upon insulin initiation or titration.

Insulin regimes – using the Right Insulin

Now that we have looked at the factors we need to consider before starting insulin, we are now ready to think about which regime we might start in the individual.

There are three main regimes that we use in Type 2 diabetes:

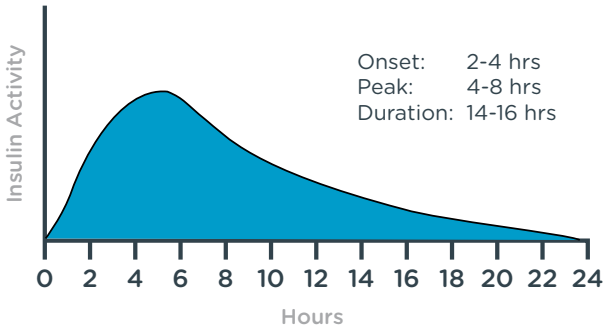
1. Basal insulin (once or twice daily)
2. Biphasic insulin
3. Multiple daily injections such as basal bolus regimes

The different regimes are described on the following pages.

NICE guidance recommends starting with human NPH basal insulin injected at bedtime or twice daily according to need[21]. Evidence from the 4-T trial highlighted that basal insulin was associated with less weight gain and less hypoglycaemia compared to both biphasic insulin and prandial insulin[47].

1 Basal insulin

NPH basal insulin (intermediate acting insulin)

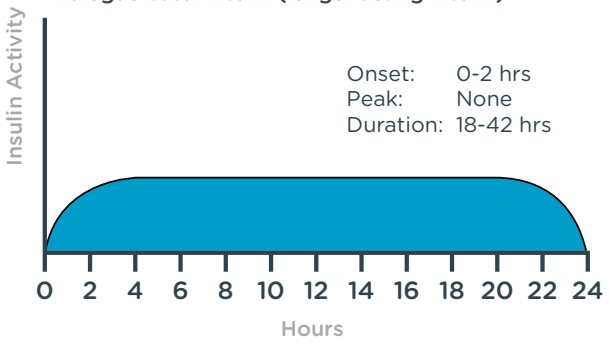


Intermediate Acting Insulin can be used once daily (usually injected before bedtime*) or twice daily (usually injected before bed and in the morning*). These insulins are cloudy and re-suspension of this type of insulin is important, otherwise hypo/hyperglycaemia may occur[55]. Examples are Humulin I®[58], Insulatard®[59] and Insuman Basal®[60,61,62] and are summarised in the table to the right[35,58,59,60,61,62].

Type	Insulin	Manufacturer	Preparations available
Intermediate acting human isophane (NPH) insulin	Humulin I® 100 units/ml	Lilly	• 10ml vial • 3ml cartridge (for Autopen® Classic or HumaPen®) • 3ml Humulin I KwikPen® pre-filled disposable injection devices
	Insulatard® 100 units/ml	Novo Nordisk	• 10ml vial • 3ml Insulatard Penfill® cartridge (for Novopen® devices) • 3ml Insulatard InnoLet® pre-filled disposable injection devices
	Insuman Basal® 100 units/ml	Sanofi–Aventis	• 5ml vial • 3ml cartridge (for ClikSTAR® and Autopen® 24) • 3ml Insuman® Basal Solostar® prefilled disposable injection devices

* Timings of administration differ between preparations. Check with your local diabetes team or in the specific license for the insulin for more information.

Analogue basal insulin (longer acting insulin)



Longer acting insulins such as insulin glargine (Lantus®)[35], insulin detemir (Levemir®)[35] and insulin degludec (Tresiba®)[35] have a flatter profile i.e. they are less peaked. They provide a continuous level of insulin and duration is slightly different for each brand[55].

When would we use basal long acting insulin analogues (LAIA) over isophane (NPH) insulin?

In line with NICE guidance[21] we would consider using insulin glargine or insulin detemir if:

- The person needs assistance from a carer or healthcare professional to inject insulin, and use of LAIA would reduce the frequency of injections from twice to once daily, or
- The person's lifestyle is restricted by recurrent symptomatic hypoglycaemic episodes, or
- The person would otherwise need twice-daily NPH insulin injections in combination with oral glucose-lowering drugs, or
- The person cannot use the device to inject NPH insulin.

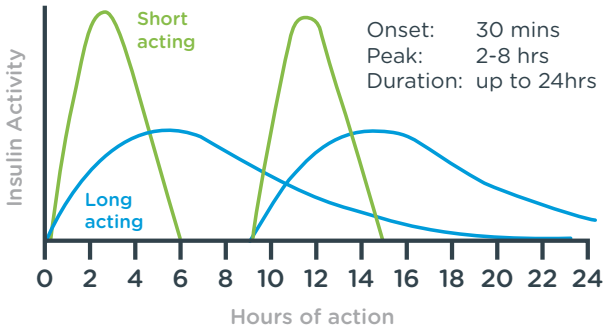
We should consider switching to a LAIA from NPH insulin in people[21]:

- Who do not reach their target HbA_{1c} because of significant hypoglycaemia, or
- Who experience significant hypoglycaemia on NPH insulin irrespective of the level of HbA_{1c} reached, or
- Who cannot use the device needed to inject NPH insulin but who could administer their own insulin safely and accurately if a switch to a LAIA were made, or
- Who need help from a carer or healthcare professional to administer insulin injections and for whom switching to a LAIA would reduce the number of daily injections.

2 Biphasic insulin

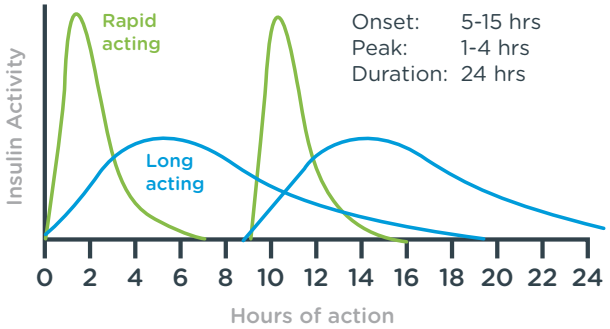
Biphasic insulin (or pre-mixed insulin) contains a mixture of two components, generally a rapid or short acting insulin along with a longer acting component. The different types of pre-mixed insulin are detailed below.

Pre-mixed isophane Insulin – Humulin® M3[35], Insuman® Comb 15[35], Insuman® Comb 25[35], Insuman® Comb 50[35]



These contain mixtures of short acting and isophane insulin. These are usually injected up to 30 minutes before a meal[63].

Pre-mixed Analogues – NovoMix® 30[64], Humalog® Mix25[65], Humalog® Mix50[65]



Pre-mixed analogues are a mixture of rapid-acting insulin analogue (insulin aspart or insulin lispro) and the same rapid-acting insulin analogue attached to protamine. Protamine prolongs its absorption so that it transforms into an intermediate-acting insulin with NPH-like pharmacokinetics. This insulin can be injected immediately before or right after a meal[64,65].

When might more complex regimes be more appropriate than basal regime?

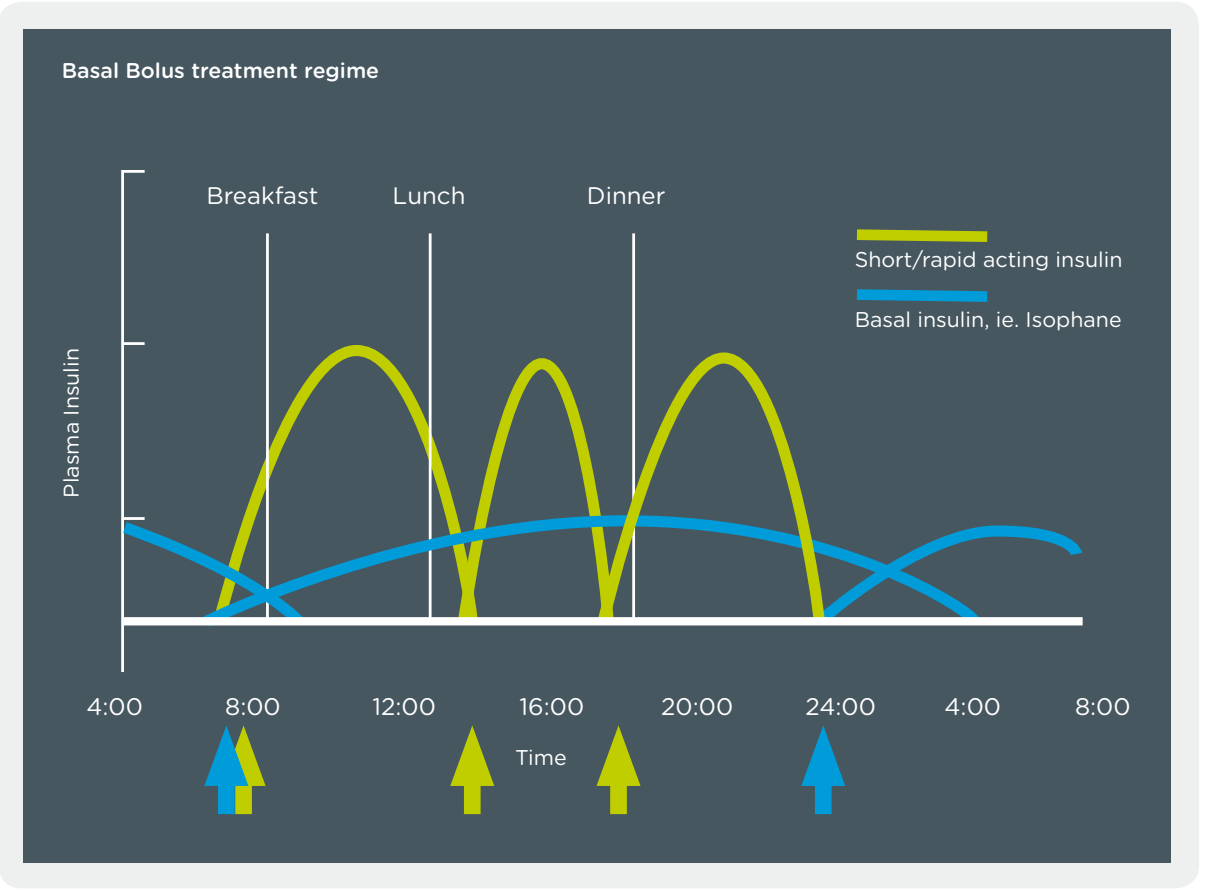
There are several indications when to consider initiating a more complex insulin regimen such as a biphasic preparation or basal-bolus regime:

- Current HbA_{1c} is >2% higher than the target HbA_{1c}
- If the fasting glucose levels have improved however HbA_{1c} remains significantly elevated due to post-prandial hyperglycaemia[20,21,50]
- Hypoglycaemia is a concern[20,50]
- Patients preference for greater flexibility in an insulin regime i.e due to work, exercise, erratic lifestyle
- In those with both high fasting and mealtime blood glucose readings[46,50]
- In patients who maintain a fairly constant routine of meals (timing and content of carbohydrate) and lifestyle[38,46]

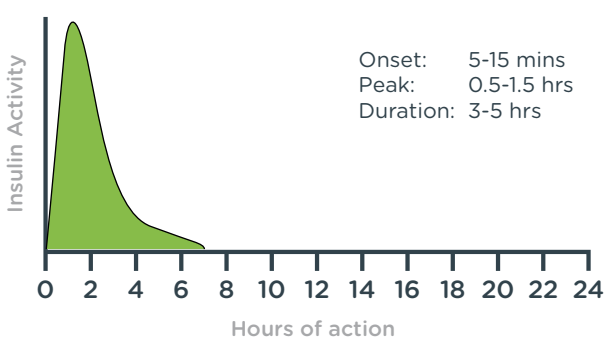
3 Multiple daily injections

The most commonly used multiple daily injection regime is basal-bolus. This uses a combination of intermediate or long acting insulin as a basal insulin injected once or twice daily with the addition of a rapid or shorter acting insulin used as a bolus to cover meal times. We have already discussed the intermediate and long acting insulins and so will focus on the 'bolus' insulin preparations here of which there are two main types.

- Rapid Acting
- Short Acting

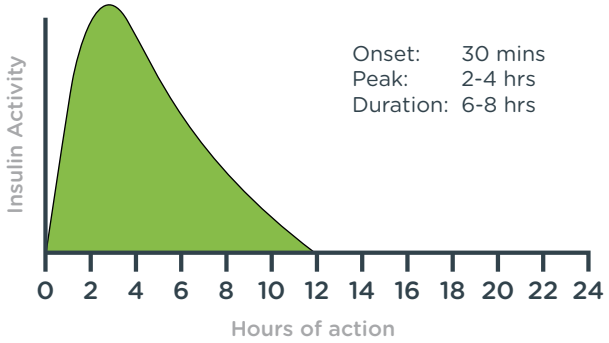


Rapid Acting Insulin Action
– NovoRapid®[66], Apidra®[67,68,69], Humalog®[70]



Rapid Acting insulin **onset** is within **5-15 minutes**. It should be taken just before eating or with food due to its rapid and short action[66,67,68,69,70].

Short Acting Insulin Action
– Actrapid®[71], Humulin S®[58], Insuman® Rapid[72]



Short Acting Insulin **onset** is approx. **30 minutes** after injection. It can be injected several times during the day. It is not frequently used as it can increase the risk of hypoglycaemia in the morning or early hours of the night. Generally it should be injected up to 30 minutes before food although each preparation differs. See licensing information for further information.

Are there other multiple daily injection regimes?

A basal plus regime is also an option for some individuals. Basal plus involves a combination of intermediate or long acting insulin as a basal insulin injected once or twice daily with the addition of a rapid or shorter acting insulin used as a bolus to cover the meal with the highest carbohydrate content[20].

Summary of the differences between the various injection regimes

We have discussed the different regimes available. Below is a summary of some of the pros and cons of the different regimes in the table below:

Summary of the pros and cons of the different insulin regimes for Type 2 diabetes[20,35,47,50,55,73]

Insulin type	Pros	Cons
Basal insulin	• Once or twice daily injections • Easy for patients to use • Less weight gain than other regimes • Less hypoglycaemia than other regimes • Easiest if patient is dependent on District Nurses/carers to administer insulin	• Doesn't address post prandial excursions in glucose • May progress quickly to other regimes
Biphasic insulin	• Once or twice daily injections one with breakfast, second dose with evening meal • Easy for patients to use • Relatively easy to teach and simple for the patient to understand • Better post prandial control than basal alone • More likely to reach HbA_{1c} Target if HbA_{1c} >8.5-9%	• Require fixed meal times, meal carbohydrates and daily activity • Unable to titrate individual doses of rapid/short or longer acting insulin • More weight gain than basal insulin • Hypoglycaemia risk higher than basal
Basal Bolus	• Closely mimics normal insulin physiology • Allows mealtime and activity flexibility • Adjustments can be made to individual doses • Suitable for patients with a very active lifestyle and high variability in eating habits	• Minimum four injections per day as well as frequent blood glucose testing – may affect adherence • More weight gain than basal insulin • Hypoglycaemia risk higher than basal • Requires the patient to be highly motivated and compliant

What insulin preparations are currently available?

There are a number of different insulin preparations on the UK market. Link to Diabetes UK website for latest information.

Although the majority of insulin we prescribe is human insulin, other forms of insulin such as porcine and bovine are still available. Some patients may be prescribed animal insulin if it is thought that the human insulin has caused the loss of hypoglycaemia warning symptoms[35] or where they feel it works better for them than human[74].

For further information on these preparations, see www.evidence.nhs.uk/formulary/bnf/current or www.medicines.org.uk

As the management of diabetes is an ever changing landscape, it is likely over the next few years that new insulin preparations will come to the market. These will be reviewed by national bodies and local formulary committees and decisions made on their likely place in therapy. Contact your local medicines optimisation team or pharmacy team for local formulary information.

Who can initiate insulin?

Initiating insulin is not straightforward and should be undertaken by an appropriately trained and competent healthcare professional[55,75].

The NICE Quality Standard for Diabetes in Adults[54] recommends:

"Trained healthcare professionals initiate and manage therapy with insulin within a **structured** programme that includes dose titration by the person with diabetes."

In most areas, initiation of insulin is undertaken by specialist teams either in the community or hospital setting. In some local areas, basal insulin initiation is undertaken by healthcare professionals in primary care who have completed an appropriate level of training.

There are a number of national training programmes for insulin initiation and titration, for example:

Optimising Glycaemic Control, University of Warwick – go to website

and

PITstop (Programme for Injectable Therapies) – go to website

Module 1: Supporting People on GLP-1 & Starting GLP-1 anonists

Module 2: Starting & Supporting Patients during the first 6 months of insulin therapy

Module 3: Reflect on progress & Carbohydrate Awareness/Insulin

Similar training programmes may be available in your local community.

If you are not trained in insulin initiation, please refer all patients to your locally commissioned specialist team. Please contact your local CCG for further information on the pathway for insulin initiation in your area.

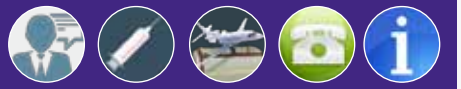
If you currently initiate basal insulin and your patient requires a more complex insulin regime then they should be referred to the local specialist service either in community or acute settings for review.

What should be included within an insulin initiation structured programme?

When starting insulin therapy, we need to provide people with a supportive and structured package of care, usually delivered through an education programme either in a group or on an individual basis. This may be based on where initiation needs to take place, patient needs and commissioning arrangements.

It is important that the benefits, risks and aims of insulin therapy are carefully discussed with individuals[21] and all fears, concerns and barriers need to be identified and addressed where possible. Insulin therapy should only be started if the individual agrees to initiation[21]. It is important to ensure both the insulin regime and subsequent delivery device are tailored to the individual's need and preference[55] and there is understanding that both the regime and the dose may change over time. Contents of a structured education programme may vary however should cover the following[20,21,38,49,55,54,76,77,78,79,80]:

What should be included within an insulin initiation structured programme?



- Dose titration to target and the principle of individualised targets and goals
- Recognition, management and the avoidance of hypoglycaemia. Where necessary, education regarding the administration of glucagon should be taught to carers and family members
- Management of acute changes in plasma glucose control including advice on what to do during illness, and any changes to timing of insulin when lifestyle changes
- Impact of diet and exercise changes

- How to test blood glucose and frequency of self-monitoring

- Injection technique including:
  - preparation of insulin before injection
  - appropriate sites for injection
  - timing of injections in relation to food, and
  - the importance of rotating injection sites
- Ensuring the device is appropriate for the individual
- Storage of insulin
- Safe sharps disposal

- Information on Type 2 diabetes and the need for insulin therapy
- Benefits and challenges of insulin therapy
- Dietary understanding
- Insulin safety including all patients have an insulin passport – see NPSA website – and carry identification highlighting that they use insulin

Implications for the individual, including:

- Employment
- Driving: insurance and DVLA regulations: see DVLA website, download TREND leaflet
- Holiday insurance: see website
- Alcohol
- Cultural considerations, such as Ramadan
- Travel and holidays

- Continuing telephone support including contact numbers for support from an appropriately trained and experienced healthcare professional
- The person starting insulin may also want a carer to be present at the education sessions for support
- It is important to note that education is a continuing process and should be given at initiation and on a regular basis as needed by the individual

What are typical starting doses of basal insulin?

As documented above, in line with NICE guidance, NPH basal insulin is the first line insulin in Type 2 diabetes unless the individual meets criteria for other insulin regimes or preparations[21]. In the majority of cases, patients will be referred to their local Diabetes Intermediate teams for Insulin initiation and the information below is provided as an example only as initial doses may differ dependent on patient factors.

It is usually the case that the basal insulin will be started within the range of 0.1-0.2units/kg/day however some patients may need higher doses (0.3-0.4units/kg/day) in more severe hyperglycaemia[20]. In practice, 10 units of basal insulin is a common starting dose[81].

At initiation, contact numbers and details of a key healthcare professional that can be contacted in times of need will be provided to patients. Generally, insulin initiation in Type 2 diabetes is a planned procedure; therefore people should not be started on insulin on Friday unless absolutely essential[55].

In the majority of people with Type 2 diabetes, 10 units of basal insulin is unlikely to control HbA_{1c} levels and gradual titration of the dose will be needed.

What about titration of basal insulin doses?

As stated, it is unlikely (but not impossible) that starting doses of basal insulin will control HbA_{1c} or blood glucose to the desired levels. In order to achieve optimal glycaemic control it is vital that both healthcare professionals and patients actively titrate basal insulin doses until pre-determined individualised glucose targets are reached. As with insulin initiation, insulin titration should be facilitated by an appropriately trained healthcare professional[54].

Supporting patients to self titrate is an important part of self care however titration can cause anxiety for people with Type 2 diabetes and it is important that frequent contact with healthcare professionals involved in their diabetes care is maintained[20].

Here are some pointers from our own Dr Patel on essentials to remember when titrating.

Dr P's 7 Titration Rules[82]

Rule 1
Blood glucose targets should be individualised and documented.

Rule 2
Eliminate hypoglycaemia first prior to managing episodes of hyperglycaemia – the hyperglycaemia could be rebound.

Rule 3
Never INCREASE insulin dose based on ONE high blood glucose reading.

Rule 4
Adjust one insulin at a time – aim to correct fasting glucose readings first (ensure that the individual has not had a hypo overnight with a resulting rebound hyperglycaemia in the morning).

Rule 5
Every action has a consequence – make only one change at a time and wait for 3 days prior to making any further changes.

Rule 6
Adjust insulin dose in line with your local guidance.

Rule 7
Nightmares, restless sleep, headache on waking, and wet pillow or sheets may be signs of sleeping through an episode of hypoglycaemia.

How frequently will people need to undertake blood glucose monitoring?

Blood glucose monitoring is often a controversial area in Type 2 diabetes. Self-testing of blood glucose should be undertaken to support the management of the individual's care. It is important that **all** people who are prescribed insulin have the right access to blood glucose monitoring[21]. It is likely that people who may be starting insulin will be asked to undertake blood glucose monitoring for at least 2–4 weeks prior to the initiation of insulin therapy to ensure the healthcare professional who is starting the insulin has a good background of current readings. Once insulin is initiated, a guide on frequency of testing for each insulin regime is provided below however please refer to your local guidance on frequency of blood glucose testing. This will be available from your Medicines Optimisation Team.

Insulin regime	Minimum blood glucose testing requirements[86]
Basal Insulin – once daily (night time)	Pre-breakfast i.e. fasting* blood glucose
Basal insulin – twice daily	Pre-breakfast and either before bed or before evening meal (fasting* blood glucose)
Biphasic insulin – twice daily	Prior to each injection
Basal Bolus	Prior to each injection and pre-bedtime

*Different times of the day may apply to shift workers whose fasting times will differ. Contact your diabetes team for more information.

It is also important to note circumstances where additional testing may be required:

Circumstances where additional testing may be required

Additional blood glucose testing needs to be considered in a number of other circumstances such as:

- Lifestyle changes[21,84]/Disruptions to routine[21,84]/Driving[21] (refer to DVLA advice[51,79], including for Group 2 drivers)
- Intercurrent illness[21]
- When therapy or dosing is changed[21]
- If steroids are co-prescribed (depends on type of steroid please discuss with diabetes team)[85]
- Patients with persistent hyperglycaemia over 24-48 hours (Pre >7 & ± Post>9)[85]
- Pregnancy/Pre-conception and breast-feeding[84]
- Certain patient groups who are at increased risk of developing hypoglycaemia e.g. elderly[84], the hypo-unaware[87], impaired renal function[85]. Refer to NHS Diabetes hypoglycaemia guide for list of at risk groups[84].

Which meter and test strips to use?

There are over 50 different test strips and associated meters currently available on the UK market[86]. The test strips can range between £7 and £17 for 50[86] and a number of areas have worked collaboratively across primary and acute teams to develop a preferred list of blood glucose test strips and meters that meet International Standards[87]. Contact your Medicines Optimisation team for more information.

What blood glucose levels should we be aiming for?

As we've discussed earlier in the toolkit this should be individualised however as mentioned in "Individualising treatment" under 'blood glucose profile', in most patients, it would be reasonable to aim for a fasting glucose level of 4-7mmol/L or pre-meal 5-7mmol/L, pre-bedtime of 6-8mmol/L and a post-prandial (i.e. 2 hours after a main meal) level between 6-8.5mmol/l /l but this will depend on the individual[16,20,55,57]. Patients with overall higher HbA_{1c} targets as documented earlier in the toolkit will also have higher blood glucose target levels[20].

When reviewing an individual who has commenced insulin Dr P says **remember**[82,88]:

Hypoglycaemia

- People worry about it
- Ensure individual can identify symptoms, potential causes and know how to treat
- The individual knows when to ask for help and from whom

Employment

- Diabetes is covered by the Disability Discrimination Act 1995
- Certain occupations are limited for those on insulin, eg. Emergency Services, Forces. Contact Diabetes UK Careline for more details
- Shift patterns and activity levels will need to be considered
- Further information is available from Diabetes UK Careline

Ongoing care

- Insulin requirements can change over time
- Individualise the care with the individual
- Encourage self management in appropriate individuals
- Ensure regular follow up has been planned

Exercise

- All types of activity effect glucose levels
- Ensure advice has been provided to prevent hypoglycaemia
- There should be no reason not to exercise, the only sports that are restricted are deep sea diving, freefall parachuting

Alcohol

- Alcoholic beverages have different effects on blood glucose levels – the glucose levels can initially rise and then drop – hence the risk of delayed hypoglycaemia needs to be discussed
- Where alcoholic intake exceeds recommended levels, people need appropriate advice to minimise risks

Driving

- Implications for driving and insurance
- Possible loss of livelihood
- Ensure that the individual understands their responsibilities when behind a wheel
- Ensure individual has access to sufficient number of capillary testing strips (as now required by law). Go to gov.uk website
- Download an example of a patient leaflet developed by TREND

Travel

Being on insulin should not affect travel opportunities, however planning is required – i.e.

- The individual will need to carry adequate identification and a supporting letter explaining the need to carry insulin and devices onto the plane
- Consider destination, climate (heat can make the body more sensitive to insulin), illness, change in activity, mode of travel, time zones availability and storage of supplies

Injection sites

- Inspect injection sites at each visit for lipohypertrophy – 'lumpy sites'
- Encourage the individual to rotate between sites on a weekly basis
- Lipohypertrophy can affect the absorption of insulin leading to erratic control.
- Arms should be used with caution due to rapid onset of action – only use 4mm needles.
- Human Insulin is absorbed more rapidly from the abdomen than the thighs.
- There should be no need to prescribe needles longer than 6mm

Sick day rules

- Insulin doses may need adjusting during illness
- Patients may require additional support
- More frequent monitoring may be required
- Generally insulin should never be stopped in Type 2 diabetes
- **If vomiting stop metformin**

A checklist to assist decision making on seeking guidance from your local diabetes team

When would you ask for assistance from your local Diabetes Specialist team? Your local Diabetes Specialist team may be a specialist GP or practice nurse in your practice, or nearby practice, or in the Intermediate Diabetes Team – please check your local guidance.

Insulin treatment

Does the individual know which insulin treatment they are on?
Do they know if they are on any other diabetes treatment?
Do they know the doses and timings?

NO → If any of the answers are **NO** – to be reviewed by the Practice Nurse or Community Pharmacist for Medicine Use Review.

Insulin administration

Do you have concerns about the individual insulin administration technique?

- Correct use of pen
- Air bubble in cartridge
- Re-suspension of insulin
- Use of current insulin longer than 30 days
- Needle length (risk of IM injections)
- Skin fold lit technique
- Do injection sites have lipohypertrophy?

Examine as if you were examining for breast lumps (visual and physical)

YES → If any of the answers are **YES**

- Stop injections into areas of lipohypertrophy.
- Advise the individual to rotate between injection sites clear of lipohypertrophy on a weekly basis (e.g. Left leg one week, right leg another etc) and to use the largest amount of area possible for each site (postcard size).

Glycaemic control

- Have glycaemic targets been agreed with the patient? What are they? Has it been recorded in the clinical notes?
- Review the individual's Capillary Blood Glucose machine or diary – are majority of the Capillary glucose results within the targets?

NO → If any of the answers are **NO** either:

- titrate insulin as per your local guidelines OR
- refer to local specialist team.

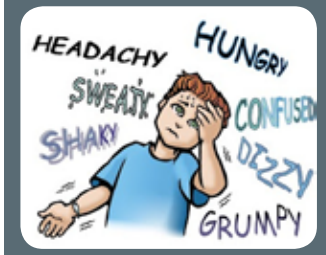
SOS

- Have there been any ambulance call outs since the last appointment?
- Have there been any hospital admissions (for hypoglycaemia or hyperglycaemic emergencies) since the last appointment?
- Has the patient required 3rd party assistance for the management of hypoglycaemia?
- Has the patient been commenced on steroids or at risk of being prescribed steroids?

YES → If any of the answers are YES refer to local specialist team.

With hypoglycaemia initially reduce the dose of insulin by 10-20% (20% if hypoglycaemia severe)

Hypoglycaemia[82,89]



http://richthediabetic.com/wp-content/uploads/2014/04/hypoglycemia.jpg

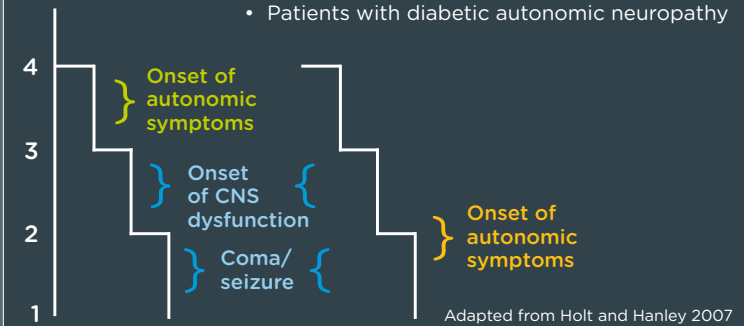
Symptoms

Causes

Hypoglycaemia aware

Hypoglycaemia unaware

- Older patients
- Patients with frequent hypoglycemic episodes
- Patients with diabetic autonomic neuropathy



Adapted from Holt and Hanley 2007

Hypoglycaemia: Glucose <4mmol/l

Treatment

Initial:

Take quick acting carbo-hydrates: half a glass of juice/ 100-200mls of lucozade **or** five jelly beans **or** five dextrose tablets **or** 1 tbsp of honey

then

Follow with more slow acting carbohydrates: sandwich; digestive biscuits; banana **or** have your next meal

↑ Insulin/Secretagogue	Medication administration concerns	Decreased endogenous insulin production	Other considerations
Dose may need to be decreased or medication changed	Reduced vision > incorrect doses of insulin or medication	• Alcohol • Renal failure or progression of kidney disease	• First trimester pregnancy • Gastroparesis • Insulin overdose
• Stacking of the insulin – continuous adminsitration of correction insulin dose without accounting for the continuing effect of the earlier doses • Timing of insulin/medication	**Injection Sites** • Injecting into muscle/ lipohypertrophy **Memory** • Accidentally taking medication/insulin twice • Mixing up insulin types	**Increased glucose utilisation** • During or after physical activity	
	Other • Missed/delayed meals • Miscalculated insulin dose		

Weight gain

Weight gain can also be a problem with insulin therapy. Insulin therapy is likely to increase body weight by 2-4kg on average and usually greatest during early stages of insulin use[14,43]. Strategies to minimise weight gain should be discussed at insulin initiation and periodically throughout therapy. Simple strategies such as referring the patient to a dietician[21], continuing metformin therapy where clinically appropriate[21,46], and avoiding hypoglycaemia and subsequent rebound snacking can all help.

Key points – to discuss

1. Know limitation of your skills. Basal initiation can be undertaken with appropriate training. If training has not been undertaken and not competent, refer to specialist teams.
2. Know when to make an appropriate referral to the specialist team.

How to commission quality diabetes services

This toolkit has been developed to support delivery of the **Right Insulin, Right Time, Right Dose** project. The objectives are:

- Improvement in population outcomes in South London for HbA_{1c} management
- Number of South London CCGs which achieve, maintain or increase LPP thresholds on % non-analogue insulin (long and intermediate acting) prescribing
- Number of South London Medicines Optimisation teams with robust plans for implementation of the project

This section focuses on how intelligent commissioning can support the first two outcomes and drive change at a patient, practice / service and population level.

Commissioning of diabetes services is often undertaken on a multi-tiered approach[90] and different models exist across South London. This means that measures should be collected across all providers of diabetes care: acute hospitals, community services and general practice.

Services must be commissioned to reflect the individualisation of blood glucose targets supported by NICE Quality Standards[54] and the population control of blood glucose to support the public health need of our local people.

The measures described below will support tighter control of HbA_{1c}, intensification of therapy and use of the Right Insulin at the Right Time at the Right Dose.

Control of HbA_{1c} – population measure

Suggested measure

% patients with Type 2 diabetes achieving an HbA_{1c} of ≤64mmol/mol

Key thoughts

It is important to measure control of the whole population using GP QOF data not allowing exceptions.

Consider setting the same target for community and acute teams.

Consider setting target above QOF thresholds for GP practices.

Data can be shared with practices, neighbourhoods, localities and service providers.

Control of HbA_{1c} – reducing variation

Suggested measure

Variation of HbA_{1c} of ≤64mmol/mol population control at a provider level

Key thoughts

It is important to reduce variation of GP QOF data not allowing exceptions across GP practices.

Reducing variation, whilst maintaining or increasing population control, will increase equity of service.

Consider setting the same target for community and acute teams.

Consider how services can be provided across GP practices, neighbourhoods, localities and community services.

Data can be shared with practices, neighbourhoods, localities and service providers.

Control of HbA_{1c} – individual patient measure

Suggested measure

% patients with Type 2 diabetes who have a personalised HbA_{1c} target, (usually between 48 mmol/mol and 58 mmol/mol (6.5% and 7.5%)), and receive an ongoing review of treatment to minimise hypoglycaemian

Key thoughts

It is important to individualise and agree each patient's HbA_{1c} target.

Collaborative care planning supports patients and health professionals to agree and document health goals.

All patients with diabetes should have at least an annual review of HbA_{1c}.

This measure is in line with NICE Quality Standard 6[54].

It is important to measure individualised care from specialised services.

Audit required in primary care as data not documented systematically.

Right Insulin – population measure

Suggested measure

% non analogue insulin (long and intermediate acting) as a % of all insulin (long and intermediate acting)

Key thoughts

It is important to measure the use of insulin of the whole population using GP data.

Consider setting the same target for community and acute teams.

Consider setting target above London Procurement Partnership (LPP) of 17.5%. as some providers already perform above this target.

Track lost opportunities and cost avoidance data through the LPP website.

This measure is in line with NICE Clinical guideline 87[21].

Data can be shared with practices, neighbourhoods, localities and service providers.

Right Insulin – reducing variation

Suggested measure

Variation of % non analogue insulin (long and intermediate acting) as a % of all insulin (long and intermediate acting) at a provider level

Key thoughts

It is important to reduce variation across GP practices.

Reducing variation, whilst maintaining or increasing population targets, will increase equity of service.

Consider setting the same target for community and acute teams.

Consider how initiation of insulin services can be provided across GP practices, neighbourhoods, localities and community services.

Data can be shared with practices, neighbourhoods, localities and service providers.

Right Insulin – individual patient measure

Suggested measure

% patients with Type 2 diabetes on analogue insulin (long and intermediate acting) that have been reviewed in the last 12 months and have a documented reason for choice of insulin

Key thoughts

Collaborative care planning supports patients and health professionals to agree and document health goals.

All patients with diabetes should have at least an annual review of HbA_{1c}.

It is important to measure individualised care provided by specialised services.

Audit required in primary care as data not documented systematically.

Get involved

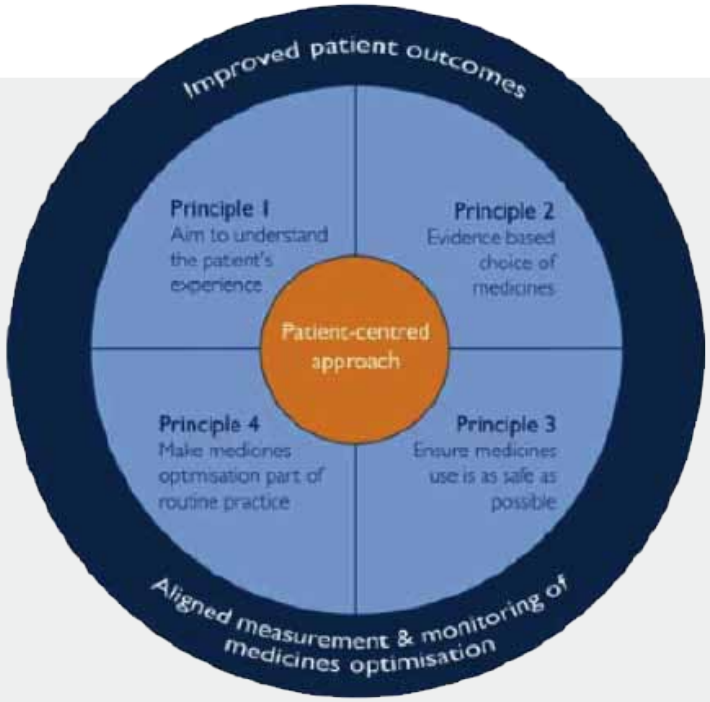
The Network appreciates that many of the commissioning teams and service providers are already providing local quality and performance initiatives and delivering best practice. We would welcome your feedback and support in developing our key commissioning indicators to improve health outcomes and in sharing our resources across South London.

Medicines optimisation

Medicines play a key role in the management of Type 2 diabetes, and work alongside lifestyle interventions. Medicines optimisation encompasses a patient centred approach to prescribing ensuring we obtain the best outcomes for patients for the investment we make in medicines[91,92]. This includes making joint decisions about medication, supporting compliance, reducing waste, reducing unnecessary medication and improving safety[91,92].

The Royal Pharmaceutical Society highlight four key principles of medicines optimisation[91] as shown below. Ensuring we prescribe the Right Insulin at the Right Time at the Right Dose supports all four principles of medicines optimisation.

This toolkit highlights how the four principles of medicines optimisation have been the cornerstones of the project and resources we have developed.



Principle 1
To understand the patient experience

- Engagement with local diabetes forums and undertaking focus groups has shaped the project and allowed us to have better insight and understanding of people with Type 2 diabetes' perspectives, fears and barriers to medicines optimisation and insulin use. These have helped to shape this toolkit and associated resources.
- User involvement at a local level will bring this toolkit to life and develop this work further.

Principle 2
Evidence-based choice of medicine

- Optimisation of therapy and using the Right Insulin at the Right Time at the Right Dose promotes adherence to evidence-based NICE guidance[21,52].
- Commissioning a review of the evidence for use of NPH insulin in Type 2 diabetes post NICE guidance has confirmed the project aims are consistent with the current evidence for choice of insulin in Type 2 diabetes[34].

Principle 4
Make medicines optimisation part of routine practice

- This toolkit provides resources for commissioners and healthcare professionals to use and embed into every day practice.

Principle 3
Medicines use is as safe as possible

- Optimising care with the right medication at the Right Time with the Right Dose promotes the safe optimisation of appropriate medication.

The evidence in practice

A toolkit of takeaway resources have been developed to support the implementation of this project locally. The toolkit of resources centres around the four principles and can be used by all healthcare professionals involved in the commissioning or provision of services to patients. Each resource is listed below with a summary and a link to download the resource.

Resource A

First line insulin therapy choice in Type 2 diabetes - Evidence Review

The London Medicines Evaluation Network reviewed the evidence for first line insulin therapy choice in Type 2 diabetes. They have concluded that 'based on the currently available evidence to date, NPH insulin should remain the first choice when initiating insulin in people with Type 2 diabetes. To ensure the best value for money from limited resources, when initiating insulin in Type 2 diabetes the use of long-acting insulin analogues should be reserved for specific individual patients who would be most likely to benefit as defined by NICE criteria[34].' The full review is available here.

Resource B

Insulin in Type 2 Diabetes Myth Buster!

We have worked with people with Type 2 diabetes and healthcare professional colleagues across South London to collect views about barriers to insulin use. We shared these with the Medicines Information Team at Guy's and St Thomas' NHS Foundation Trust who have summarised the evidence to bust some of those myths! The Insulin in Type 2 Diabetes Myth Buster can be used to support discussions with healthcare professionals and people with Type 2 diabetes and is available here.

Resources C & D

Type 2 Diabetes Responsible Prescribing Messages and value pyramid

The South London Health Innovation Network worked with Medicines Optimisation colleagues in Surrey Downs CCG to develop responsible prescribing messages and a value pyramid for Type 2 diabetes. Whilst the responsible prescribing messages primarily concentrate on the management of HbA_{1c}, the value pyramid combines the evidence for cardiovascular risk reduction alongside HbA_{1c} interventions. These resources can be used to support Medicines Optimisation teams, diabetes teams and commissioners.

The responsible prescribing messages come together to form the acronym TITRATION UP. This fits with our overall project aim to ensure the right patient gets the Right Insulin at the Right Time. The TITRATION UP messages are available here.

The value pyramid describes the relative value of different interventions for Type 2 diabetes when applied to a population. The calculations used to develop the value pyramid look at the clinical effectiveness using cost per quality adjusted life year (QALY) using NICE health economic data. A QALY gives an idea of how many extra months or years of life of a reasonable quality a person might gain as a result of treatment taking account of benefits and risks of therapy. Additionally, the value bar chart looks at the incremental cost and benefits of using different therapies for reducing HbA_{1c} at different steps of the pathway. The Type 2 diabetes value pyramid and bar chart is available here.

The evidence in practice

Resource E

Guidelines for the management of HbA_{1c}

The example guidelines for the management of HbA_{1c} discussed earlier by Drs Chamley, Doherty and Thomas can be downloaded here. For a word version for local adaptation, please contact lamccg.medicinesoptimisation@nhs.net

Resource F

PowerPoint Slides for Type 2 diabetes

A set of PowerPoint slides to support the implementation of the Right Insulin, Right Time, Right Dose are available to support delivery. The slide pack includes all the key messages for this project and are designed to be used by healthcare professionals involved in commissioning or provider roles to ensure we have consistent messages across South London. The slide pack is available by clicking here or from lindabriant@nhs.net

Get involved

The Network appreciates that many of the Medicines Optimisation teams are already undertaking local reviews and audits and delivering best practice. Please feel free to share reviews and audits with us for dissemination to others via the toolkit.

Resource G

Example prescribing audits and reviews

A number of local CCGs have shared audits and reviews that have led to improved outcomes in local populations. These are shared below for download in word format for local adaptation where necessary.

Review 1: This review supports practices to look at the practice Type 2 diabetes population with an HbA_{1c} > 64mmol/mol and optimise treatment in line with prescribing guidelines to improve the overall % of practice diabetes population with an HbA_{1c} ≤ 64 mmol/mol. Click here to download a copy of the review for local adaptation. EMIS web searches for importing are also available to support this review by clicking here or emailing lindabriant@nhs.net

Review 2: This is a review tool to assess whether the prescribing of newer agents for Type 2 Diabetes is in accordance with NICE guidance. Click here to download a copy of the review for local adaptation or contact anna.hodgkinson@nhs.net

Resource H

Diabetes Outcome Versus Expenditure (DOVE) Tool

This tool is available on the Public Health England website and looks at the relationship between spending on diabetes care (prescribing data comes from Health and Social Care Information Centre) and clinical outcomes (using QOF data). This data is available at a CCG level and comparisons can be made with all other CCGs including those with similar populations. The tool also identifies the potential changes to costs that would result from changing outcomes or expenditure to benchmarked levels. The tool is available from here.

Community Pharmacy supporting people living with Type 2 diabetes

The pharmacy profession is the third largest health profession and with a wide and easily accessible community based service, therefore in a time when the primary care workforce is facing huge challenges, partnership working between GP practices and Community pharmacy, offers significant opportunities for delivery of integrated care for patients with diabetes[93,94].

Pharmacists are highly skilled professionals who historically, have been underutilised when it comes to the management of patients with long term conditions (LTC)[93]. This section of the toolkit aims to highlight the important role community pharmacy can play in supporting patients with Type 2 diabetes around self-management of their condition.

Community pharmacy is recognised to be the most accessible element of the NHS for patients. Around 89.2% of the population in England is estimated to have access to a community pharmacy within a 20 minutes' walk from their home[95] with 84% of adults in England visiting a pharmacy at least once each year[93].

Accessibility, along with their expertise, makes community pharmacists ideally situated to play an expanded role in direct patient care, in addition to the tasks they already perform, such as reinforcement of lifestyle advice and treatment goals. Traditionally, the predominant role of community pharmacy was the supply of medicines, however over time; the role of community pharmacy has extended to the delivery of advanced and enhanced services that can be utilised by patients with Type 2 diabetes.

Advanced Services

Medicines Use Reviews and the New Medicines Service are two examples of advanced services that accredited community pharmacists can deliver to support patients with Type 2 diabetes to achieve the best outcomes from their medicines.

What is a Medicines Use Review?

A Medicines Use Review (MUR) is an advanced service offered by community pharmacies, in addition to their standard NHS community pharmacy contract. MURs are conducted by accredited pharmacists within a private consultation room in the pharmacy and involve checking the patients understanding of their medications, adherence with the prescribed directions and whether medicines are being used correctly and effectively.

When MURs were introduced into the pharmacy contract, community pharmacies were expected to ensure that at least 50% of MURs were for patients in the following three national target groups:

- Patients taking high risk medicines;
- Patients recently discharged from hospital who had changes made to their medicines while they were in hospital
- Patients with respiratory disease.

From January 2015, a fourth target group has been added: patients at risk of or diagnosed with cardiovascular disease and regularly being prescribed at least four medicines. Since April 2015, community pharmacies have been required to ensure that at least 70% of MURs are for patients falling within one of the four national target groups[96].

How can MURs be beneficial in patients with Type 2 diabetes?

By targeting MURs in patients with type 2 diabetes, community pharmacists can:

- Improve non-adherence by increasing patients' understanding of their medicines and help reinforce their importance in keeping the patient's condition stable.
- Identify problems the patient may have with taking their medicines as the prescriber intended and work in partnership with the patient, GP and the patient to suggest possible solutions.
- Reduce medicines wastage, through better use and storage of medications (e.g. insulin pens, blood glucose test strips etc.) and by encouraging the patient to only order the medicines they need.

It is important to note that MURs are **not** clinical reviews as the pharmacist will not be undertaking an assessment or examination of the patient's health status or results.

New Medicines Service

The New Medicine Service (NMS) is an advanced service that was initially introduced within the community pharmacy NHS contract as a pilot in 2011. Following publication of an evaluation of the pilot[97] which confirmed that the NMS delivered better patient outcomes at a reduced cost to the NHS, it has been made a permanent component of the NHS pharmacy contract.

The NMS allows community pharmacists to provide extra support for patients prescribed new medicines, from an agreed list, for the management of one of the following long term conditions:

- asthma and COPD
- diabetes (Type 2)
- antiplatelet / anticoagulant therapy
- hypertension

Patients are eligible to receive this service if they have one of the above LTCs/therapies and are newly prescribed one of the listed medicines for that condition. Click here for list of medicines[98]

Eligible patients need not have visited the pharmacy previously and the NMS can be provided in a consultation area of the pharmacy or over the phone. The pharmacy contract does not allow for delivery of the NMS within the patient's home.

The NMS is split into three stages:

Stage 1: Patient engagement

Following the prescribing of a new medicine covered by the service, patients may be recruited to the service by prescriber referral (which could include referral for medicines prescribed to the patient as a hospital inpatient or outpatient) or opportunistically by the community pharmacy.

The patient will be asked to consent for information to be shared with their GP, as necessary and the pharmacy will dispense the prescription and provide initial advice, as it normally would.

Stage 2: Intervention

Between 7 and 14 days after stage 1, the pharmacist will use an interview schedule to assess the patient's adherence, identify problems and the patient's need for further information and support which the pharmacist will provide.

Stage 3: Follow-up

The pharmacist will follow up with the patient 14 to 21 days after the intervention (again face to face or by telephone) to discuss how the patient is getting on with their medicine. They will also provide advice, if required.

If at either the intervention or follow up stages, the pharmacist identifies a problem which requires the prescriber to review the prescription, the pharmacist will complete an NMS feedback form to inform the GP of the issue and provide them with any detail they require.

Community Pharmacy Enhanced Services

The vast majority of community pharmacies now also offer a number of locally commissioned enhanced services that can be accessed by patients with diabetes to help them manage their condition and their general well-being. Box 1 lists just some of the services available.

Box 1

Smoking Cessation Services

Weight Management Services

Health Coaching & Motivational Interview Consultations for Patients with Non Adherence Issues

Flu Vaccination

Minor Ailment Services

NHS Health Checks

Waste Management Schemes

Needle Exchange Services

Substance Misuse

Emergency Hormonal Contraceptive (EHC) Services

Resources for Providers of Pharmaceutical Services for Patients with Diabetes

The Royal Pharmaceutical Society (RPS) has produced a diabetes support tool for its members that provide useful resources for pharmacists delivering diabetes services99. The resources include:

- A Checklist of 'Practical Tips' for the Development and Approval of a Pharmacy Diabetes Service Business Case
- Implementation Checklist for Pharmacy Service Providers
- Supporting People using Insulin Pens

The resources may also be useful for managers within organisations responsible for commissioning services for people with diabetes.

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The Health Innovation Network is one of 15 Academic Health Science Networks (AHSN) across England. As a membership organisation, we are focused on lasting system-wide improvements in patient and population health, strengthening relationships, and capitalising on teaching and research strengths across South London.

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