Diabetes Milletus type II

Medical treatment and Nutritional management

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Diabetes Self-Management Education & Support (DSME & DSMS).

- All people with diabetes should participate in DSME and DSMS both at diagnosis and as needed thereafter.
- Effective self-management, improved clinical outcomes, health status, and quality-of-life are key outcomes .
- DSME/S should be patient-centered, respectful, and responsive to individual patient preferences, needs, and values.

American Diabetes Association Standards of Medical Care in Diabetes. Lifestyle Management. Diabetes Care 2017; 40 (Suppl. 1): S33-43

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Diabetes Self-Management Education & Support (DSME & DSMS).

Four critical time points for DSME/S delivery:

1. At diagnosis
2. Annually for assessment of education, nutrition, and emotional needs
3. When new complicating factors arise that influence self-management; and
4. When transitions in care occur

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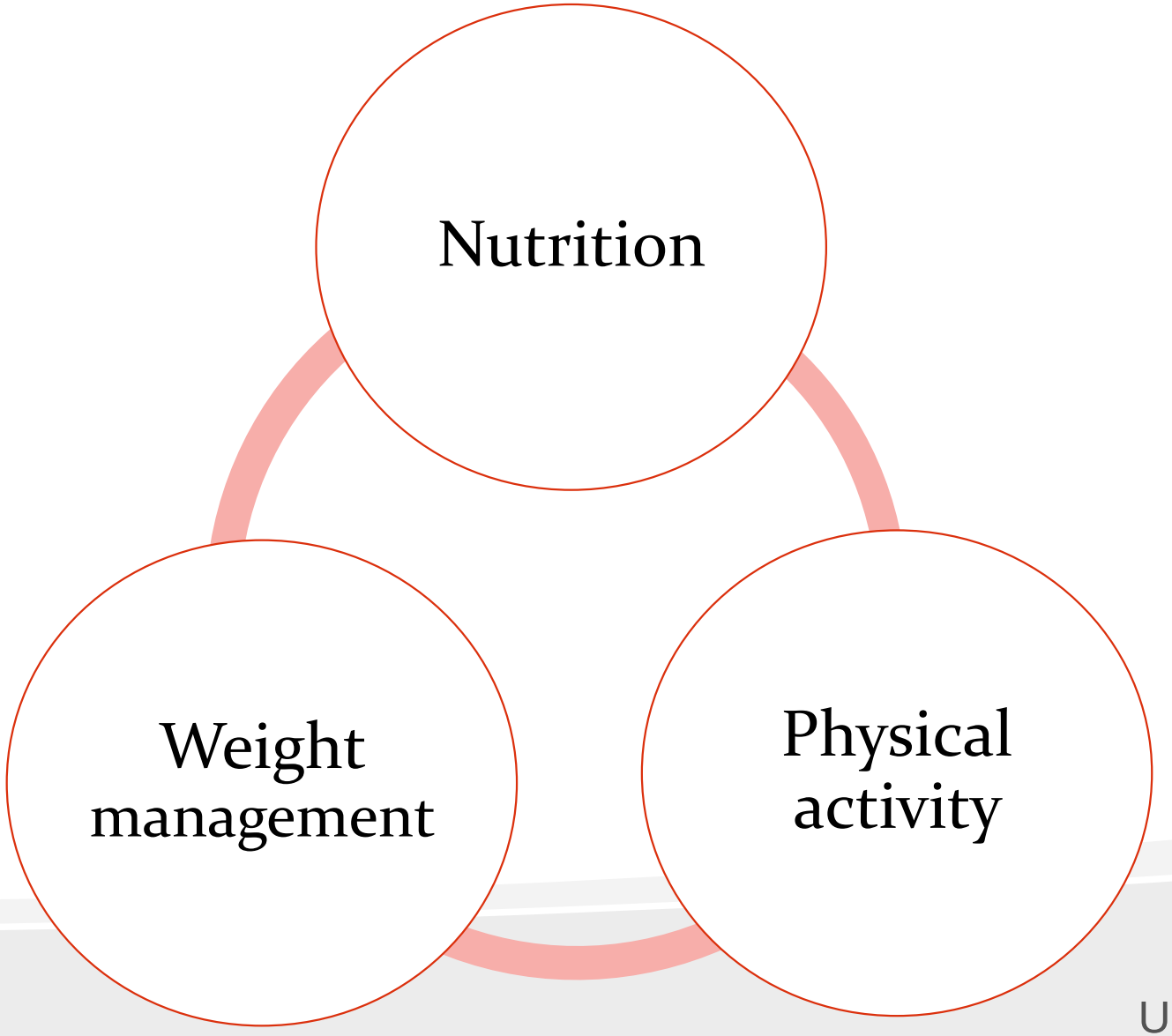
Diabetes Milletus II- Lifestyle management



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Diabetes Milletus II- Nutrition

Goals of Nutrition Therapy

1. Promote & support healthful eating patterns, emphasizing a variety of nutrient-dense foods in appropriate portion sizes, to improve health and to:
   - Achieve and maintain body weight goals
   - Attain individualized glycemic, blood pressure, and lipid goals
   - Delay or prevent complications of diabetes

2. Address nutrition needs based on personal & cultural preferences, health literacy, **access to healthful foods**, **willingness and ability to make behavioral changes & barriers to change.**

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Goals of Nutrition Therapy (2)

3. To maintain the pleasure of eating by providing **non-judgmental messages about food choices.**

4. Provide **practical tools** for developing healthful eating patterns rather than focusing on **individual macronutrients, micro-nutrients, or single foods**.

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Diabetes II- Medical Nutrition Therapy (MNT)

Effectiveness of Nutrition Therapy:

- An individualized MNT program is recommended for all people with DM.
- For people on a flexible insulin program, education on carb counting and, in some cases, fat and protein gram estimation can improve glycemic control.
- For people whose daily insulin dosing is fixed, a consistent pattern of carb intake can result in improved glycemic control and a reduced risk of hypoglycemia.

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Diabetes II- Medical Nutrition Therapy (MNT)

Effectiveness of Nutrition Therapy (2):

- Emphasizing healthy food choices and portion control may be more helpful for those with DM II who are not taking insulin, who have limited health literacy, and who are elderly and prone to hypoglycemia.

- Because diabetes nutrition therapy can result in cost savings and improved outcomes (e.g., A1C reduction), MNT should be adequately reimbursed by insurance.

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Diabetes II- Medical Nutrition Therapy (MNT)

- **Energy Balance:**

Modest weight loss by the combination of lifestyle modification and the reduction of calorie intake → benefits overweight or obese adults with DM II and also those with prediabetes.

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Diabetes II- Medical Nutrition Therapy (MNT)

Eating patterns & macronutrient distribution:

- **Macronutrient distribution should be individualized** while keeping total calorie.
- **Avoid sugar-sweetened beverages** to control weight and reduce their risk for CVD and fatty liver .
- Minimize added sugars.
- **Mediterranean, DASH, and plant-based diets** could be used for treatment and prevention.

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Diabetes II- Medical Nutrition Therapy (MNT)

- **Carbohydrates:**

Carbohydrate intake from :

→ whole grains, vegetables, fruits, legumes, and dairy products.
→ High fiber content & Low glycemic load.

- **Carbohydrate Consistency:**

→ Meal timing and carbohydrate intake day-to-day.

→ Most important when patients in DM II (prevent hypoglycemia)

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Diabetes II- Medical Nutrition Therapy (MNT)

- **Carbohydrate counting:**

  → Help in glycemic control.

  → Consistent pattern of carbohydrate consumption.

  →Exchange lists.

- **Carbohydrate intake (amount) :**

  → 30 to 45 grams at meals and 15 to 20 grams of for snacks.

  → no less than 130 grams?

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Diabetes II- Medical Nutrition Therapy (MNT)

- **Glycemic index & glycemic load:**

→ Foods containing the same amount of carbohydrate can have significantly different glycemic effects

→ Recommend low GI foods.

A meta-analyses of trials comparing low and high glycemic index diets in individuals with either type 1 or type 2 diabetes, **low GI diets significantly reduced A1C by 0.4 to 0.5 percentage points** (Elliot & Thomas, 2009)

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Diabetes II- Medical Nutrition Therapy (MNT)

Other Nutrients:

- **Protein** – increase insulin response without increasing plasma glucose concentrations/ in Hypoglycemia?

- **Fat**- increase intake of MUFA / May improve glucose metabolism and lower CVD risk.

→ ω-3 fatty acids, such as fatty fish, nuts, and seeds, is recommended to prevent or treat CVD

ω-3 dietary supplements?

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Diabetes II- Medical Nutrition Therapy (MNT)

Micronutrients and herbal supplements:

- No clear evidence of benefit.
- Safety concerns regarding the long-term use of **antioxidant supplements** such as vitamins E and C and carotene.

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Diabetes II- Medical Nutrition Therapy (MNT)

- **Alcohol**- Only in moderation / increased risk for hypoglycemia.

- **Sodium**- limit sodium consumption to < **2,300 mg/day.**

  What about HTN?

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HEALTHY COOKING TIPS

How food is prepared can be just as important in controlling diabetes as the food you eat. Here are some healthy cooking tips you may find helpful:

Skim fat from the top of soups and stews. Fat floats to the top as soups and stews chill. Just skim off the fat, reheat, and eat.

Limit salt. Don't add salt to food or cook with salt. Season foods with herbs, spices, vinegar, wine, or lemon juice.

Eat or cook with skim or 1% milk instead of whole milk or 2% milk.

Grill, broil, roast, stir-fry, or poach only low-fat meats.

Use lemon or lime on fish and vegetables instead of butter or sauces.

Prepare foods using vegetable oil sprays instead of oil, shortening, or butter. Small amounts of canola or olive oil are best if you use oils.

Prepare chicken or turkey without the skin. Trim fat off meats before cooking.

Use only low-fat or fat-free milk, yogurt, cheeses, and meats in recipes.

Steam vegetables using water or a low-fat, low-salt broth.

Cook with whole-grain products (such as brown rice, oatmeal, barley, bran) rather than refined-grain products.

Add vegetables to casseroles and salads.

Healthy cooking tips are the same for people with or without diabetes. Talk to your diabetes educator, dietitian, or doctor for more information.

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A HEALTHY MEAL PLAN SHOULD INCLUDE:

COMPLEX CARBOHYDRATES

whole grain bread, oatmeal, potatoes, brown or wild rice

FIBER

beans, whole grains, fruits & vegetables

PROTEIN

fish, chicken or turkey (without skin), eggs or egg whites, Select or Choice grades of beef trimmed of fat

LOTS OF VEGETABLES

especially the green, leafy ones

LIMITED AMOUNTS OF HEART-HEALTHY FATS

olive, peanut or canola oil, walnuts, almonds & flax seed

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Diabetes II- Medical Nutrition Therapy (MNT)

Nonnutritive sweeteners:

- Has the potential to **reduce overall calorie** and carbohydrate intake **if substituted** for caloric sweeteners and without compensation by intake of additional calories from other food sources.

- Safe to use within the defined acceptable daily intake levels.

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Diabetes II- Physical activity /Recommendations:

- Children with diabetes/prediabetes: at least 60 min/day.

- Adults: 150+ min/weak of **moderate-to-vigorous activity** over at least 3 days/week with **no more than 2 consecutive days without exercise**.
- Shorter durations (minimum 75 min/week) of **vigorous-intensity** or interval training may be sufficient for younger and more physically fit individuals.

- **Resistance training** → 2-3 sessions/week on nonconsecutive days

American Diabetes Association Standards of Medical Care in Diabetes. Lifestyle Management. Diabetes Care 2017; 40 (Suppl. 1): S33-43

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Diabetes II- Physical activity /Recommendations:

- All adults with DM II, should decrease the amount of time spent in daily sedentary behavior.

→ Prolonged sitting should be interrupted every 30 min for blood glucose benefits.

- **Flexibility training and balance training** are recommended 2–3 times/week for older adults with diabetes.

e,.g. Yoga may increase flexibility, muscular strength, and balance.

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Moderate-intensity Physical Activity (Approximately 3-6 METs) Requires a moderate amount of effort and noticeably accelerates the heart rate.	Vigorous-intensity Physical Activity (Approximately >6 METs) Requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate.
Examples of moderate-intensity exercise include:	Examples of vigorous-intensity exercise include:
• Brisk walking	• Running
• Dancing	• Walking / climbing briskly up a hill
• Gardening	• Fast cycling
• Housework and domestic chores	• Aerobics
• Traditional hunting and gathering	• Fast swimming
• Active involvement in games and sports with children / walking domestic animals	• Competitive sports and games (e.g. Traditional Games, Football, Volleyball, Hockey, Basketball)
• General building tasks (e.g. roofing, thatching, painting)	• Heavy shovelling or digging ditches
• Carrying / moving moderate loads (<20kg)	• Carrying / moving heavy loads (>20kg)

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Endurance	Strength	Flexibility
4 - 7 days/ wk	2 - 4 days/ wk	4 - 7 days/ wk
AEROBIC EXERCISE: Improving cardiovascular endurance requires challeng-ing your system by increasing aerobic activity for sustained periods of time (10-15 min.) Activities: brisk walking, biking, interval training, swimming, dancing	WEIGHT BEARING & RESISTANCE EXERCISES: Weight bearing exercises improve posture, increase muscle strength, bone density, & metabolism. Activities: weight lifting, resistance training	STRETCHING EXERCISES: Stretching elongates muscles & increases the blood flow for best performance. It improves your flexibility (range of motion) and decreases the chance of injury. Activities: tai chi, pilates, stability ball

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Diabetes II- Physical activity/benefits

Summary of the benefits of exercise in people with Type 2 Diabetes

Benefit	Effect
Greater metabolic control	Increased uptake of glucose (sugar) by the exercising muscles Decreased reliance on insulin Decreased reliance on other diabetes-related medications
Improved lipoprotein (fat) profile	Combining aerobic and resistance training increases lean muscle tissue and decreases abdominal (visceral) fat
Reduced cardiovascular disease risk	Exercise improves blood pressure and stops the development of atherosclerosis

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Diabetes II- Physical activity/benefits

- Regular exercise can reduce long - term mortality **by 50 – 60%** in patients with type 2 diabetes compared with patients with poor cardiorespiratory fitness

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Diabetes II- Physical activity/hypoglycemia

- Exercise **does not** usually cause **hypoglycaemia** in type 2 diabetes (in contrast to type 1 diabetes), and therefore extra carbohydrate is generally unnecessary.

- However, in case of insulin therapy or sulphonylureas:

  → A snack with 15g CHO is advised if blood sugar <70mg/dl.

  → Best to adjust medications or insulin to compensate for increased activity or a reduced calorie intake rather than add extra snacks, for weight control.

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Diabetes II- Weight management

- Weight loss is achieved by decreasing total energy intake and/or increasing physical activity and thus energy expenditure.
- **Gradual weight loss** is preferred –not more than 0.5 – 1 kg/week.
- For effective weight loss and improvement in glycaemic control, the amount of energy restriction is more important than dietary composition.
- Weight loss of as little as 4 kg will often ameliorate hyperglycaemia.
- **Reduced - calorie diets** result in clinically significant weight loss regardless of which macronutrients they emphasize.

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Diabetes II- Weight management

- A sustained weight loss of even **5 to 10 percent** of initial body weight can have a lasting beneficial impact on serum glucose, dyslipidemia, and hypertension.

- Intentional weight loss (up to 30 pounds) in one prospective study (n = 4970) was associated with a 25 percent reduction in total mortality over 12 years, and a 28 percent reduction in mortality secondary to cardiovascular disease and diabetes

Williamson DF &Thompson TJ, et al. Intentional weight loss and mortality among overweight individuals with diabetes. Diabetes Care 2000; 23:1499.

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Diabetes II- Weight management/ Strategies

	Body Mass Index Category (kg/m^2)				
Treatment	23.0* or 25.0-26.9	27.0-29.9	27.5* or 30.0-34.9	35.0-39.9	≥40
Diet, physical activity & behavioral therapy	┼	┼	┼	┼	┼
Pharmacotherapy		┼	┼	┼	┼
Metabolic surgery			┼	┼	┼

* Asian-American individuals

┼ Treatment may be indicated for selected, motivated patients.

American Diabetes Association Standards of Medical Care in Diabetes. Obesity management for the treatment of type 2 diabetes. Diabetes Care 2017; 40 (Suppl. 1): S57-S63

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Diabetes II- Weight management/ Strategies

- Diet, physical activity & behavioral therapy designed to achieve >5% weight loss should be prescribed for patients **ready to achieve weight loss.**
- Interventions should be high-intensity (≥16 sessions in 6 months) and focus on diet, physical activity & behavioral strategies to achieve a **500 - 750 kcal/day energy deficit.**
- **Individualized plan**

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Diabetes II- Weight management/ Strategies

- Short-term (3-month) interventions that employ very low calorie diets (≤800 kcal/day) and total meal replacements may be prescribed for **select patients** by **trained practitioners with close medical monitoring.**

- Involve long-term, comprehensive, weight maintenance counseling.

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Diabetes II- Weight management/ pharmacotherapy

- Antiobesity drugs have so far played only a minor part in the management of the obese patient with diabetes.
- May be effective adjuncts to lifestyle intervention for select type 2 patients with a BMI ≥27 kg/m2.
- Minimize the medications for comorbid conditions.
- **Potential benefits must be weighed against the potential risks of the medications.**

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Common Weight Loss Drugs

Drug	Efficacy	Common potential side effects	Safety
orlistat (Xenical, Alli)	*Weight loss:* 2 kg greater than placebo after 4 years of therapy *Clinical outcomes:* not documented	• Flatus, greasy/loose stools or diarrhea, fecal incontinence, and abdominal cramps • Worsened by increased dietary fat intake	• Contraindicated during pregnancy. • Malabsorption of fat-soluble vitamins; concurrent use of multivitamin recommended • Patients on warfarin may need to decrease their warfarin dose.
lorcaserin (Belviq)	*Weight loss:* 3.6 kg greater than placebo after 1 year of therapy *Clinical outcomes:* not documented	• Nausea • Headache • Dizziness	• Contraindicated during pregnancy. • Avoid use with other serotonergic agents (including most antidepressants, and some muscle relaxants). • Concern over increased rate of cardiac valve disease and a possible increase in the risk of breast tumors.
phentermine IR/ topiramate ER (Qsymia)	*Weight loss:* 7.5-8.8 kg greater than placebo after 2 years of therapy *Clinical outcomes:* not documented	• Anticholinergic symptoms (such as dry mouth and constipation) • Irritability, anxiety, insomnia, and depression • Increased heart rate	• Contraindicated in hyperthyroidism, glaucoma, patients taking MAO inhibitors, pregnancy. • Prescribe with a *Risk Management Program* for women of childbearing age, including monthly pregnancy test. • Adjust dose in renal and hepatic impairment. • Abuse potential. • Discontinuation requires tapering to avoid seizures.

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Bariatric surgery and DM II/ Recommendations

- Obese patients with BMI ≥ 40 and those with BMI > 35 when hyperglycemia is inadequately controlled despite other treatments.

- BMI 30-34.9 when hyperglycemia is inadequately controlled despite optimal medical control by either oral or injectable medications (including insulin).

** **Should be performed in high-volume centers with multidisciplinary teams that understand and are experienced in the management of diabetes and gastrointestinal surgery.****

American Diabetes Association Standards of Medical Care in Diabetes. Obesity management for the treatment of type 2 diabetes. Diabetes Care 2017; 40 (Suppl. 1): S57-S63

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Bariatric surgery and DM II/ Recommendations

- Long-term lifestyle support and routine monitoring of micronutrient/nutritional status must be provided after surgery.
- People presenting for metabolic surgery should receive a comprehensive mental health assessment.
- Surgery should be postponed in patients with histories of alcohol or substance abuse, depression, or other mental health conditions until these conditions have been fully addressed.

American Diabetes Association Standards of Medical Care in Diabetes. Obesity management for the treatment of type 2 diabetes. Diabetes Care 2017; 40 (Suppl. 1): S57-S63

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Bariatric surgery and DM II/ Effectiveness ?

- Either gastric banding or procedures that involve resecting, bypassing, or transposing sections of the stomach and small intestine

→Can be effective weight-loss treatments for severe obesity when performed **as part of a comprehensive weight-management program with lifelong lifestyle support and medical monitoring**

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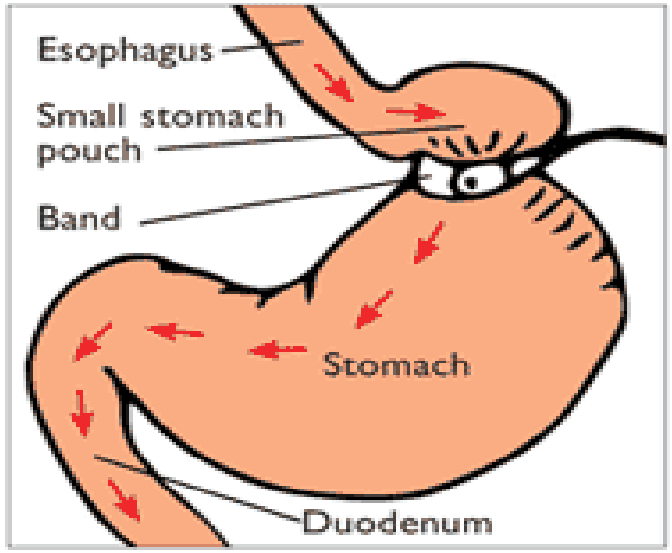

Figure 1. Laparoscopic adjustable gastric band

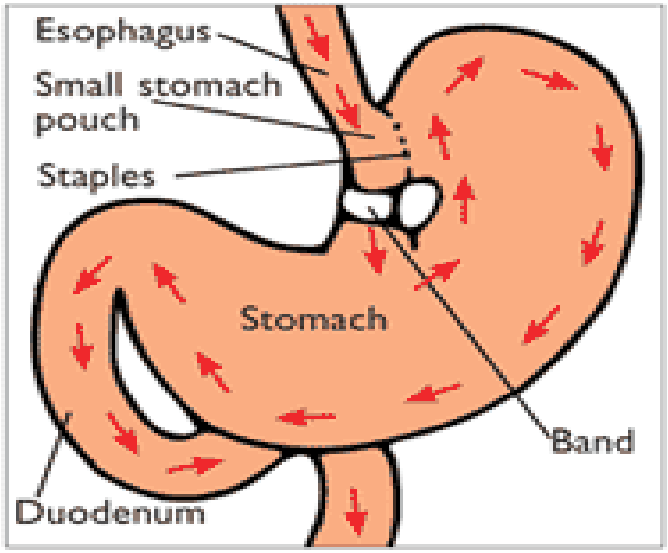

Figure 2.
Vertical banded gastroplasty

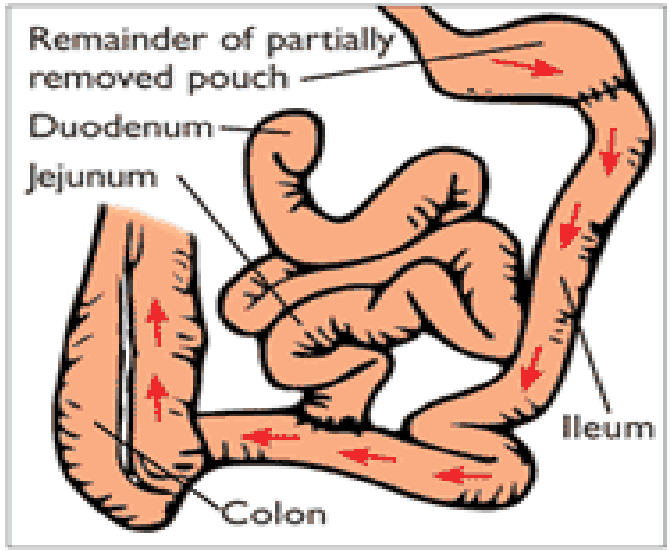

Figure 3.
Biliopancreatic diversion

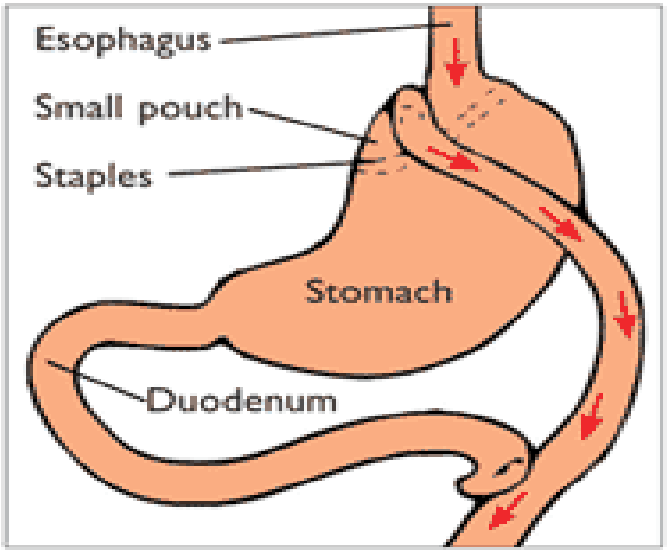

Figure 4.
Roux-en-Y gastric bypass

Source: Reference 24.

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Bariatric surgery / Is it A Cure ?

- Randomized controlled trials with postoperative follow-up ranging from 1 to 5 years have documented sustained **diabetes remission in 30–63% of patients**, **though erosion of remission occurs in 35-50% or more.**

- **Metabolic surgery** - Surgical operations with intestinal diversion have consistently shown the capacity to improve glucose homeostasis by modulating gut hormones, beyond reducing energy intake and body weight. (Koliaki et al,2017)

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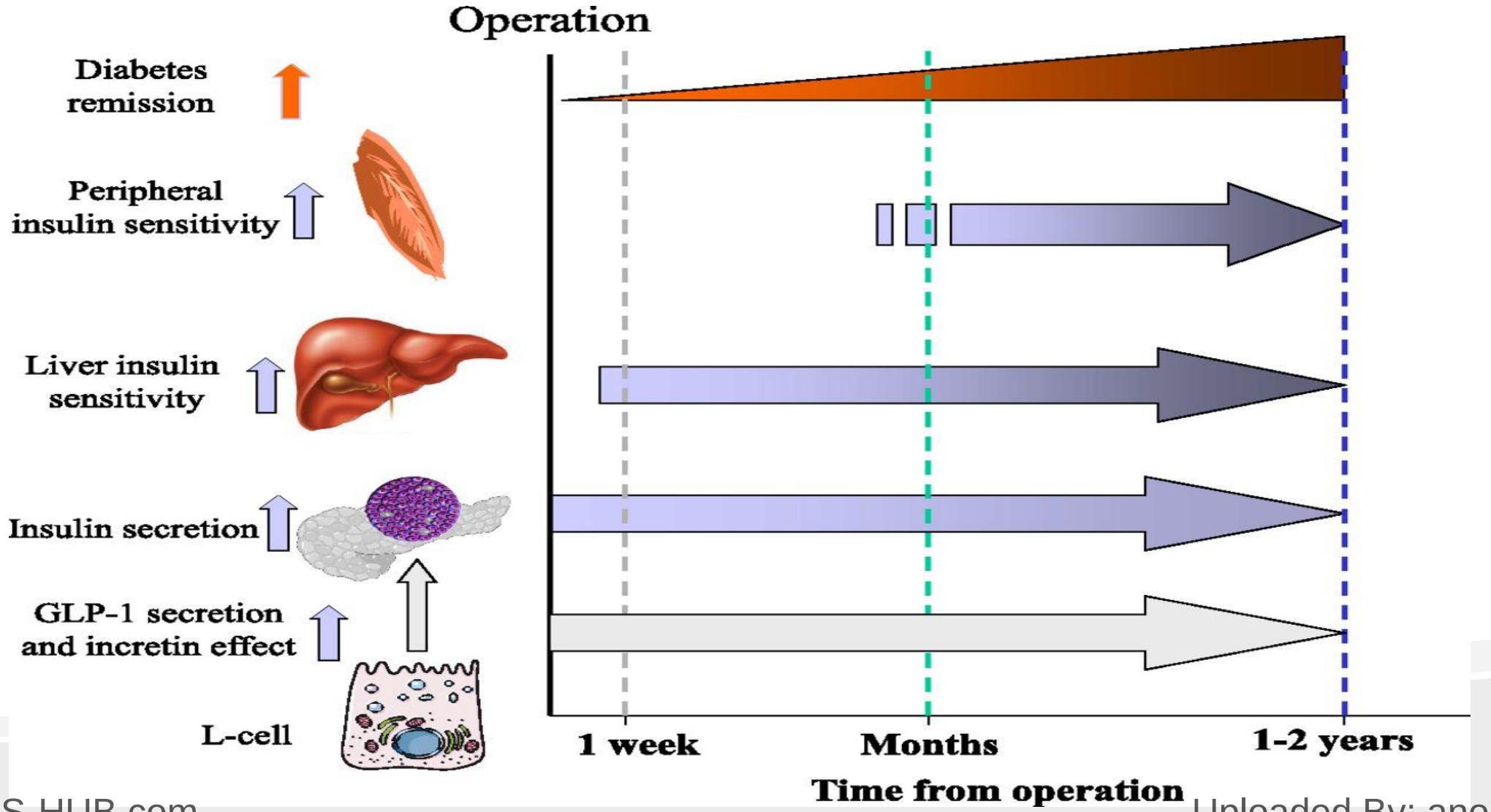
Bariatric surgery and DM II/ Benefits



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Bariatric surgery- Adverse effects

- Costly
- Some associated risks
- Outcomes vary
- Patients undergoing metabolic surgery may be at higher risk for depression, substance abuse, and other psychosocial issues

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DM II- Case study

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Case study- **A 57-year-old woman with newly discovered type 2 diabetes**

- A 57-year-old woman was found to have hyperglycemia at a health fair when a **random blood glucose level was 227 mg/dL**. Several days later a **fasting blood glucose value was 147 mg/dL.**
- No previous history of diabetes, she is alarmed by the possibility of having this disorder, and seeks your advice.
- The patient has been treated for **hypertension** for 10 years.
- She was once told that her **cholesterol value was "borderline high,"** but does not know the value.

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Case study- **A 57-year-old woman with newly discovered type 2 diabetes**

- She denies symptoms of diabetes, chest pain, shortness of breath, heart disease, stroke or circulatory problems of the lower extremities.
- **Current weight = 75 kg.**
- She thinks she **weighed 54 kg at age 21 years**, but gained weight with each of her three pregnancies, and did not return to her non-pregnant weight after each delivery.
- No family medical history is available because **she was adopted.**

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Case study- **On examination**

- She does not eat breakfast, has a modest lunch and consumes most of her calories at supper and in the evening.
- On examination:
  - **Blood pressure** : 140/85
  - **Weight** : 76 kg , BMI : 30.9 kg/m2.
  - **Foot exam**: Light touch sensation is reduced.
  - **Eye exam** : no evidence of retinopathy

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Case study- What are your thoughts?

- What is/are the medical problems that the patient has?
- What are the risk factors that might lead to DM II?
- What other comorbidities might have lead to DM II?
- Do you think that the patient is a new DM II case ? Why?

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Case study - Answers

- The patient has type 2 diabetes.
- Risk factors : Obesity, Lifestyle, Family history ?
- The patient has CVD related comorbidities.
- The patient has had diabetes for a prolonged period because of evidence of distal sensory neuropathy on exam.

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Case study- Laboratory results

- **Fasting glucose**= 141 mg/dL .
- **Triglycerides** = 210 mg/dL (2.4 mmol/L),
- **Total cholesterol** = 222 mg/dL .
- **HDL cholesterol** = 73 mg/dL .
- **LDL cholesterol** = 107 mg/dL .
- **A1C** = 8.4 percent.
- **The urine microalbumin/creatinine ratio** = 14.3 mg/g.

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Case study- What are your thoughts?

- What is/are the laboratory values of interest to you as a dietitian?
- What are the parts of MNT that you can follow with the patient?
- Do you have any lifestyle tips to give for this patient?

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Case study - Answers

- You note the lipid values and plan to reassess them when the patient's diabetes is in satisfactory control.
- Preventing further weight gain and achieving modest weight reduction.
- Exercise ?
- 3 meals/day and 2 snacks.
- Control the size of portions, to reduce the evening snacks, and to limit her intake of fat.
- individualized counseling

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DM II- Pharmacological therapy

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Glucose lowering drugs

Main classes of oral agents:

- Metformin- Glucophage.
- Sulphonylureas - Amaryl .
- DPPIV inhibitors
- SGLT 2IS.
- GLP-1 analogues
- Meglitinides
- Thiazolidinediones (Glitazones)
- Alpha Glucosidase Inhibitor

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Metformin

- **lowering glucose mainly by decreasing hepatic glucose output.**
- Decreases absorption of glucose from GI tract
- Increases insulin sensitivity in peripheral tissues (exogenous and endogenous)
- **No** increased insulin secretion -**hypoglycaemia very rare**
- Reduces insulin levels
- Increases GLP-1 secretion

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Metformin

- It does not cause weight gain and, indeed, has **some appetite - suppressing activity that may encourage weight loss.**

- A typical **starting dose** of metformin is 500 mg daily or twice daily, rising to 850 mg twice daily.

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Metformin – side effects

- Major side effects are nausea, anorexia or diarrhoea, which affect about 1/3 of patients.
- Lactic acidosis is a rare but serious side effect that carries high mortality.
- It can be avoided by not giving metformin to patients with **renal, hepatic, cardiac or respiratory failure or those with a history of alcohol abuse.**

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Sulphonylureas

- The sulphonylureas are an old, but very effective, group of antidiabetic agents.
- Discovered during the treatment of typhoid with sulphonamide derivatives
- They are usually prescribed for people with type 2 diabetes who are not overly obese.

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Sulphonyureas

- Stimulate insulin secretion by binding to sulphonylurea (SU) receptors (SUR - 1) on the β cell plasma membrane, which leads to closure of the ATP - sensitive K+ channel, membrane depolarisation, opening of calcium channels, calcium influx and exocytosis of insulin granules
- The most serious side effect is hypoglycaemia, especially in older patients and those with renal impairment.
- Modest weight gain may also accompany sulphonylurea use.

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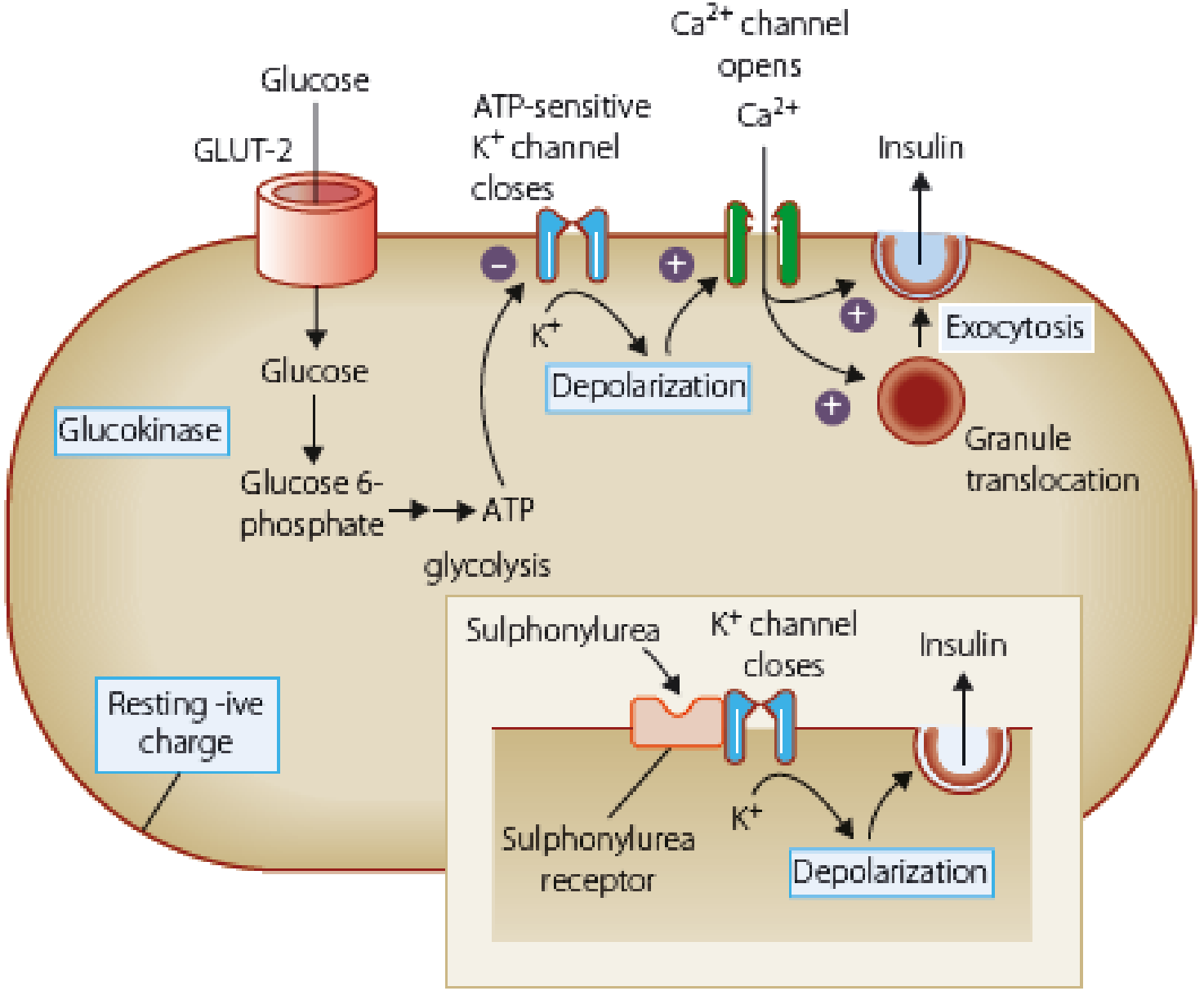

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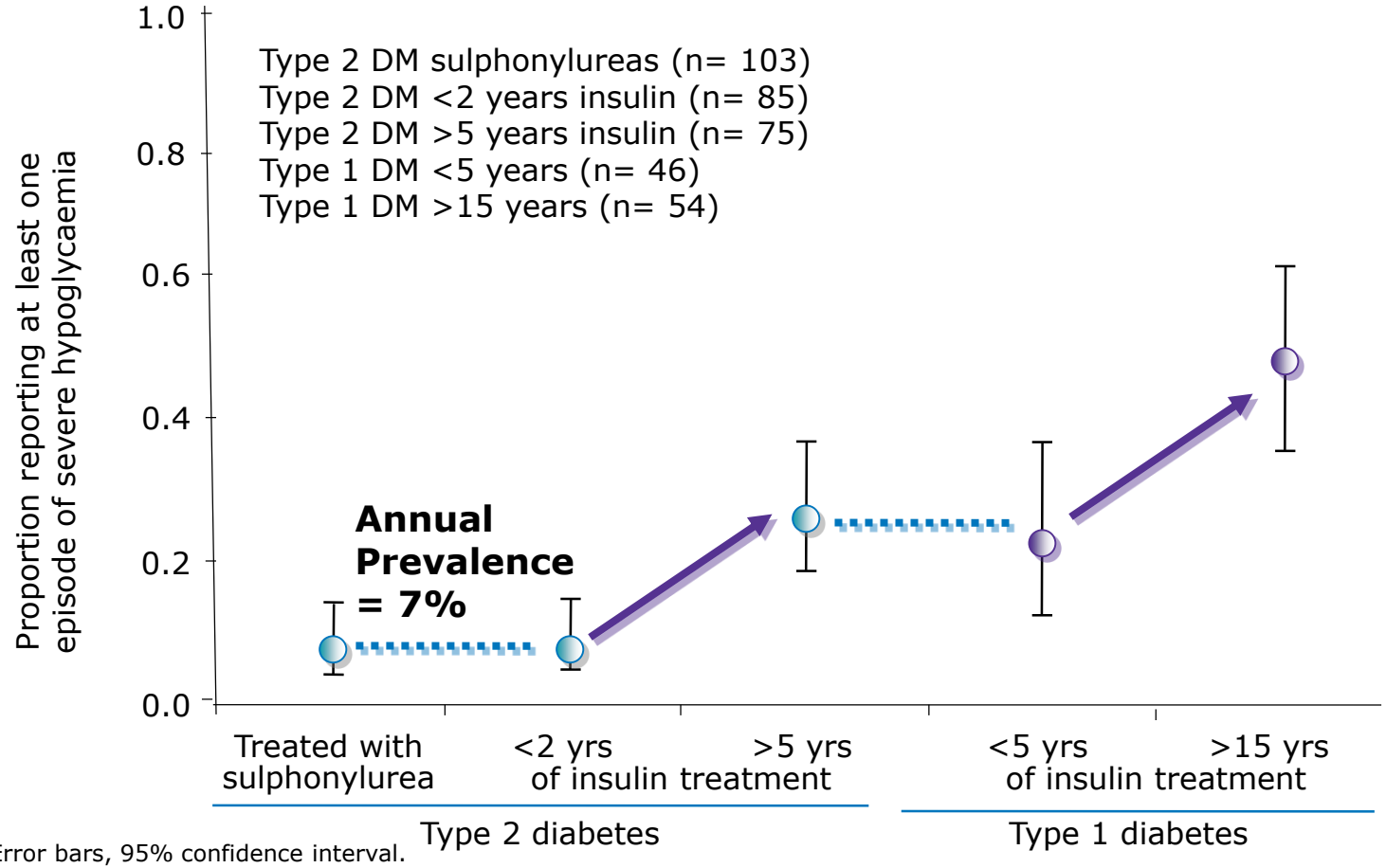
The incidence of severe hypoglycaemia increases with duration of treatment



Error bars, 95% confidence interval.

- The proportion of patients with type 2 diabetes experiencing severe hypoglycaemia was similar for those treated with sulphonylureas or insulin for <2 years (7% in both groups)

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Adapted from UK Hypoglycaemia Study Group. Diabetologia. 2007;50:1140-7.

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Thiazolidinediones (TZD)

- Bind to and activate peroxisome proliferator-activated receptor-gamma (PPAR-gamma)
- less insulin resistance, decreased insulin levels
- Increased risk of MI, stroke and heart failure.
- Increased risk of bladder cancer?

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Thiazolidinediones (TZD) mechanism of action

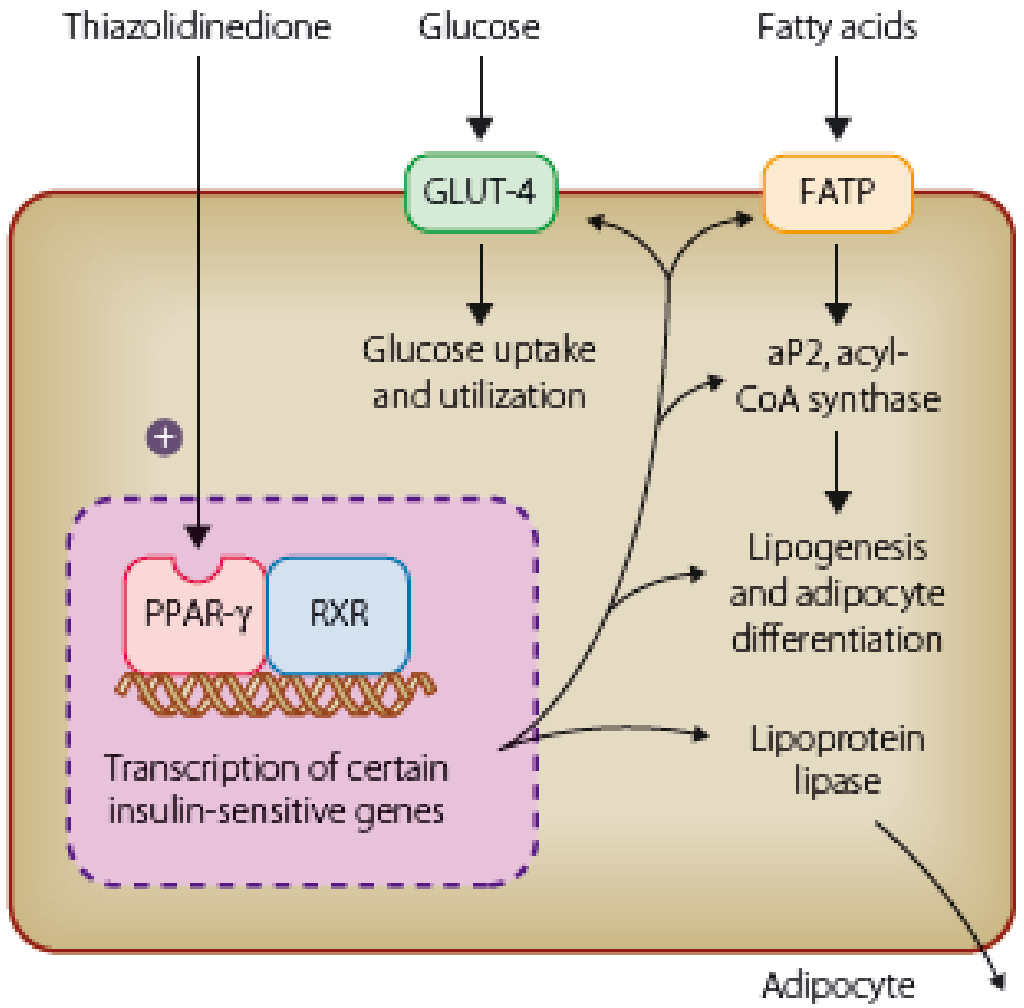

Figure 11.9 Mechanism of action of TZDs. These agents stimulate the PPARγ in the cell nucleus, mainly in the adipocyte. In conjunction with the RXR, this promotes transcription of certain genes and increased expression of GLUT-4, fatty acid transporter protein (FATP), adipocyte fatty acid-binding protein (aP2), fatty acyl coenzyme A (CoA) synthase and other enzymes involved in lipogenesis.

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Thiazolidinediones (TZD)- Other side effects

Side effects include:

- Fluid retention, anaemia, headache, G.I. disturbance, visual disturbances, haematuria, impotence, increased LDL (non-atherogenic form?), increased HDL, osteoporosis
- Fluid retention can precipitate or exacerbate heart failure

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Diabetes II- Insulin treatment

- The progressive nature of T2DM should be regularly & objectively explained to T2DM patients.
- Patients who are **not achieving glycemic goals**, promptly initiate insulin therapy
- Avoid using insulin as a threat, describing it as a failure or punishment.
- Give patients a self-titration algorithm.

American Diabetes Association Standards of Medical Care in Diabetes. Approaches to glycemic treatment. Diabetes Care 2017; 40 (Suppl. 1): S64-S74

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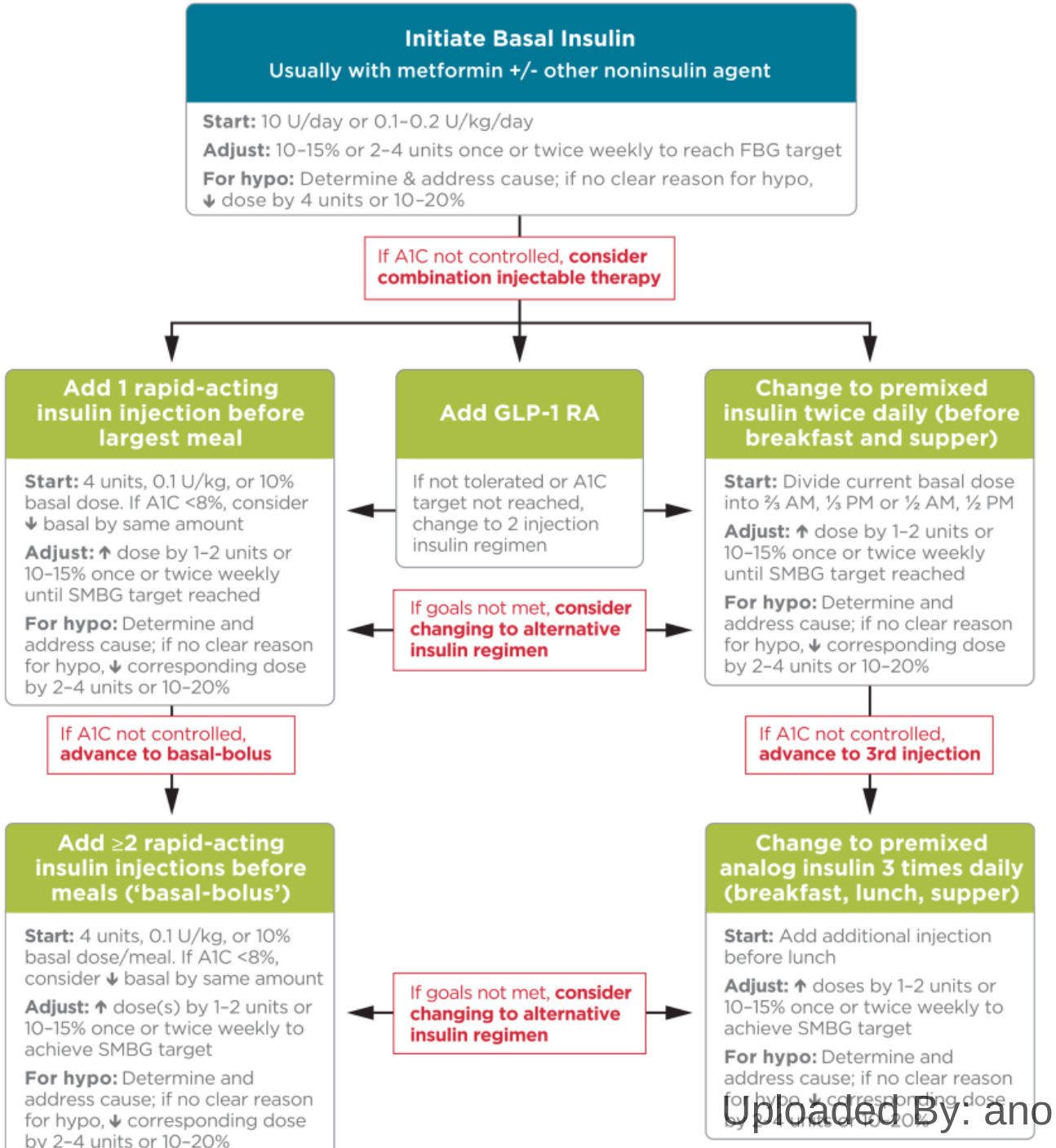
Algorithm of DM II therapy



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Diabetes II- Insulin treatment

- Initial therapy should begin with diet, weight reduction, and exercise, which may induce normoglycemia if **compliance is optimal.**

- Metformin therapy (in the absence of contraindications) may be initiated, concurrent with lifestyle intervention, at the time of diabetes diagnosis.
- If failed add **a second oral or injectable agent,** including insulin, or switch to insulin

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Diabetes II- Insulin treatment

- However, insulin is the preferred second-line medication for patients with A1C >8.5 percent OR
- With symptoms of hyperglycemia despite metformin titration.

- **Thus, many patients with type 2 diabetes will ultimately require treatment with insulin.**

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