Overview of Nutritional Assessment in Pancreatic Cancer

Isabelle March

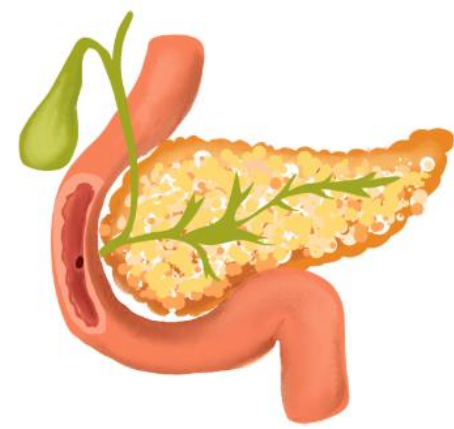Acute Specialist Registered Dietitian

Learning Outcomes

- To be able to outline what the roles of the endocrine and exocrine function of the pancreas
- To be able to identify Type 3C Diabetes Mellitus in pancreatic cancer.
- To be able to understand the risks of cachexia, sarcopenia, malnutrition and frailty in those with pancreatic cancer
- To be able to identify the factors affecting nutritional status
- To be able to assess nutritional status in those with pancreatic cancer.

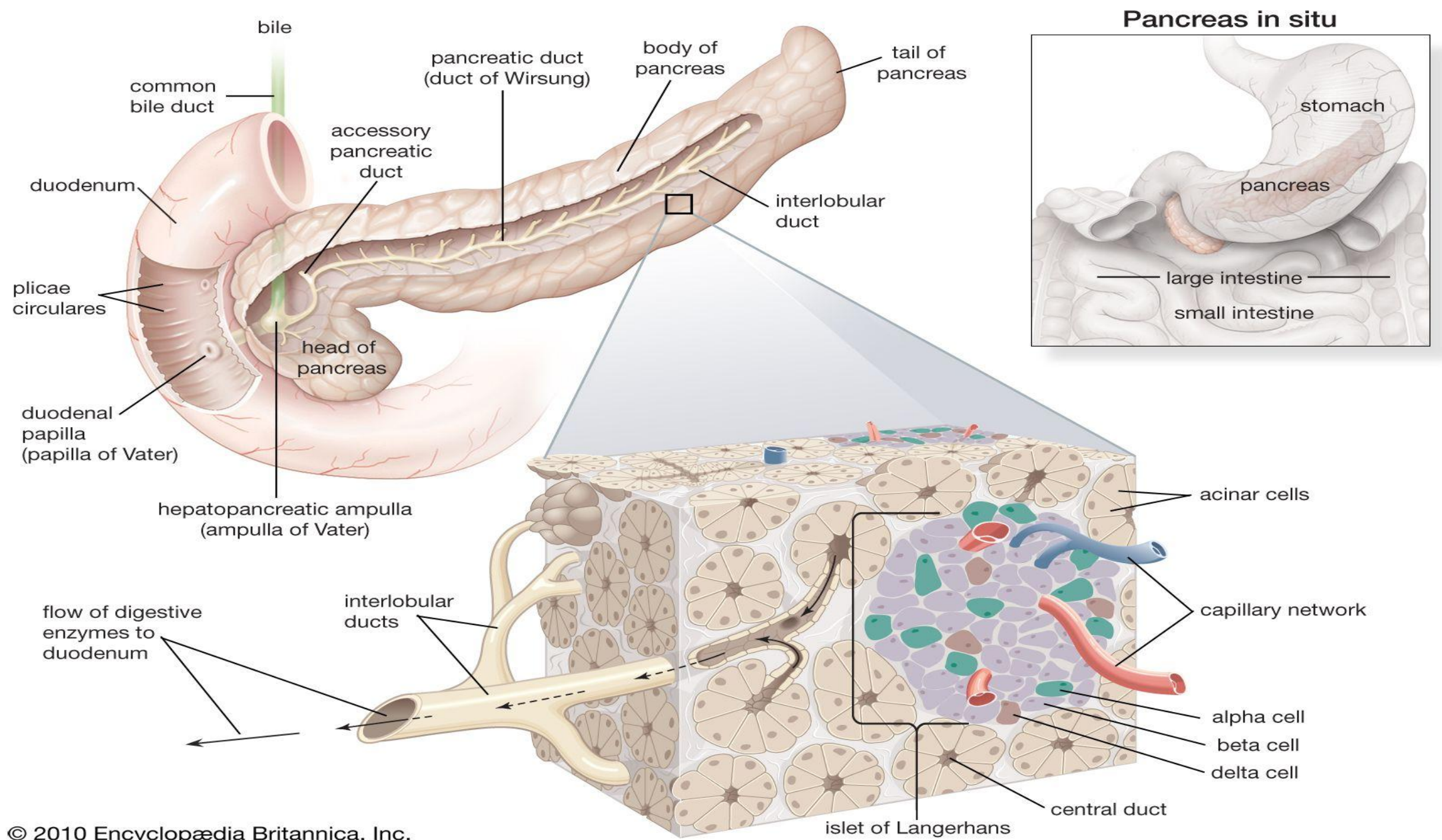# What are the main functions of the panc (multiple choice):
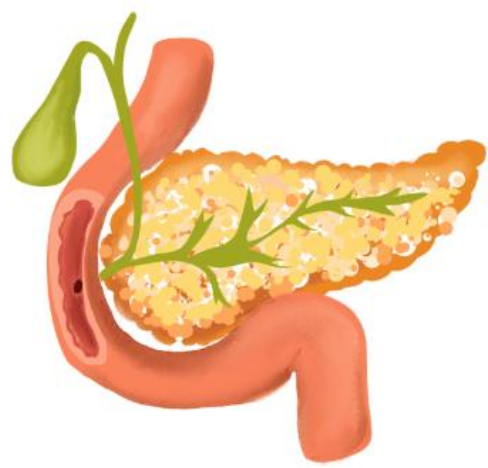
- Secrete digestive enzymes.
- Secrete insulin and other hormones for metabolism and blood glucose control.
- Filter blood to remove waste.
- Control blood pressure.
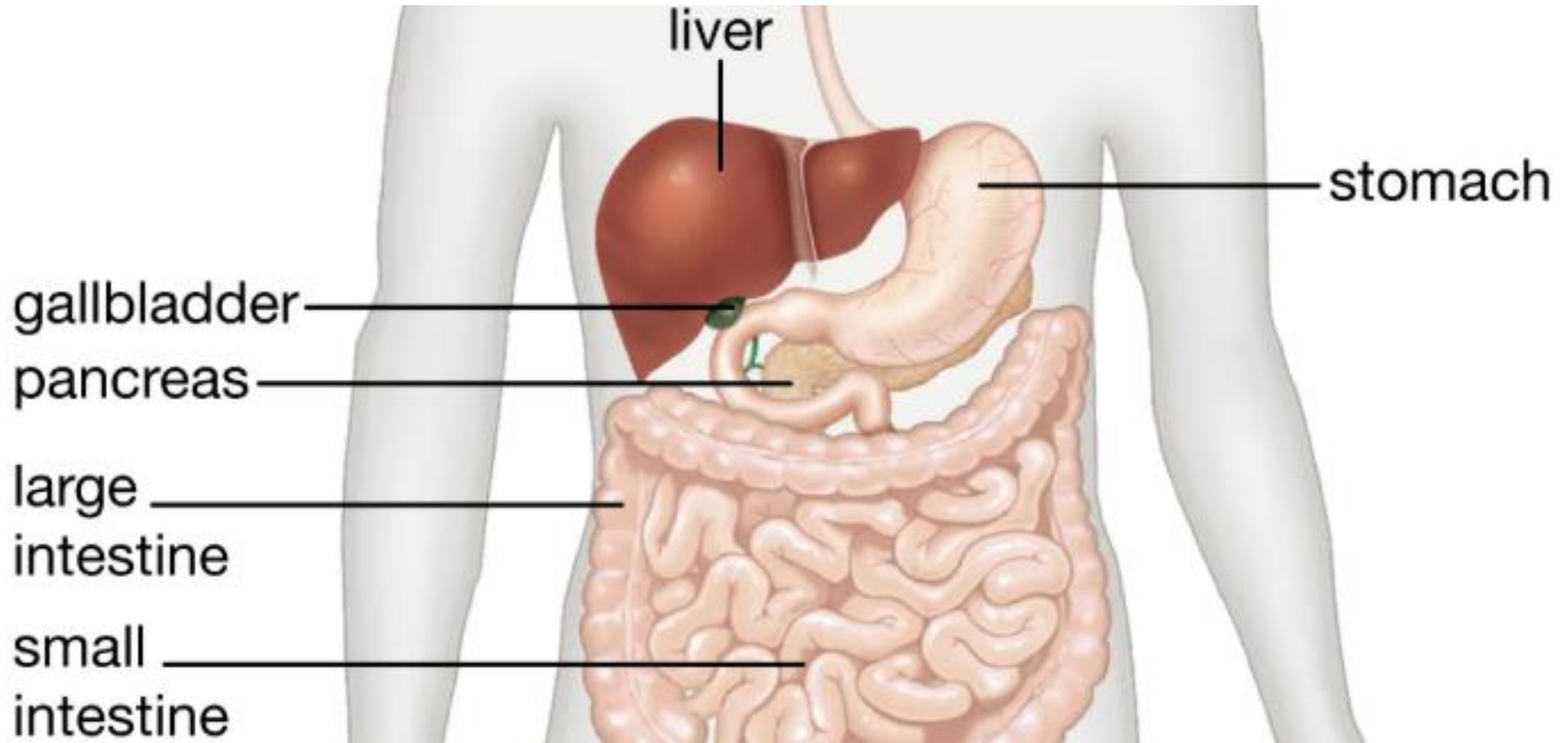- Detoxify and remove harmful substances from the blood.

What are the main functions of the panc (multiple choice):

- Secrete digestive enzymes.
- Secrete insulin and other hormones for metabolism and blood glucose control.

bile

common bile duct

pancreatic duct (duct of Wirsung)

body of pancreas

tail of pancreas

Pancreas in situ

accessory pancreatic duct

duodenum

interlobular duct

stomach

pancreas

plicae circulares

large intestine

small intestine

head of pancreas

duodenal papilla (papilla of Vater)

hepatopancreatic ampulla (ampulla of Vater)

acinar cells

flow of digestive enzymes to duodenum

interlobular ducts

capillary network

alpha cell

beta cell

delta cell

central duct

islet of Langerhans

© 2010 Encyclopædia Britannica, Inc.

Overview of the Pancreas

liver

stomach

gallbladder

pancreas

large intestine

small intestine

Overview of the Pancreas - sections

- It has four sections
  body and tail
- The head is located
  delivering the pand
  pancreatic duct.
- The neck of the pa
  connecting the hea
- The body of the pa
  pancreas.
- The tail of the pand
  pancreas, connecte

bile

common
bile duct

pancreatic duct
(duct of Wirsung)

body of
pancreas

tail of
pancreas

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(papilla of Vater)
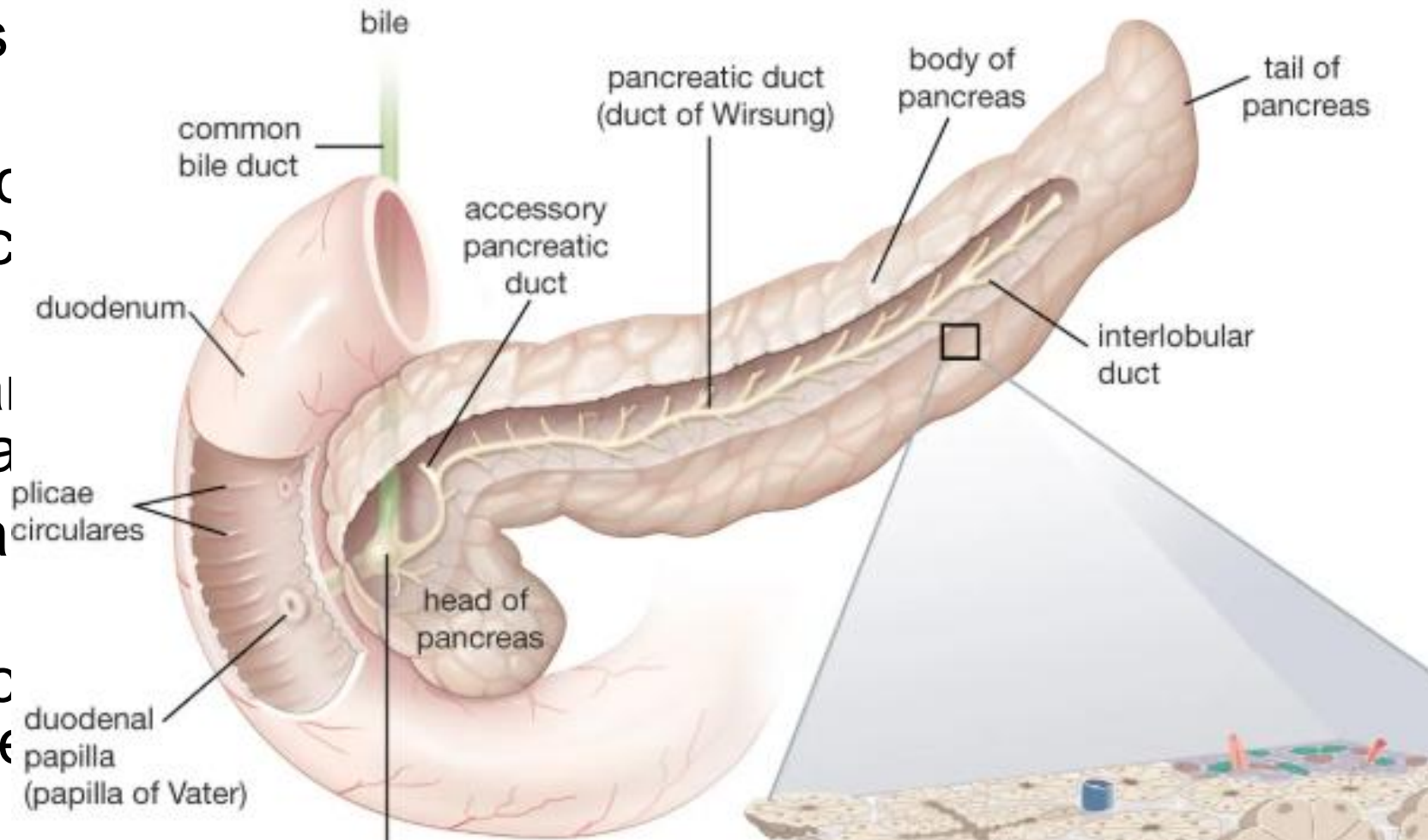
Dual Functions of the Pancreas

- Exocrine – >95% of pancreatic tissue
  - o Made up of acinar cells which are gathered in clusters known as acini.
  - o Produce digestive enzymes to break down fats, proteins and complex carbohydrates
- Endocrine – 1-2% of pancreatic tissue
  - o Made up of Islet of Langerhans
  - o Secrete hormones to regular blood glucose levels.

Exocrine Function

- The acinar cells produce and release digestive enzym
  - o **Protease**
  - o **Lipase**
  - o **Amylase**

- The pancreas also **secretes bicarbonate ions**

- The secretion of enzymes and bicarbonate is controlled by hormones released from the small intestine:
 - o Secretin
  - o Cholecystokinin (CCK)
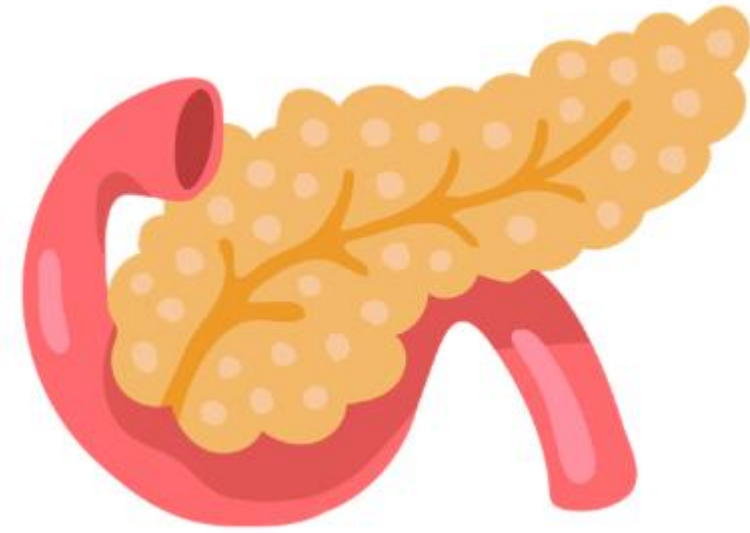
Exocrine Function

- The foods we eat are made up of three macronutrients – fat, carbohydrates and proteins and micronutrients – fat-soluble and water-soluble vitamins and minerals.

- Starchy carbohydrates, fats and proteins need to be broken down to be absorbed and used by the cells.

- The digestive enzymes produced by the pancreas (pancreatic enzymes) break these down into their smaller parts. These parts are then absorbed by the body cells via the small bowel.

- Carbohydrates and fats provide the body with energy, and proteinprovides the building blocks for healing and tissue growth (e.g.muscle growth)

Endocrine Function

The Islet of Langerhans release hormones to aid blood glucose control:

- **Insulin** - lowers blood glucose levels, facilitates glycogen) and encourages fat storage and protein synthesis.

- **Glucagon** - increases blood glucose levels and promotes lipolysis.

- **Somatostatin -** regulatory hormone

- **Pancreatic polypeptide -** regulates enzyme secretion and gallbladder contraction.

- **Ghrelin** - stimulates appetite
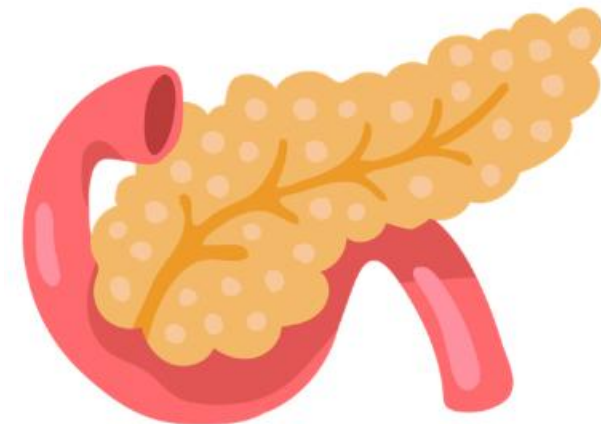
Type 3c Diabetes

Type 3c diabetes can occur when there is **damage to the pancreas** and it **stops producing enough insulin or glucagon** for the body. Type 3c diabetes can occur in those with pancreatic cancer, pancreatitis (acute and chronic) and post pancreatic surgery.

Symptoms of diabetes– the four T's:

- **Toilet** – increased urination
- **Thirst** – increased thirst
- **Tired** – increased tiredness
- **Thinner** – unintentional weight loss

Malnutrition in Pancreatic Cancer

"Malnutrition is a state of nutrition in which a **deficiency** or excess (or imbalance) of **energy, protein and other nutrients** causes measurable **adverse effects on tissue / body form** (body shape, size and composition) and **function and clinical outcome**." (BAPEN, 2020)

Malnutrition in Pancreatic Cancer - Cachexia

- Occurs in 46-89% of those with pancreatic cancer (yule, 2024 & Yoon et al, 2025)

- Cachexia is caused by pathophysiological metabolic changes, tumour microenvironment interactions and systemic inflammation.

- Muscle wasting is one of the key features due to increased catabolic activity (Yule, 2024).

- Inflammation drives changes in the adipose tissue, converting white fat (storage) to brown fat (energy) (Yule, 2024)
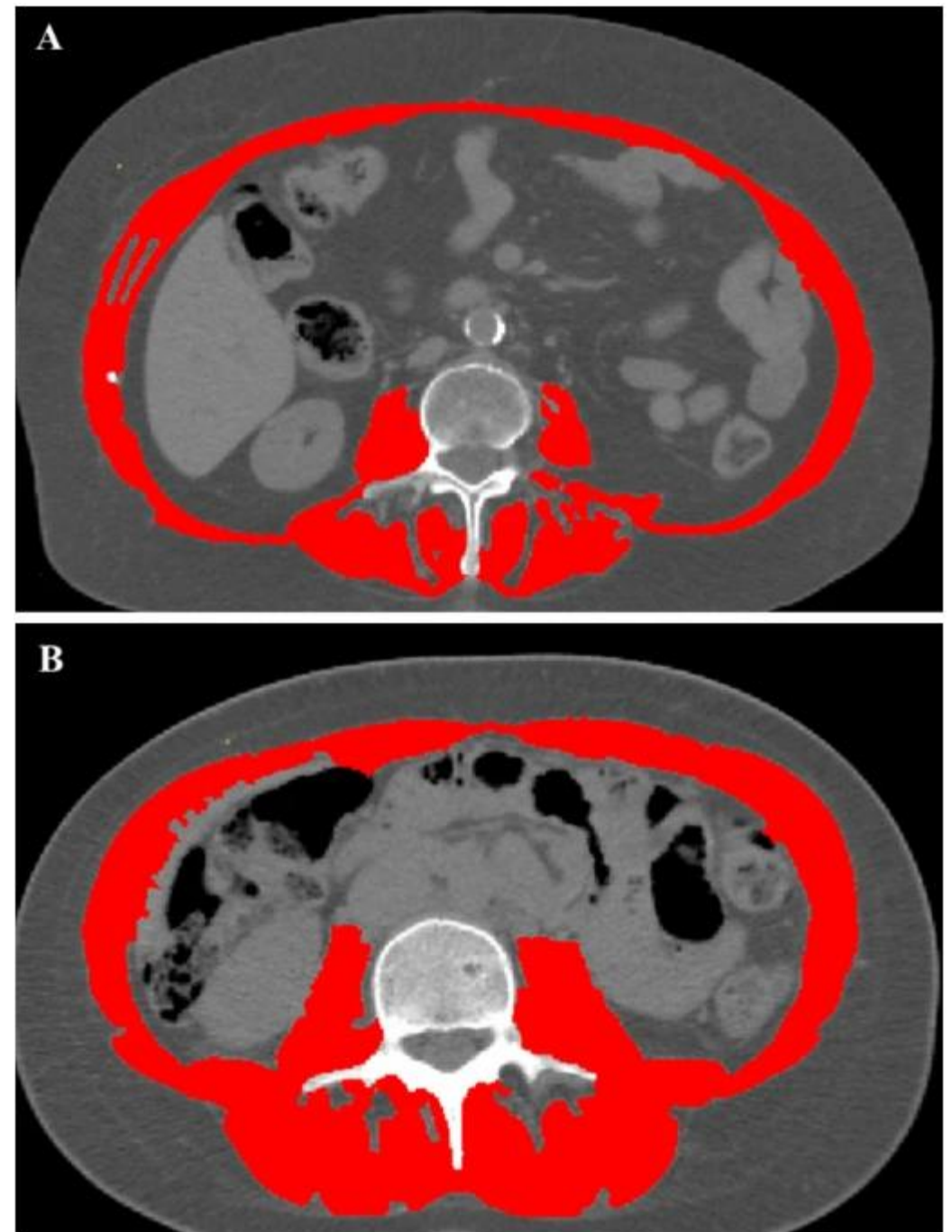
Sarcopenia

- Sarcopenia is the loss of skeletal muscle mass and is a symptom of cachexia.

- It effects ~40% of those with pancreatic cancer (Tsukagoshi, Araki & Shirabe, 2024)

- High BMI can hide sarcopenia

Image – CT body composition of Patient A and Patient B:

A. Sarcopenic

B. Non-Sarcopenic

(Chianca et al, 2022)

Frailty

- Frailty is the reduction in physiological reserve.

- Frailty effects 45% of those with pancreatic cancer (Zhang, Yan & Ge, 2023).

- Frailty increases the risk for post operative complications, treatment outcomes and overall survival rate.

- Can be measured using the Clinical Frailty Scale

Clinical Frailty Scale*

1 **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 **Well** – People who have **no active disease** symptoms but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 **Managing Well** – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.

4 **Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being "slowed up", and/or being tired during the day.

5 **Mildly Frail** – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 **Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

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(Rockwood, 2005)

Factors affecting Nutritional Status

- **Pancreatic Exocrine Insufficiency** – malabsorption of fat, protein and complex carbohydrates related to damage to the pancreas

- **Type 3C Diabetes** – impaired insulin secretion increasing metabolic instability

- **Tumour location** - gastric outlet obstruction, delayed gastric emptying and biliary obstruction

- **Systemic inflammation and cachexia** – catabolism accelerates muscle and fat breakdown.

Assessing Nutritional Status

ADULT NUTRITIONAL ▲

Category	
	Admission Date DD/
	Weight_____ k
	Circle: Measured/ Re
	Time (24hour clock)
	Weight (kg) / indicate
	(Measured, Reported
Weight (consider fluid retention when assessing weight history)	Unintentional weigh months, **extremely th**
	Unintentional weigh
	No weight loss
Appetite (current)	Little or no appetite
	Poor: eating less thar
	Reduced: eating half
	Good: eats 3 meals/d
Ability to eat (current)	NBM for more than 5
	Unable to tolerate fo vomiting, constipatio
	Requires prompting.
	No difficulties, able t
Stress Factor (if clinical condition is not listed, choose a similar condition)	Upper GI cancer (pre output stoma/fistula. pancreatic or Bone N
	Moderate surgery e. **Malignant disease** w **Recent multiple inju Bowel surgery** (unco **Kidney** e.g. acute kid **Severe infection** e.g. **Pancreatitis** (acute &
	Progressive disorder failure, COPD). **Strok** Fractured neck of fen Uncomplicated /stabl Uncomplicated condi
Pressure Ulcer/ Wound (if ungradable choose highest)	Cat 4 pressure ulcer c
	Cat 3 pressure ulcer c
	Cat 1-2 pressure ulce
	Pressure areas intact,

See Page 2 for Action

Scored Patient-Generated Subjective Global Assessment (PG-SGA)

History: Boxes 1 - 4 are designed to be completed by the patient.
[Boxes 1-4 are referred to as the PG-SGA Short Form (SF)]

Patient Identification Information

1. Weight *(See Worksheet 1)*

In summary of my current and recent weight:

I currently weigh about _____ kg
I am about _____ cm tall

One month ago I weighed about _____ kg
Six months ago I weighed about _____ kg

During the past two weeks my weight has:

☐ decreased (1)   ☐ not changed (0)   ☐ increased (0)

Box 1 ☐

2. Food intake: As compared to my normal intake, I would rate my food intake during the past month as

☐ unchanged (0)
☐ more than usual (0)
☐ less than usual (1)

I am now taking

☐ *normal food* but less than normal amount (1)
☐ little solid food (2)
☐ only liquids (3)
☐ only nutritional supplements (3)
☐ very little of anything (4)
☐ only tube feedings or only nutrition by vein (0)   **Box 2** ☐

3. Symptoms: I have had the following problems that have kept me from eating enough during the past two weeks (check all that apply)

☐ no problems eating (0)
☐ no appetite, just did not feel like eating (3)   ☐ vomiting (3)
☐ nausea (1)   ☐ diarrhea (3)
☐ constipation (1)   ☐ dry mouth (1)
☐ mouth sores (2)   ☐ smells bother me (1)
☐ things taste funny or have no taste (1)   ☐ feel full quickly (1)
☐ problems swallowing (2)   ☐ fatigue (1)
☐ pain; where? (3) _____
☐ other (1)** _____

Examples: depression, money, or dental problems   **Box 3 ☐

4. Activities and Function:

Over the past month, I would generally rate my activity as:

☐ normal with no limitations (0)
☐ not my normal self, but able to be up and about with fairly normal activities (1)
☐ not feeling up to most things, but in bed or chair less than half the day (2)
☐ able to do little activity and spend most of the day in bed or chair (3)
☐ pretty much bed ridden, rarely out of bed (3)

Box 4 ☐

The remainder of this form is to be completed by your doctor, nurse, dietitian, or therapist. Thank you.

Additive Score of Boxes 1-4 ☐ **A**

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email: faithotterymdphd@gmail.com or info@pt-global.org

+ Step 3
Acute disease effect score

If patient is acutely ill **and** there has been or is likely to be no nutritional intake for >5 days
Score 2

Acute disease effect is unlikely to apply outside hospital. See 'MUST' Explanatory Booklet for further information

...ion

: of malnutrition
2 or more High Risk

2 or more High Risk
Treat*

• Refer to dietitian, Nutritional Support Team or implement local policy
• Set goals, improve and increase overall nutritional intake
• Monitor and review care plan Hospital – weekly Care Home – monthly Community – monthly

* Unless detrimental or no benefit is expected from nutritional support e.g. imminent death.

...resence of obesity. For those with ...g conditions, these are generally controlled ...e treatment of obesity.

Re-assess subjects identified at risk as they move through care settings
See The 'MUST' Explanatory Booklet for further details and The 'MUST' Report for supporting evidence   © BAPEN

Anthropometrics / Functional Status

- Percentage weight loss
- Body composition analysis including MRI, CT and BIA
- Handgrip Strength
- Calf circumference
- Tricep Skinfold Measurement
- Mid-Upper arm circumference
- Sit-to-Stand

(PENG, 2018)

Biochemistry

o Full blood count, B12, folate and ferritin (NICE, 2024)

o Sodium, Potassium, Urea and Creatinine (NICE, 2024)

o Glucose and HbA1c (NICE, 2024; Phillips, 2021)

o Phosphate and magnesium (NICE, 2024)

o Calcium (NICE, 2024)

o C-reactive protein (NICE, 2024)

o Trace elements - selenium, zinc and copper (Phillips, 2021)

o Vitamin A, D, E and K (Phillips,2021)

o Parathyroid hormone (Phillips,2021)

TEST RESULTS
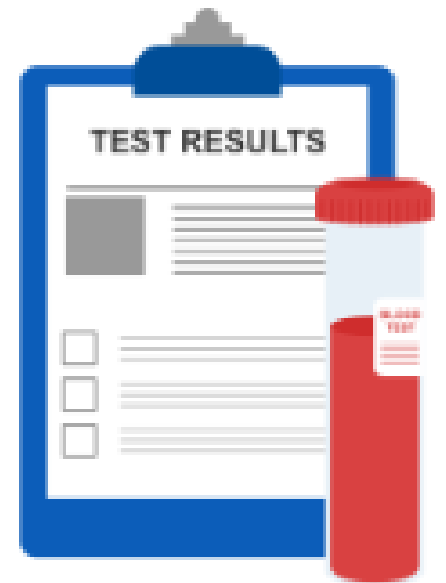
Clinical

- Symptoms impacting nutritional intake e.g.
  - o Diarrhoea (?PEI related) / Constipation
  - o Nausea
  - o Low appetite
  - o Mouth soreness
  - o Taste changes
  - o Early satiety
  - o Lethargy
  - o Reflux
  - o Bloating

- Faecal Elastase results

- DEXA (bone density) scan

- Knowledge and confidence in pancreatic enzyme replacement therapy (PERT)

Nutritional intake and barriers

- **Estimate nutritional intake** using 24hour recall, 3-day food diary or typical day (BAPEN, 2020)

- **Optimisation of PERT**

- **Estimate energy requirements** using Basal Metabolic Rate +/- physical activity levels using clinical reasoning and PENG/ESPEN recommendations (BAPEN, 2020; PENG, 2018; ESPEN, 2016).

- **Estimate protein requirements** using PENG/ESPEN recommendations and clinical reasoning (PENG, 2018; ESPEN, 2016)

Case Study

78 year old man is referred by the GP for **nutrition support** following a recent diagnosis of **pancreatic cancer** (head of pancreas). She reports **bloating**, **tiredness** and **weight loss**.

What we should check in the nutritional assessment of this patient? Discuss in the chat.

Case Study Answers

- Nutritional screening score
- Percentage weight loss
- Handgrip strength / sit to stand / mid upper arm circumference
- Recent biochemistry
- Signs of pancreatic exocrine insufficiency/ malabsorpti
- Check the four T's
- Review nutritional intake – is it sufficient
- Review barriers to intake
- Review changes to activity levels

Key Points

- The pancreas has two main functions – **exocrine** (digestive enzyme production and secretion) and **endocrine** (insulin and glucagon secretion)

- When the pancreas is damaged, the person is **at risk of developing type 3c diabetes** and can be **identified with the four T's**

- Malnutrition is significantly prevalent in pancreatic cancer, effecting **46-89% of those living with pancreatic cancer**

- Assessment of nutritional status should include more than just the person's BMI, as **sarcopenia is often masked.**

- Factors impacting nutritional status include exocrine and endocrine **damage**, **obstruction** to the gastrointestinal tract and systemic **inflammation**.

References

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