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Unit No. 2

INSULIN THERAPY IN TYPE 2 DIABETES MELLITUS

Dr Tan Seng Kiong, Dr Tan Hwee Huan, A/Prof Sum Chee Fang

ABSTRACT

Initiation of insulin therapy is challenging in the primary care setting without nursing support. Doctors have to prepare their practices to deal with these challenges in order not to delay insulin therapy when needed.

Keywords: insulin therapy, challenges, strategies

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INTRODUCTION

Insulin therapy is initiated for patients early in their course of diabetes to relieve symptoms of severe hyperglycaemia or in the hope of achieving remission and during the course of diabetes to attain optimal control.[1,2] In the specialist outpatient setting, successful initiation of insulin therapy is very much dependent on having dedicated diabetes nurse educators (DNE) who would ensure the smooth transition of the therapy for the patient and the doctor. With the increasing prevalence of diabetes in Singapore, most patients with Type 2 Diabetes Mellitus (T2D) are now receiving their care in the community. The initiation of insulin in the polyclinics is facilitated by nurses trained in diabetes management who can assist with the initiation, optimisation and intensification of the therapy. For family practices that are not often supported by DNE, initiation of insulin therapy may be challenging. This article hopes to share some clinical pointers to help these doctors prepare their practices for their patients who require insulin therapy.

EMPOWERING PATIENTS DURING INSULIN INITIATION

A good resource that can be obtained easily online is the Royal College of Nursing booklet on "Starting injectable treatment in adults with Type 2 diabetes".[3] The chapter on a step-by-step guide to insulin therapy includes details on first appointment/first injection, choosing a delivery device, teaching injection technique, choosing injection site, rotating injection sites, timing of injection, insulin dosage, storage, and checklist. The following chapter on essential education elaborates on the subjects to be covered at three stages of insulin therapy: immediately upon starting the therapy; within the first few weeks of starting therapy; and once the patient is feeling more confident with the therapy. This is a very easy book to read and provides a simple, comprehensive, and practical overview for the initiation of insulin therapy.

In preparation for the conversation on insulin therapy with the patient, it is recommended that the practice gathers together the armamentarium or tool kit required for the education and support of insulin therapy. This could include:

1. Blood glucose monitoring (BGM) gadgets – glucometer, strips, lancets (include safety lancets that do not require a separate lancing device), lancing device, record book, swabs, and sharps disposal. If available, Flash (intermittent) continuous glucose monitoring demonstration kit or online video.[4,5]

1. Insulin therapy gadgets: vial, disposable prefilled pens, self-fill pens, syringes (30, 50, 100cc; 6 and 8mm), pen needles (gauge 31-33, length 4, 5 and 6mm), insulin wallets, sharps disposal, and swabs.[3,6]

1. Written information on instructions for insulin dose and time, delivery device, rotating sites, hypoglycaemia management, and sick day management.

1. Travel advice and letter for airport securities.

The doctor should be prepared to spend time to proactively engage and work with the patient to deal with the challenges faced with insulin therapy.[7,8] These anticipated barriers and challenges could be explored with the patient early on and during the course of diabetes to ensure timely initiation of insulin therapy when required. The doctor should be careful not to use insulin therapy as a threat for poor control but rather as an effective therapeutic option. The mnemonic PICK DMP is a useful reminder of the common barriers and challenges encountered. **Table 1** below elaborates on the use of this mnemonic.

DR TAN SENG KIONG
Consultant
Khoo Teck Puat Hospital

DR TAN HWEE HUAN
Senior Consultant
Diabetes Centre, Admiralty Medical Centre

A/PROF SUM CHEE FANG
Senior Consultant
Diabetes Centre, Admiralty Medical Centre

Table 1: Common barriers in insulin initiation and proposed strategies

Challenges/Barriers		Assess	Strategies
Pain	It is going to be painful.	If the fear is perceived or real; show range of needles currently available (smallest: 31-33 G x 4-5 mm) as compared to those used for drawing of blood (16-21 G x 12-40 mm).	Demonstrate how insulin is administered. Share experiences of others/self. Offer trial injection. Offer insulin port or pump for those on multiple dose injections.
Inconvenience	It will disrupt my lifestyle.	Current and desired lifestyle – daily activities at home, work (shift work), or school, meal times – regularity, driving, leisure, physical activity, travel, fasting needs, storage – fridge at home, insulin wallets.	Demonstrate the convenience of insulin pens. Offer to initiate regimen that will lead to least disruption.
Cost	It is going to be expensive.	Cost of current oral therapy, financial status, eligibility for funding. Understanding of cost of complications.	Offer cost saving measures or funding application.
K(C)ompetence	I'm not sure I can handle so much.	Learning abilities (cognitive function), self-care skills (self-monitoring of blood glucose and interpretation of results), literacy, diabetes numeracy, dexterity, vision, support	Offer support for first jab and ongoing support until confident. Offer support from diabetes centre/ specialist clinic if more assistance/training required. Goal setting to be decided with patient using SMART (specific, measurable, achievable, relevant/Realistic, and time-based) and reviewed and adjusted accordingly.
Denial	I'll try harder; I don't need this yet. I feel fine.	Understanding of diabetes as a "silent killer", concept of HbA1c as predictor of complication, progression of diabetes and failure of oral agents (not patient's failure).	Offer individual or group education, peer support. Stage approach to initiation of insulin – raise awareness and understanding of glycaemic levels and desired targets through SMBG training and interpretation. Offer trial of insulin with review date.
Myth	If I go on insulin, I'll lose a foot, my kidney or end up dying. If I start, I will need to continue for life.	Source of information; level of fears and misunderstanding. Understanding of hyperglycaemia as cause of complications and need to achieve glycaemic targets. Understanding of sick-day management and risk of hypoglycaemia. Understanding of need for insulin in Type 2 Diabetes – insulin deficiency and insulin resistance. Understanding of benefits of early initiation of insulin.	Offer evidence from trials with regards to safety and efficacy of insulin therapy; other patient's testimonies; peer support group. Reinforce sick day management and hypoglycaemia management.

Phobia	I can't possibly give myself an injection. I'll have low sugar reactions. I'll get fat.	If there's needle phobia. Understanding of action of insulin, why hypoglycaemia happens, how to avoid and manage if it happens. Ability to manage hypoglycaemia. Indication for insulin, fear of weight gain and understanding of reason for weight gain and measures to avoid excessive weight gain.	Offer to refer to a psychologist. Caregiver to perform jabs. Offer auto-injector, insulin port. Offer measures to reduce risk of hypoglycaemia – start with low dose and close monitoring of response and review during optimisation of therapy. Offer measures to reduce weight gain – lifestyle advice, concomitant use with SGLT-2 inhibitors, GLP-RA and metformin.

SELECTION OF INSULIN THERAPY AND REGIME

The prescription of insulin and therapy regime needs to be tailored to the patient. Insulin regimens such as basal only, basal-plus, basal-bolus, or pre-mixed insulin are reasonable options if the patient can adhere to it. The ideal dosing of insulin is to mimic normal pancreatic insulin physiology; therefore it is important to be familiar with the pharmacokinetic profiles of the insulin prescribed.

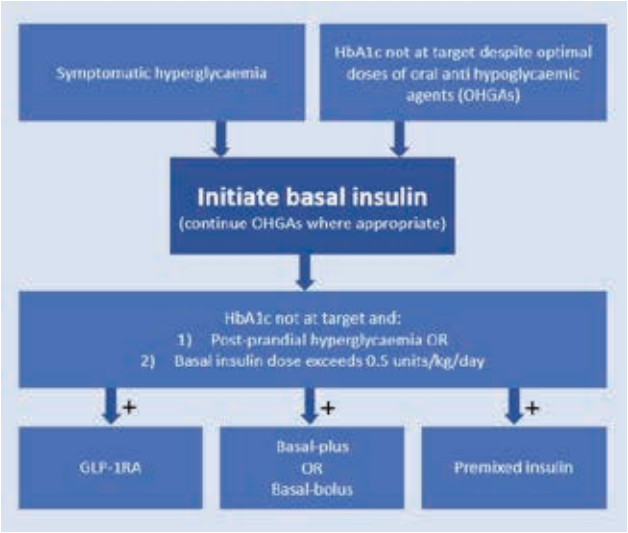
STEPS TO INSULIN INITIATION AND INTENSIFICATION OF THERAPY

The doctor should consider initiating insulin therapy when:

1. Glycaemic targets are not met on optimal treatment with oral glucose-lowering agents.
2. Patient has symptomatic hyperglycaemia.

There are various formulations of insulins that the doctor may choose. The Appropriate Care Guide (ACE) on Initiating Basal Insulin in Type 2 Diabetes Mellitus[10] is a useful resource to guide doctors in their choice of basal insulin and steps in titration. Basal insulin can be started at a dose of 0.1-0.2 units/kg/day depending on the patient's age, comorbidities and blood glucose profile. The dose can be titrated by 2-4 units once or twice a week, until the target fasting blood glucose is achieved. Should the patient's HbA1c remain poorly controlled, and the patient has postprandial hyperglycaemia or a basal insulin dose that exceeds 0.5 units/kg/day, the doctor should consider adding on prandial insulin. This can be done in form of basal-plus, basal-bolus, or premixed (biphasic) insulin, depending on the patient profile. Injectable GLP-1 receptor agonists may also be considered.

Figure 1: Algorithm for insulin therapy



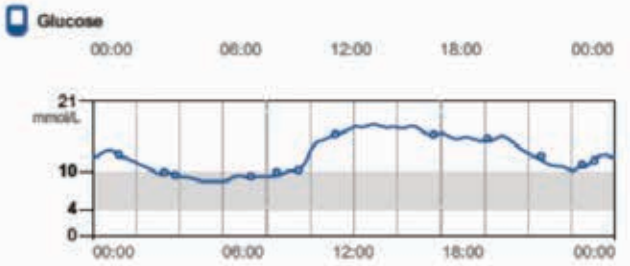
Insulin prescription is made easier if the doctor can figure out the glycaemic profile of the patient.[1,9] A prescription of BGM to be performed by the doctor, patient, or caregiver should first be given to evaluate the glycaemic profile of the patient. It can be done using the FITT model as illustrated below:

Table 2: FITT model for Capillary Blood Glucose Monitoring

Frequency	Intensity	Time	Targets – to be individualised
Daily for 3 days	2 points	BT & FBG	FBG: 4-7mmol/L; BT: 7-10 mmol/L
Once a week	2 points	FBG & PD	FBG: 5-8mmol/L; PD: 5-8mmol/L
On off days or weekend	2 points, up to 7	Before and 2 hours after meals & BT	Pre-meal BG <7 mmol/L; post-meal BG <10 mmol/L

Legend: FBG: fasting blood glucose; PD: pre-dinner; BT: bedtime

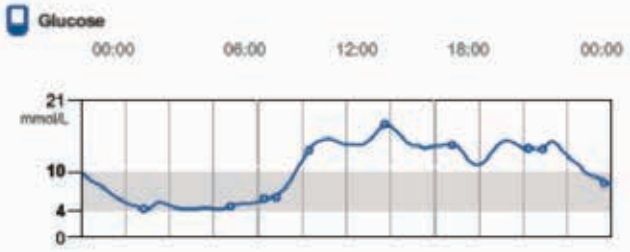
Figure 2 : Common patterns of glucose profiles and possible therapeutic interventions.



All day hyperglycaemia

BGM: BT & FBG

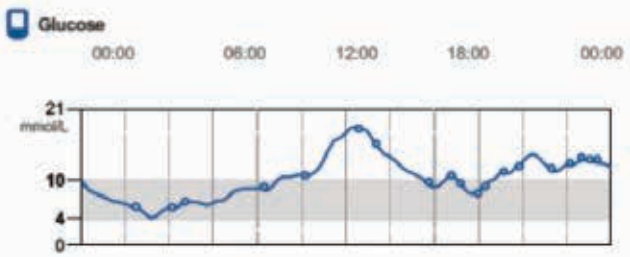
Insulin: Basal insulin – once a day either morning or bedtime



Daytime hyperglycaemia

BGM: FBG, Pre-lunch and Pre-dinner

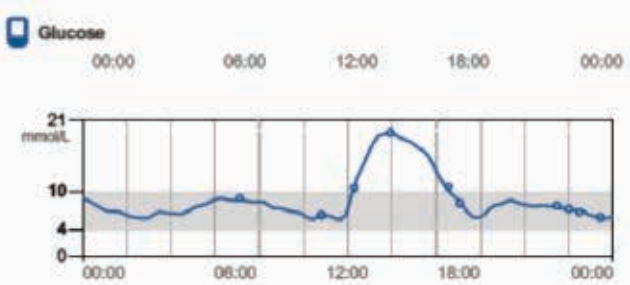
Insulin: Premixed (30/70) at breakfast



Predominant postprandial hyperglycaemia.

BGM: Pre-meal & mid-day

Insulin: Premixed (50/50) at culprit meal

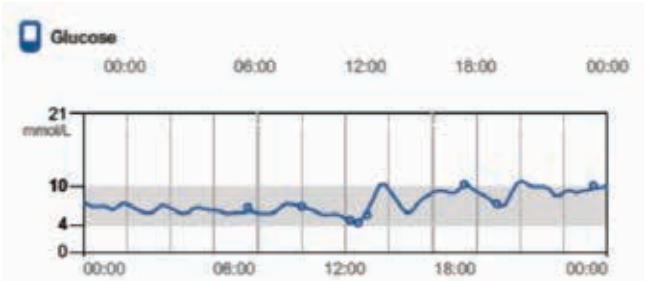


Predominant postprandial hyperglycaemia.

BGM: Pre and post-meal

Insulin: Prandial insulin

Desired blood glucose levels after initiation of insulin therapy:



Normoglycaemia.

BGM: FBG; when hungry

No evidence of hypoglycaemia.

BLOOD GLUCOSE MONITORING

In patients receiving insulin therapy, blood glucose monitoring is important to help our patients identify patterns in their blood glucose fluctuations. This can be done in the form of a capillary blood glucose or a flash continuous glucose monitoring system. The frequency of monitoring needs to be individualised in order to improve patient compliance and obtain sufficient information to have meaningful interpretation of the data. The target blood glucose levels also need to be individualised according to the patient's comorbids and risk of hypoglycaemia. **Table 2** provides some of the common used monitoring frequency and blood glucose targets, and **Figure 2** summarises the commonly encountered blood glucose profiles and their interventions.

BEWARE OF HYPOGLYCAEMIC UNAWARENESS

Hypoglycaemic unawareness occurs when the patient does not develop the early warning symptoms of hypoglycaemia when their blood glucose levels are low. These symptoms include tremors, palpitations, and diaphoresis. This may occur when the patients have repeated episodes of hypoglycaemia or concomitant autonomic neuropathy, and this results in a significant increase risk of developing severe hypoglycaemia. Patients with hypoglycaemic unawareness should be advised to increase their glycaemic targets for a few weeks to avoid hypoglycaemia.

CONCLUSION

In summary, insulin therapy is an important and effective therapeutic option in the management of Type 2 diabetes. Initiation, optimisation, and intensification will be challenging if doctors are not prepared to deal with the challenges. With careful preparation as proposed above, insulin therapy can be initiated safely and effectively even in primary care settings.

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RECOMMENDED READINGS

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LEARNING POINTS

- **Insulin therapy should be introduced as an effective therapeutic option and not used as a threat for poor control.**
- **Challenges faced with insulin therapy should be managed with patients early in their course of diabetes.**
- **Clinicians have to be prepared to deal with the challenges faced with insulin therapy.**