

# An Introduction to Insulin Management and the Role of the Community Diabetes Specialist Nursing Service

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# Primary Care Diabetes Management

- Screening at-risk groups and diagnosis
- Usually first point of contact for newly diagnosed diabetes
  - Type 1 diabetes – newly diagnosed and not unwell, referred to DSN
  - Type 1 diabetes – newly diagnosed/unwell, admitted to hospital
  - Type 2 diabetes referred to DSN service for group education (as per NICE guidelines), retinal screening and diabetes registration
- Continued management of uncomplicated type 2 diabetes and stable type 1 diabetes
- QOF: Maintain practice-based register for type 1 and type 2 diabetes; record of BMI, HbA1c, retinal screening, foot screening, blood pressure, microalbumin, cholesterol, depression rating, flu vaccination, smoking cessation (within a 15 month period)

# Secondary Care Diabetes Management

- Acutely unwell requiring admission – ketoacidosis/ HONK/ hypoglycaemic coma
- Foot ulceration, necrosis/gangrene or active Charcot foot
- Pregnant patients with type 1 or 2
- All Secondary diabetes – i.e. Cushing's, haemochromatosis, pancreas related (Post pancreatitis, Pancreatectomy, Cystic fibrosis, Glucagonoma)
- Insulin pump patients
- Renal complications

# Community Diabetes Specialist Nursing Service

- Team of 5 specialist nurses who cover different GP localities and diabetes specialities (insulin pump therapy and diabetes management in pregnancy)
- Employed by SWYPFT (previously PCT Care Services Direct)
- Manage diabetic emergencies to avert admission to hospital (newly diagnosed type 1 patients who are not acidotic, hypoglycaemia, hyperglycaemia caused by illness/steroid use)
- Ongoing management support for all patients with diabetes until they are able to self-manage their condition
- Provide nurse-led clinics in 9 locations

# Who can be refer?

- GP/Practice Nurse
- Hospital Consultants
- Hospital Wards
- AHPs
- YAS
- Nursing/ Residential Homes
- Service User (Drop In Clinic on Wednesday morning for non-urgent problems)

# Reasons for Referral

- Newly diagnosed and existing type 1 patients, for education and management support (including insulin adjustment for carbohydrate counting)
- Structured education for newly diagnosed type 2 patients and existing patients who require re-education (2 day standard education and XPERT programme)
- Poorly controlled diabetes where treatments in primary care have been exhausted
- Insulin initiation and insulin regime review (including insulin pump therapy)
- Initiation of drugs on shared care agreements
- Hyperglycaemia/sick day management/corticosteroid management
- Hypoglycaemia
- Pregnancy and pre-pregnancy counselling

# How to Refer?

- Choose and Book (Preferable option – 2-3 slots available in community clinics)
- Paper referral (Fax to Apollo Court DSN Office 209888)
- Telephone Contact (Apollo Court 209884 for urgent requests, followed up with fax)
- Self referral at pop in clinic (Apollo Court – Weds 9.30am-12pm)

# Levels of Care In Diabetes Management

Based on House of Care Model (Kings Fund,2013)

Level	Description	Provision
1	<ul style="list-style-type: none"> <li>Prevention / Identification</li> <li>Impaired Glucose Tolerance/Impaired Fasting Glucose</li> <li>Diet controlled Type 2 diabetes</li> </ul>	<p>Provided by GP practices as core practice care under the GMS/PMS/APMS contract</p>
2	<ul style="list-style-type: none"> <li>Type 2 diabetes on tablets</li> </ul>	
3	<ul style="list-style-type: none"> <li>Management of patients stabilised on injectable therapies (Type 1 &amp; 2 diabetes)</li> </ul>	<p>Provided by GP practices through enhanced services under the NHS standard contract. Practices undertake relevant training.</p> <p>Support and mentorship provided by diabetes specialist nurses working in the community, with consultant input.</p> <p>Diabetes specialist nurse advice and support available for community nursing, GP practices, etc.</p> <p>Model emphasises planned care to avoid unplanned care episodes</p>
4	<ul style="list-style-type: none"> <li>Initiation of injectable therapies</li> <li>Patients requiring treatment change</li> <li>Unstable Diabetes* (Type 1 &amp; 2 diabetes)</li> </ul>	
5	<ul style="list-style-type: none"> <li>Gestational diabetes</li> <li>Pre-conceptual care</li> <li>Children &amp; adolescents</li> <li>In-patient hospital care</li> <li>Complex complications</li> <li>Insulin pump</li> <li>DAFNE</li> </ul>	



# Scenarios

# Patient A

65 year old female. Diagnosed T2DM for 10 years. Managed with Metformin 1g BD, Gliclazide 160mg BD and Humulin I 40 units pre-bed.

BMI 34. Previous MI. HbA1c 68mmol/mol

What next?

# Patient B

28 year old female. Newly diagnosed. New to GP practice. History of weight loss but no ketones in urine. Reports frequent episodes of dizziness.

BMI 27. No other medical history. Blood glucose 22mmol/l. HbA1c 75mmol/mol.

What next?

# Patient C

92 year old male, diagnosed with diabetes 9 months. Commenced on Humulin M3 insulin at previous admission due to hyperglycaemia. District nurses administer insulin therapy. Frequent hypoglycaemic episodes so insulin doses reduced. Insulin stopped 1 week ago.

Presented at GP surgery feeling generally unwell. Blood glucose 18mmol/l. Urine ketones present.

What next?

# Insulin Management

# The prevention of microvascular complications

Maintaining near-normal levels of blood glucose and blood pressure significantly decreases the risk of microvascular complications in people with diabetes.

- The DCCT (1993), UKPDS (1998) and Kumamoto Studies (1995) have demonstrated this in regard to hyperglycaemia
- The UKPDS Study and HOT Trial (2012) have shown the importance of the effective control of blood pressure

The control of dyslipidaemia is also of vital importance, as is, if necessary, weight reduction

# The prevention of macrovascular complications

- The same basic improvements in diet and physical activity that prevent type 2 diabetes are likely to prevent CVD complications
- Also, a wide range of drugs has now been proven to be effective in reducing the risk of CVD in people with diabetes, and in treating diabetes-associated CVD once it is present

## Highest Percentage Reduction of the Risk of Diabetic Complications in People with Type 2 Diabetes shown in Recent Studies

Strategy	Complication	Reduction of Complication
Lipid control	• Coronary heart disease mortality	↓ 36% <sup>1</sup>
	• Major coronary heart disease event	↓ 55% <sup>1</sup>
	• Any atherosclerotic event	↓ 37% <sup>1</sup>
	• Cerebrovascular disease event	↓ 62% <sup>1</sup>
Blood Pressure Control	• Cardiovascular disease	↓ 51% <sup>2</sup>
	• Heart failure	↓ 56% <sup>3</sup>
	• Stroke	↓ 44% <sup>3</sup>
	• Diabetes-related deaths	↓ 32% <sup>3</sup>
Blood Glucose Control	• Heart Attack	↓ 37% <sup>3</sup>

<sup>1</sup> The 4S Study (Scandinavian Simvastatin Survival Study, 1997)

<sup>2</sup> Hypertension Optimal Treatment (HOT) Randomised Trial

<sup>3</sup> UKPDS



# When to initiate insulin

- Oral hypoglycaemic agent (OHA) prescription is to the maximum tolerated dose and HbA1c  $<58\text{mmol/mol}$  (7.5%) not achieved
- Generally the target HbA1C is  $<58\text{mmol/mol}$  or  $<53\text{mmol/mol}$  (7.0%) if there are complications present however each person should be assessed on an individual basis and targets set accordingly
- OHA not tolerated/contra-indicated
- Symptoms related to poor glycaemic control
- Patient agrees to and understands the risks and benefits of insulin therapy

# Before Insulin Therapy

- Check compliance with oral hypoglycaemic agent medication
- Review and intensify oral medication if not already done
- Reinforce dietary advice and discuss lifestyle issues and employment i.e. Smoking and physical activity
- Refer to structured diabetes education programme and/or diabetes dietitian if appropriate
- Assess for diabetes related complications
- Check ability to administer own insulin or carers/district nurse involvement
- Teach patient to monitor blood glucose levels (review technique if already self-monitoring)
- Always use clinical judgement and consider patient's individual circumstances in all cases

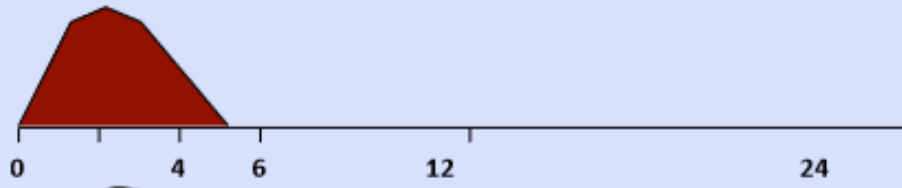
# Who may not benefit from insulin therapy?

- The target of 58mmol/mol may not be appropriate for all and the risk of hypoglycaemia must be balanced against this target. HbA1c is not always relevant if life expectancy is limited
- Some obese people may not benefit from insulin therapy which can lead to further weight gain with little or no improvement in HbA1c. In such patients consider weight reducing medication (GLP1/SGLT2) and/or referral to a dietitian/weight management/exercise programme
- People whose oral hypoglycaemic therapy could be optimised

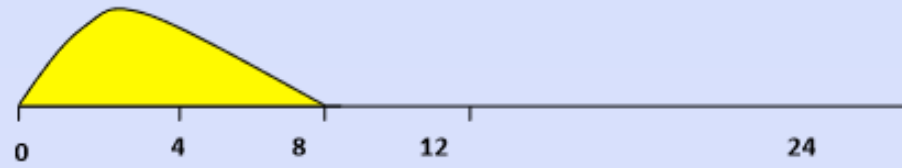
# Reasons patients may resist commencing insulin

- The decision to start insulin must be made in partnership with the patient
- Lifestyle and employment issues must be discussed e.g. HGV/PSV drivers may not wish to or delay transfer to insulin as it may disrupt their employment
- Needle phobia. Accurate information may help people with needle phobia e.g.. People may think that they need to find a vein to inject into or that the needle may be large. A demonstration of the pen device is therefore useful
- Hypoglycaemia. People generally overestimate the risk of hypoglycaemia
- Risk:benefit. Some asymptomatic people may believe their diabetes is well controlled and that they are not at risk of complications

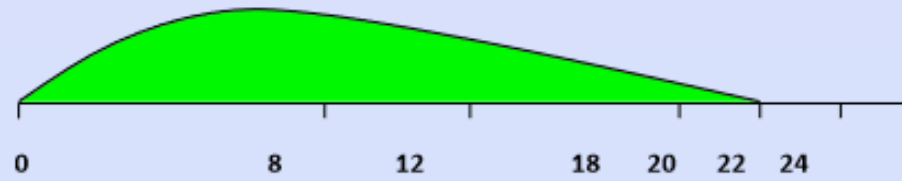
# Onset and Duration of Insulins



**Rapid-acting analogue**



**Short-acting (soluble/regular)**



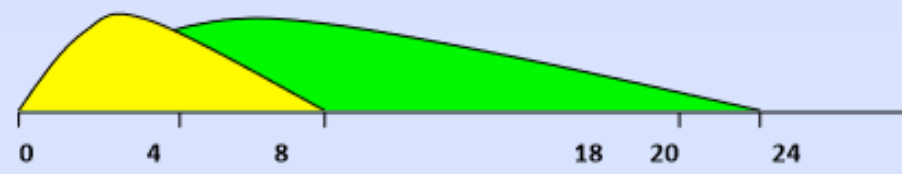
**Intermediate Acting (isophane / NPH)**



**Long acting analogue**



**Rapid-intermediate mixture**



**Short-intermediate mixture**

# Education required at insulin initiation

- Reasons for commencing insulin, including discussion around HbA1c and complications
- Normoglycaemia
- Insulin profile
- Checking expiry dates
- How to use pen device
- Timing of injections with meals
- Dietary management
- Insulin reconstitution, injection technique and site rotation
- Storage of insulin
- Side effects
- Hypoglycaemia symptoms, causes and management
- Hyperglycaemia and sick day management
- Blood glucose monitoring
- Insulin dose adjustment
- Safe sharps disposal
- Driving
- Alcohol
- Travel
- Safe use of insulin and insulin passport
- Pregnancy planning where appropriate

# Different Regimes that may be considered when initiating insulin therapy in people with diabetes

	Basal insulin with hypoglycaemic agents	Twice or 3 x daily premixed insulin	Basal Bolus Regimen
Patient Characteristics	<p>Overweight (BMI&gt;25)                      Reluctance to start insulin                      Unable to inject themselves                      Older person with no complications but where hypoglycaemia is unacceptable</p>	<p>Regular lifestyles.                      Eat similar amounts at similar times of the day                      OHAs are no longer stimulating efficient insulin production leading to postprandial high blood glucose level                      Symptomatic</p>	<p>On daily/BD insulin regimes without optimal control.                      Requiring flexibility due to an erratic lifestyle.                      Shift work.                      Regular travel across time zones                      Regular sport                      To optimise blood glucose control because of complications.</p>
Notes	Continue metformin and sulphonylurea at same doses.	Continue metformin	Continue metformin

# Addition of Basal Insulin in T2DM

(Glargine/ Levemir/ Humulin I/ Insulatard/ Insuman Basal/ Hypurin Isophane)

## **Suggested Criteria:**

One or more of the following:

- No osmotic symptoms
- HbA1c 58 – 69mmol/l
- When optimal glucose control is not appropriate ( e.g. terminal illness, inability to self manage)
- Addition to GLP1 treatment
- Patient choice



# Addition of Basal Insulin in T2DM

## Starting Basal Insulin

- Start once daily basal insulin – initially 10 units at bedtime (or in the morning if preferred) via an appropriate insulin delivery device
- Continue oral hypoglycaemic agents but monitor for hypoglycaemia (dose may need to be reduced)
- Ensure patient has been taught how to recognise and treat hypoglycaemia

# Addition of Basal Insulin in T2DM

## Active dose titration needs to take place

- Patients able to self-titrate should be taught the '3 day rule'.
- Frequent telephone contact from an appropriately skilled health care professional is required to titrate the dose if patient unable to self-manage
- Review appropriateness of insulin regime if a dose of 60 units once daily is reached and individual glucose targets not achieved
- Occasionally a twice daily basal insulin regime is appropriate

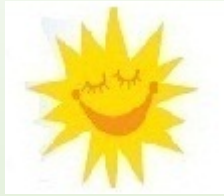
# How to adjust your insulin dose using blood glucose results for a Basal insulin with diabetes tablets

## POINTS TO REMEMBER

Blood glucose levels can change on a day to day basis for a number of reasons, examples of this include stress, illness, food and alcohol intake and activity level.

For this reason it is advisable not to alter your insulin doses in response to a "one off" abnormal reading. We recommend you adjust your insulin every 3-4 days until targets are reached. Alter insulin by 10% or by 2-4 units. Consider 2am blood glucose reading if blood glucose is in target at bedtime but low, high or variable before breakfast.

If you are unsure speak with your diabetes team.



## Insulin



### BREAKFAST

Blood glucose out of target for 3 days

**Above target= Increase evening insulin by 2 units or 10% whichever is greater, unless pre bed reading is less than 7**

**Below target= Decrease evening insulin by 2 units or 10% whichever is greater**



### LUNCH

Blood glucose out of target for 3 days



### EVENING MEAL

Blood glucose out of target for 3 days



### BEDTIME

Blood glucose out of target for 3 days

If your blood glucose is **Above** or **Below** target please discuss your oral medication with your diabetes team

If your blood glucose is below 4mmols treat with rapid acting carbohydrate, 4-6 dextrose tablets, 100ml of Lucozade or 150ml sugary drink then follow up with long acting carbohydrate. If your pre meal blood glucose level is low, treat the hypo first and ensure blood glucose is in target range before continuing to administer your insulin as normal.

# Twice Daily Biphasic Insulin (Mixture)

Commencing twice daily biphasic insulin is recommended as an option in the treatment of type 2 diabetes (NICE CG 87)

(Humulin M3/ Humalog Mix 25 and 50/ Novomix 30/ Insuman Comb 15, 25 and 50)

## Suggested Criteria

One or more of the following:

- Osmotic symptoms
- Unplanned weight loss
- HbA1c greater than 69mmol/mol
- Intolerance /maximum tolerated dose of OHAs
- Optimal glucose control is required and multiple injection therapy is not acceptable
- More suited to people with regular lifestyle/mealtimes

# Twice Daily Biphasic Insulin (Mixture)

## Starting twice daily human biphasic insulin

- Continue Metformin (consider if continuation of DPP4, TZD, SGLT2, GLP1 would be beneficial)
- Stop Sulphonylurea
- Start biphasic insulin – 10 units before breakfast / 10 units before evening meal via an appropriate insulin delivery device
- Ask patient to inject insulin 10-15 minutes before eating (analogue Mixes) or 20-30 minutes before eating (soluble mixes)
- Advise patient that BG levels may initially be high until active titration begins
- Ensure that mix is reconstituted, as this will effect the proportion of intermediate/fast acting insulin being injected

# Twice Daily Biphasic Insulin (Mixture)

## Active dose titration needs to take place

- If patient able to self-manage teach insulin adjustment using '3 day rule'
- Frequent telephone contact from an appropriately skilled health care professional will be required if patient unable to self-titrate
- Teach prevention and management of hypoglycaemia
- Review appropriateness of insulin regime if dose reaches 60 units BD and individual glucose targets not achieved
- Consider 3 times daily Mix 50 in obese patients when HbA1c above target

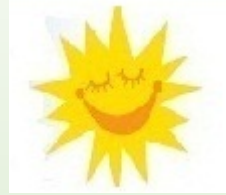
# How to adjust your insulin dose using blood glucose results for a **twice** daily insulin

## POINTS TO REMEMBER

Blood glucose levels can change on a day to day basis for a number of reasons, examples of this include stress, illness, food and alcohol intake and activity level.

For this reason it is advisable not to alter your insulin doses in response to a "one off" abnormal reading. We recommend you adjust your insulin every 3-4 days until targets are reached. Alter insulin by 10% or by 2-4 units. Consider 2am blood glucose reading if blood glucose is in target at bedtime but low, high or variable before breakfast.

If you are unsure speak with your diabetes team.



Insulin

Insulin



BREAKFAST



LUNCH



EVENING MEAL



BEDTIME

Blood glucose out of target for 3 days

Blood glucose out of target for 3 days

Blood glucose out of target for 3 days

Blood glucose out of target for 3 days

**Above target= Increase evening insulin by 2 units or 10% whichever is greater, unless pre bed reading is less than 7**

**Below target= Decrease evening insulin by 2 units or 10% whichever is greater**

**Above target= Increase breakfast insulin by 2 units or 10% whichever is greater**

**Below target= Decrease breakfast insulin by 2 units or 10% whichever is greater**

If readings are a mixture of highs and lows discuss with the team

**Above target= Increase evening meal insulin by 2 units or 10% but not if breakfast are less than 5**

**Below target= Decrease evening insulin by 2 units or 10% whichever is greater**

If your blood glucose is below 4mmols treat with rapid acting carbohydrate, 4-6 dextrose tablets, 100ml of Lucozade or 150ml sugary drink then follow up with long acting carbohydrate. If your pre meal blood glucose level is low, treat the hypo first and ensure blood glucose is in target range before continuing to administer your insulin as normal.

# Basal Bolus Insulin Management

(Basal insulin + Novorapid/ Humalog/ Apidra or Humulin S/Actrapid/Insuman Soluble)

- Basal/bolus management is based upon the knowledge gained from insulin pump therapy, but is much cheaper
- Also known as multiple daily injections (MDI)
- Basal (background) intermediate or long acting insulin usually before bed but sometimes twice daily
- Bolus (rapid-acting) short acting soluble or rapid acting analogue insulin prandial (before meals) with the dose matched to amount of carbohydrate eaten
- Can be tailored to individuals needs e.g. soluble insulin in gastroparesis, during dialysis; rapid acting insulin in high GI foods



# Basal Bolus Insulin Management

## Suggested criteria:

- Flexibility due to current lifestyle and meal pattern (unable to adhere to regular eating pattern; shiftwork; sports)
- Patients must be committed to self-management of their diabetes
- All patients must be assessed by a DSN and dietitian – they should be MOTIVATED, MONITORING, REALISTIC and must agree to carbohydrate counting/exchange education
- Pre-pregnancy and during pregnancy/ Surgery/ Steroid therapy
- Patient choice

# Basal Bolus Insulin Management

## Reasons why basal bolus regime may not be considered

- Poor concordance with diet
- Missing insulin injections
- Unwilling to monitor blood glucose on a frequent basis (at least 4 times daily)
- Incapable or unwilling to adjust insulin doses
- Incapable of learning carbohydrate awareness and self-adjustment of insulin
- HbA1c not always an indicator for multiple injections

# Basal Bolus Insulin Management

## Other disadvantages of basal bolus insulin management

- Greater risk of lipohypertrophy associated with increased number of injections
- Increased flexibility can lead to poor concordance with diabetic diet, leading to increased weight gain. Insulin controls the blood sugar level by storing away extra calories as extra fat!

*Imagine "pigging-out" on your favorite junk foods, without seeing your blood sugar level rise!*

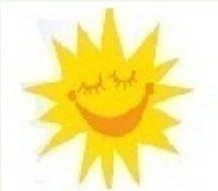
# How to adjust your insulin dose using blood glucose results of a **basal bolus** regime

## POINTS TO REMEMBER

Blood glucose levels can change on a day to day basis for a number of reasons, examples of this include stress, illness, food and alcohol intake and activity level.

For this reason it is advisable not to alter your insulin doses in response to a "one off" abnormal reading. We recommend you adjust your insulin every 3-4 days until targets are reached. Alter insulin by 10% or by 2-4 units. Consider 2am blood glucose reading if blood glucose is in target at bedtime but low, high or variable before breakfast.

If you are unsure speak with your diabetes team.



### BREAKFAST

Blood glucose out of target for 3 days

Above target= Increase basal insulin by 2 units or 10% whichever is greater

Below target= Decrease basal insulin by 2 units or 10% whichever is greater



### LUNCH

Blood glucose out of target for 3 days

Above target= Increase breakfast bolus insulin by 2 units or 10% whichever is greater

Below target= Decrease breakfast bolus insulin by 2 units or 10% whichever is greater



### EVENING MEAL

Blood glucose out of target for 3 days

Above target= Increase lunch bolus insulin by 2 units or 10% whichever is greater

Below target= Decrease lunch bolus insulin by 2 units or 10% whichever is greater



### BEDTIME

Blood glucose out of target for 3 days

Above target= Increase evening meal bolus insulin by 2 units or 10% whichever is greater

Below target= Decrease evening meal bolus insulin by 2 units or 10% whichever is greater

If your blood glucose is below 4mmols treat with rapid acting carbohydrate, 4-6 dextrose tablets, 100ml of Lucozade or 150ml sugary drink then follow up with long acting carbohydrate. If your pre meal blood glucose level is low, treat the hypo first and ensure blood glucose is in target range before continuing to administer your insulin as normal.

# Insulin therapy in Type 1 Diabetes (NICE CG15)

- Basal bolus insulin management is the preferred option in type 1 diabetes
- This offers the most lifestyle flexibility and promotes independence, and should be the chosen option if the patient is agreeable
- This regime needs to be started as part of an integrated package of specialist care including education, dietetic assessment and support, skills training in self-monitoring and adjustment of insulin doses.
- Consider twice daily insulin regime for those who are unable to commit to a multiple injection regime or who prefer to have two injections per day or may require assistance with their injections
- Long acting analogue insulins are recommended as a treatment choice for people with type 1 diabetes (NICE TA53). Inject at the same time each day (usually bedtime) but frequently split to twice daily

# Insulin therapy in Type 1 Diabetes

When glycaemic control cannot be optimized with basal bolus insulin management:

Consider

Injection technique and site management

Revisiting carbohydrate counting education

Changing long-acting analogue insulin (Insulin Degludec may be an option)

Insulin pump therapy

Thank you