

The Nutritional Management of Type 3c Diabetes

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Overview

- ▶ Defining Type3c Diabetes Mellitus
- ▶ Prevalence
- ▶ Proposed diagnostic criteria
- ▶ Characteristics
- ▶ Nutritional considerations
- ▶ How are we managing these patients locally?
- ▶ Case Studies

POLL

- ▶ What is your experience with T3cDM?
 - ▶ None
 - ▶ Some
 - ▶ Regularly see these patients

Type 3c diabetes (pancreatogenic)

- ▶ Encompasses causes of diabetes of different pathophysiologies
- ▶ Diabetes due to diseases of the exocrine pancreas
 - ▶ Fibrocalculous pancreatopathy (FCPP)
 - ▶ Pancreatitis- Acute, relapsing and chronic
 - ▶ Trauma / pancreatectomy / pancreatic surgery
 - ▶ Neoplasia
 - ▶ Cystic fibrosis
 - ▶ Haemachromatosis
 - ▶ Other (WHO 2019)

Characterised by pancreatic exocrine insufficiency

POLL

- ▶ Of overall diabetes diagnosis, what do you think is the prevalence of T3cDM?
 - ▶ <5%
 - ▶ 5-10%
 - ▶ 10-15%
 - ▶ 15-20%

- ▶ What do you think is the main cause of T3cDM?
 - ▶ Pancreatic neoplasm
 - ▶ Haemochromatosis
 - ▶ Chronic Pancreatitis
 - ▶ Pancreatic resection
 - ▶ Cystic fibrosis

5-10% prevalence of T3cDM
~75% arising from Chronic Pancreatitis
~10% Pancreatic Cancer

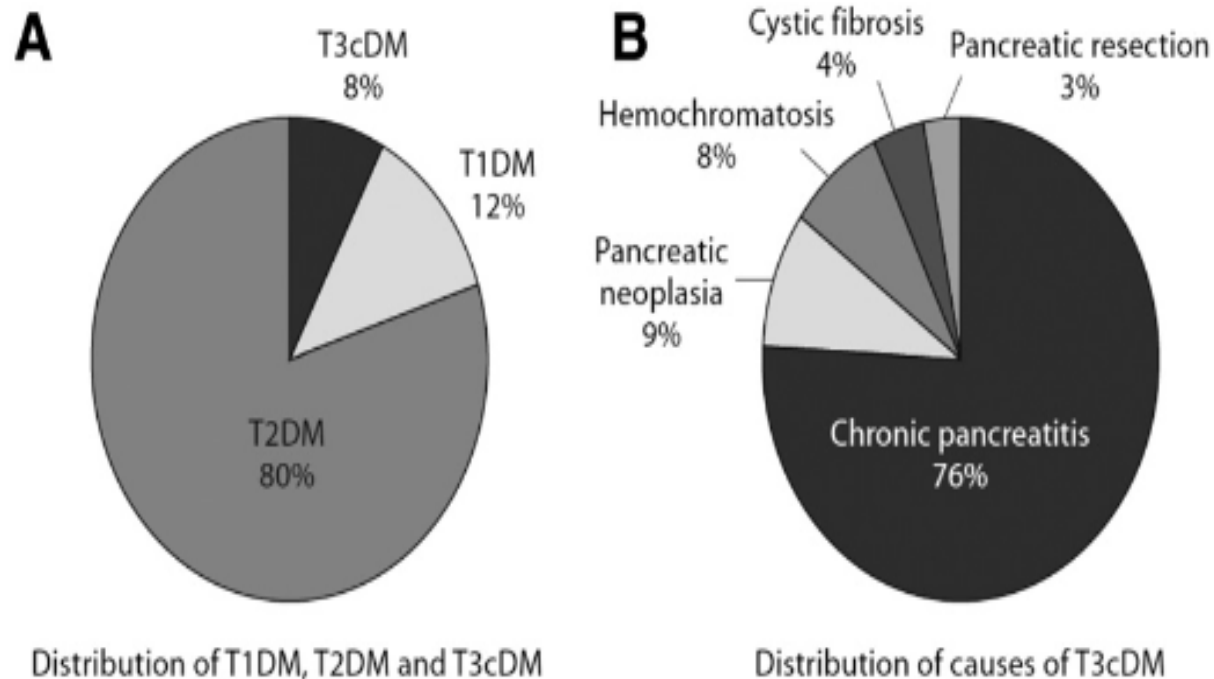


Figure 2—Prevalence of types of diabetes. Distribution of types of diabetes (A) and causes of T3cDM (pancreatogenic) diabetes (B) based on studies of 1,922 patients with diabetes reported by Hardt et al. (49). Reproduced from Cui and Andersen (47).

- ▶ Pancreatic Surgery: depends on which part and how much is removed □
- ▶ Pancreatic cancer: at diagnosis, nearly 50% had diabetes and nearly 40% had impaired fasting glucose (Pannala et al, Gastroenterology 2008)

Proposed Diagnostic Criteria

- ▶ Often missed/misclassified- mostly T2DM
- ▶ No universally accepted diagnostic criteria - Proposed criteria by Ewald & Bretzel. (2013).
- ▶ Major criteria
 - ▶ Presence of exocrine pancreatic insufficiency (faecal elastase/direct function tests)
 - ▶ Pathological pancreatic imaging (endoscopic US/MRI?CT)
 - ▶ Absence of T1DM associated autoimmune markers
- ▶ Minor criteria
 - ▶ Impaired Beta cell function (HOMA-B, C-peptide/glucose ratio)
 - ▶ No excessive insulin resistance (HOMA-IR)
 - ▶ Impaired incretin secretion (GLP-1, Pancreatic polypeptide)
 - ▶ Low serum levels of lipid soluble vitamins (ADEK)

Characteristics

Table 1—Clinical and laboratory findings in types of diabetes

Parameter	T1DM	T2DM	T3cDM
Ketoacidosis	Common	Rare	Rare
Hypoglycemia	Common	Rare	Common
Peripheral insulin sensitivity	Normal or decreased	Decreased	Normal or increased
Hepatic insulin sensitivity	Normal or decreased	Decreased	Normal or decreased
Insulin levels	Low or absent	High or “normal”	“Normal” or low
Glucagon levels	Normal or high	Normal or high	“Normal” or low
PP levels	Normal or low (late)	Normal or high	Low or absent
GIP levels	Normal or low	Variable	Low
GLP-1 levels	Normal	Variable	Variable
Typical age of onset	Childhood or adolescence	Adulthood	Any
Typical etiology	Autoimmune	Obesity, age	CP, cystic fibrosis, postoperative

“Normal,” inappropriate in the context of elevated glucose. Adapted from Cui and Andersen (47).

Common issues

- ▶ PEI - absence of PERT, inadequate dosing, not taking correctly, storage etc
- ▶ Hypos - malabsorption, deficiency in glucagon secretion, poor dietary intake, alcohol intake *remember PERT needed with all hypo treatment
- ▶ Brittle diabetes; affecting up to 25% of patients with Chronic Pancreatitis related T3cDM (Duggan et al (2016))
- ▶ Malnutrition- vitamin/mineral deficiencies, food first, oral nutritional supplements
- ▶ Consider co-morbidities, Social Circumstances, Alcohol, Quality of Life, Pain

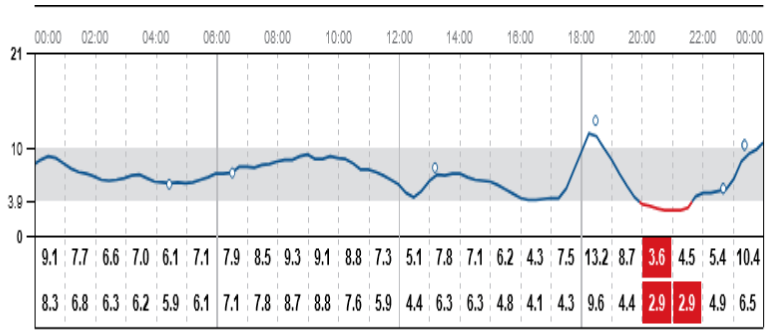
Inadequate Creon Vs Creon as directed

FRI 10 Nov

Glucose mmol/L

Max

Min



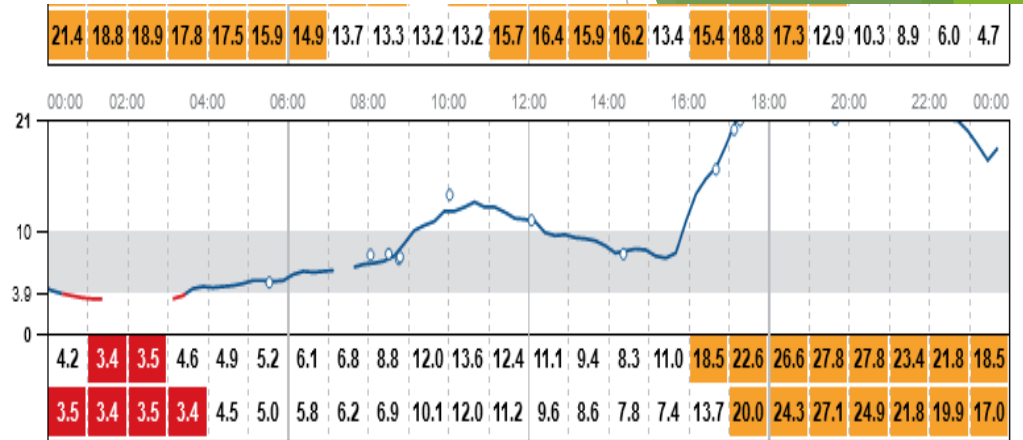
Min

TUE 14 Nov

Glucose mmol/L

Max

Min

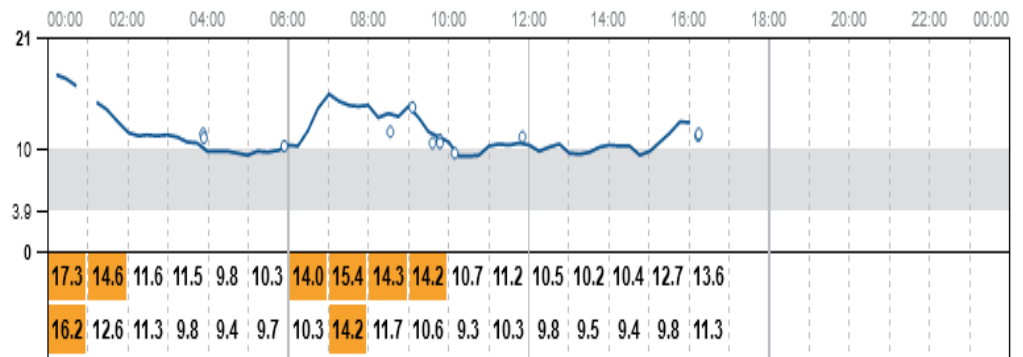


WED 15 Nov

Glucose mmol/L

Max

Min



Legend High Glucose (>13.9) Low Glucose (<3.9) Scans/Views Logged Post-Meal Peak New Sensor Time Change

17.0u-2.0+0.0 15.0u Meal + Correction + User Change = Total * Strip Test

Nutritional management (Duggan and Conlon, 2017)

NUTRITION ISSUES IN GASTROENTEROLOGY, SERIES #163

Table 2. Suggested Principles of Management/Management Strategies for Type 3c Diabetes in Chronic Pancreatitis

Principles of Management	Management Strategies
<p><i>Prevent:</i></p> <ul style="list-style-type: none">• Hypoglycemia• Hyperglycemia• Exacerbation of malnutrition• Malabsorption• Co-morbidities associated with diabetes (e.g. retinopathy, renal disease)	<ul style="list-style-type: none">• Regular meal pattern with regular starchy carbohydrates• Do not skip meals• Take small, frequent meals• Measure glucose levels frequently, particularly if on insulin, after physical activity, if diet is poor, and if any hypoglycemic symptoms• Avoid alcohol; smoking cessation• Ensure adequacy of (PERT)• Minimize high-sugar/ high-glycemic index food or fluids• Consider a diary to record diet, glucose levels, PERT, exercise, at least until acceptable glucose control is maintained• Routine dietitian assessment/ monitoring

Reprinted and adapted with permission from: Duggan & Conlon.¹⁹ A Practical Guide to the Nutritional Management of Chronic Pancreatitis. Nutrition Issues in Gastroenterology; Practical Gastroenterology. June 2013.

Management / Treatment Goals NICE 104

Pancreatitis

- ▶ In practice- diagnosis involves measurement of fasting glucose and glycated haemoglobin (HbA1c)
- ▶ HbA1c should be repeated every 6 months for those with pancreatitis for potential benefit of insulin therapy
- ▶ For those not on insulin- management in line with NICE guideline for T2DM
- ▶ For those with T3cDM who need insulin- management in line with NICE guideline for T1DM

Belfast Trust Outpatient Clinic for T3cDM

- Specialist clinic in BCH - established 2016
- Patients with pancreatic diabetes - differing aetiology
- High quality care
- MDT approach:
 - Consultant (Diabetes and Endocrinology)
 - Diabetes Specialist Dietitian
 - Diabetes Specialist Nurse

Management in practice

- Full dietetic assessment - A, B, C, D, E, F
- Reviewing history and aetiology of disease
- Relevant biochemistry - HbA1c, Fat soluble vitamins
- Previous dietetic input?
- Current treatments - insulin/ metformin?
- PEI/ PERT - Compliance, taking and storing appropriately?
- Knowledge on diabetes and diet in relation to this
- Quality of diet

- ▶ A- Anthropometry
- ▶ B- Biochemistry
- ▶ C- Clinical
- ▶ D- Dietary
- ▶ E- Environmental/Behavioural /Social
- ▶ F- Service User Focused

Management in practice

- ▶ Oral Agents- ADA and EASD recommend Metformin as first line oral therapy for T2DM, therefore often chosen for T3cDM
- ▶ Early Type3cDm- insulin segretagogues eg Sulphonylurea can be considered
- ▶ Incretin based therapies-GLP-1 and DPP4 inhibitors associated with higher risk of pancreatitis and GI side effects- AVOID
- ▶ Thiazolidines eg pioglitazone increased risk fractures, fluid retention, congestive heart failure AVOID
- ▶ Progressive disease- likely require insulin therapy, earlier in malnutrition

Basal Bolus Regimen

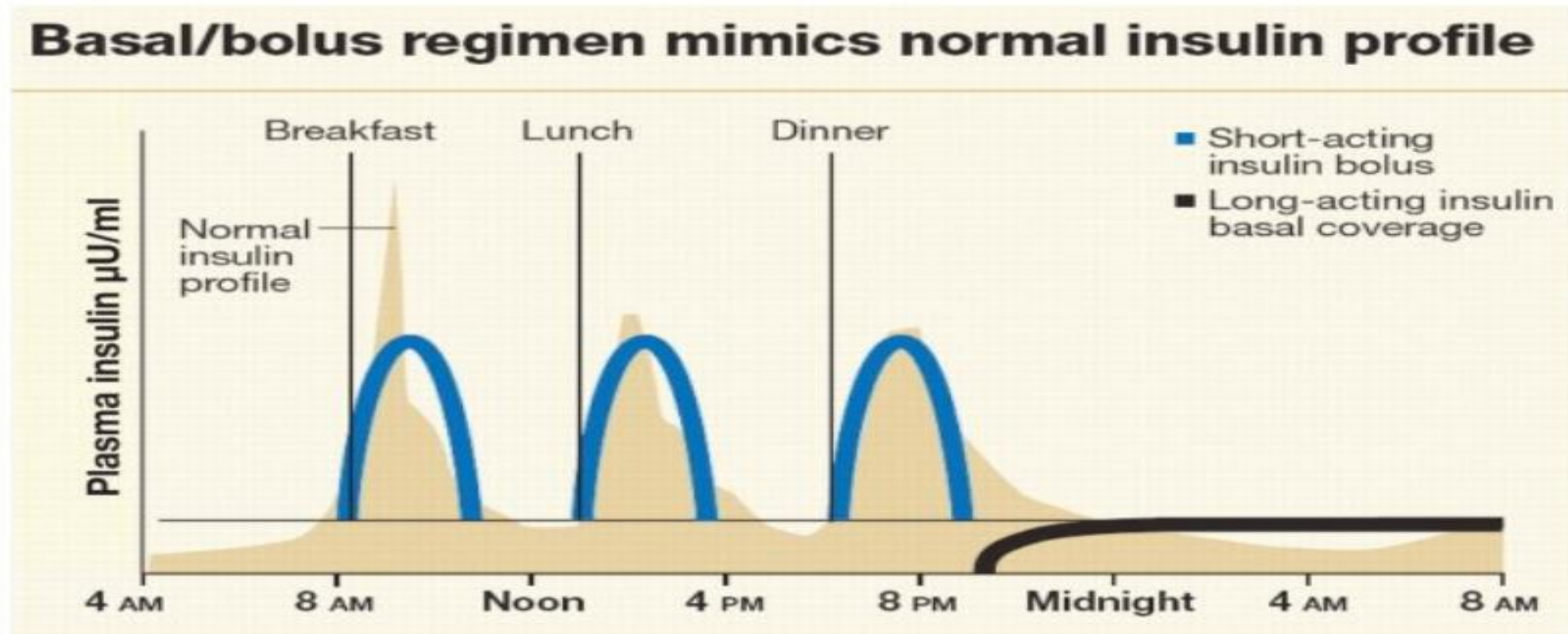


Image credit: Magaji and Johnston (2011)

Case Study 1- New referral to community MDT for follow up

- ▶ 84 year old male
- ▶ Diagnosed T2DM in the past year c/o Metformin and Gliclazide (HBA1c 84)
- ▶ Admission to hospital with obstructive jaundice, lethargy, weightloss, fatigue
- ▶ Diagnosed high grade likely stricturing biliary/pancreatic neoplasm
- ▶ Weight 63.8kg 11.4% weightloss from usual weight
- ▶ Experiencing poor oral intake, early satiety, steatorrhoea
- ▶ Blood glucose levels elevated during admission- started on Novomix 30 for DN administration
- ▶ Commenced on Creon 25,000-50,000units and dietitian commenced on ENSURE COMPACT BD

Initial assessment

- ▶ Attended Hugh at home with DSN for assessment
- ▶ Noted lives alone, district nurses attending for insulin administration, care package for meals
- ▶ Ongoing fatigue, loose motions++, early satiety/disinterest in food
- ▶ Reported taking 25,000units CREON if taking main meals however more so snacking now and not taking with snacks or supplements (therefore minimal Creon taken)
- ▶ Since hospital assessment; swapped to full cream milk and taking 1 pint per day, diet history largely ice cream and pancakes/toast, madeira cake.
- ▶ Discharged on Ensure compact BD - enjoys same
- ▶ Blood glucose levels pre breakfast 10-14mmol/l / 20-28mmol/l pre tea

DISCUSSION

- ▶ What are the main areas of concern?
- ▶ What would be your nutritional aim?
- ▶ What plan would you put in place?
- ▶ What are the benefits to seeing these patients in MDT?

What did we do?

▶ Education-

- ▶ PERT- role/doses/importance of covering small frequent snacks and supplements as this is dietary pattern at present
- ▶ CHO awareness- identifying sources of carbohydrate in the diet that Hugh was willing to take.
- ▶ Meal plan provided- consistent carbohydrate portions, noted better appetite early part of the day therefore lunch main meal of the day with lighter options later to suit patients current appetite
- ▶ Insulin profile explained in relation to requirement for consistent carbohydrate portions
- ▶ Hypo advice= increased risk of hypoglycaemia as insulin doses increase to target current hyperglycaemia

▶ On Review

- ▶ Weight stable on current regimen
- ▶ Variable intake later in the day with skipped meals on occasion, some ongoing inconsistency with creon (less likely to take later in the day when feeling unwell)
- ▶ Novomix dose being titrated however due to inconsistent evening intake some hypoglycaemia experienced.

PLAN-

- ▶ Change to basal + Bolus x2 (given with breakfast and lunch the larger meals of the day).
- ▶ Supplement split into 4 (1/2 supplement 4 times per day (18g CHO bolus rather than 36g as taken between meals)

Case Study 2- MDT referral for domiciliary follow up post admission

- ▶ Patricia 71 year old female
- ▶ Whipples procedure converted to total pancreatectomy (spleen preserving) June 2023
- ▶ New diagnosis of delayed Gastric emptying and pancreatic exocrine insufficiency
- ▶ Discharged to nursing home on Lantus (sliding scale novorapid during admission but nil on discharge)
- ▶ Weight; 19% weightloss since June 2023 Current Weight 67.7kg BMI 25.02kg/m²
- ▶ Discharged on Fortisip Compact Protein BD but not taken- trialled several ONS during admission non compliant with all.
- ▶ On Creon 50,000units with meals 25,000units with snacks- compliant but overall intake poor
- ▶ Blood glucose levels 13-14mmol/l no hypoglycaemia, anxious++++
- ▶ Appetite very poor managing mouthfuls, experiencing vomiting, poor fluid intake

What did we do?

- ▶ Full dietetic Ax- diet history taken, estimated intake and requirements
- ▶ Noted very poor oral intake, early satiety, nausea, vomiting if large portions taken
- ▶ Delayed gastric emptying- erratic blood glucose levels-Improved glycaemic control beneficial, also antiemetics/prokinetics/ small and often approach/ softer options
- ▶ ONS- not taken and declined to retrial/alternatives therefore aim to meet nutritional requirements via oral intake alone- high protein/energy
- ▶ CHO meal plan- Carb awareness to help with glycaemic control
- ▶ PEI- Creon reviewed, checked timings/storage etc. taken at meal times not with snacks
- ▶ Hypo education/ education on change to insulin profile= action of insulins etc
- ▶ DSN- c/o libre and restarted novorapid with meals, close monitoring and titration- able to jointly identify patterns/make amendments to diet/medication as required in combination with patient
- ▶ On review, improving glycaemic control, time in range increased from 24-58%, 1 hypo experienced, some episodes of hyperglycaemia rationalised through libre data and diet history to identify anxious overtreatment of potential hypoglycaemia. Weight stabilised without supplementation.
- ▶ Outcome, improved control, less hyper/hypo glycaemia, increased patient knowledge and empowerment, increased dietary variety, resolution of symptoms and gradually improving appetite

Case Study 3

- ▶ 32 year old male, chronic pancreatitis (alcohol related), prescribed
- ▶ Creon 75,000 with main meals and 50,000 with snacks, Type 3c
- ▶ diabetes for 3 years, HbA1c 86mmol/mol, blood glucose levels in the
- ▶ high teens, BMI 22kg/m². Plan - commence basal bolus insulin
- ▶ (Novorapid with meals and Lantus OD

Assessment:

- ▶ □ Chronic pancreatitis - 10 year history, currently abstaining from
- ▶ alcohol but admits to occasional binges which causes flare ups
- ▶ □ Diabetes - irregular BG monitoring, feeling thirsty, polyuria
- ▶ □ PERT - occasionally forgets to take which leads to symptoms
- ▶ □ Weight history - has noticed some weight loss recently
- ▶ □ Diet history - irregular meal pattern but tries to avoid sugary snacks
- ▶ Issues:
- ▶ □ Alcohol intake, PERT, weight, dietary intake, hypos

Plan:

- ▶ □ Education! - explanation of symptoms, risks of alcohol and irregular meal pattern with insulin
- ▶ □ Regular BG monitoring - pre meals and pre bed
- ▶ □ Appropriate use of PERT with all meals and snacks
- ▶ □ Regular meal pattern based on low GI carbohydrates
- ▶ □ Carbohydrate consistency from day to day
- ▶ □ Avoid alcohol
- ▶ □ Hypo advice
- ▶ □ Importance of regular contact with DSN
- ▶ □ Book into joint clinic for review

Summary

- ▶ Awareness of T3cDM generally poor
- ▶ Can be more difficult to manage than other types of diabetes
- ▶ Important to recognise signs of PEI and treat appropriately
- ▶ Individual approach needed for dietary management based on patient's clinical condition



▶ Thankyou for listening

▶ Any questions ?

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