Definition

Abnormally low BG (with or without symptoms).

- Usually SMBG level $\leq$ 70 mg/dl. (Some favour < 63 mg/dl).

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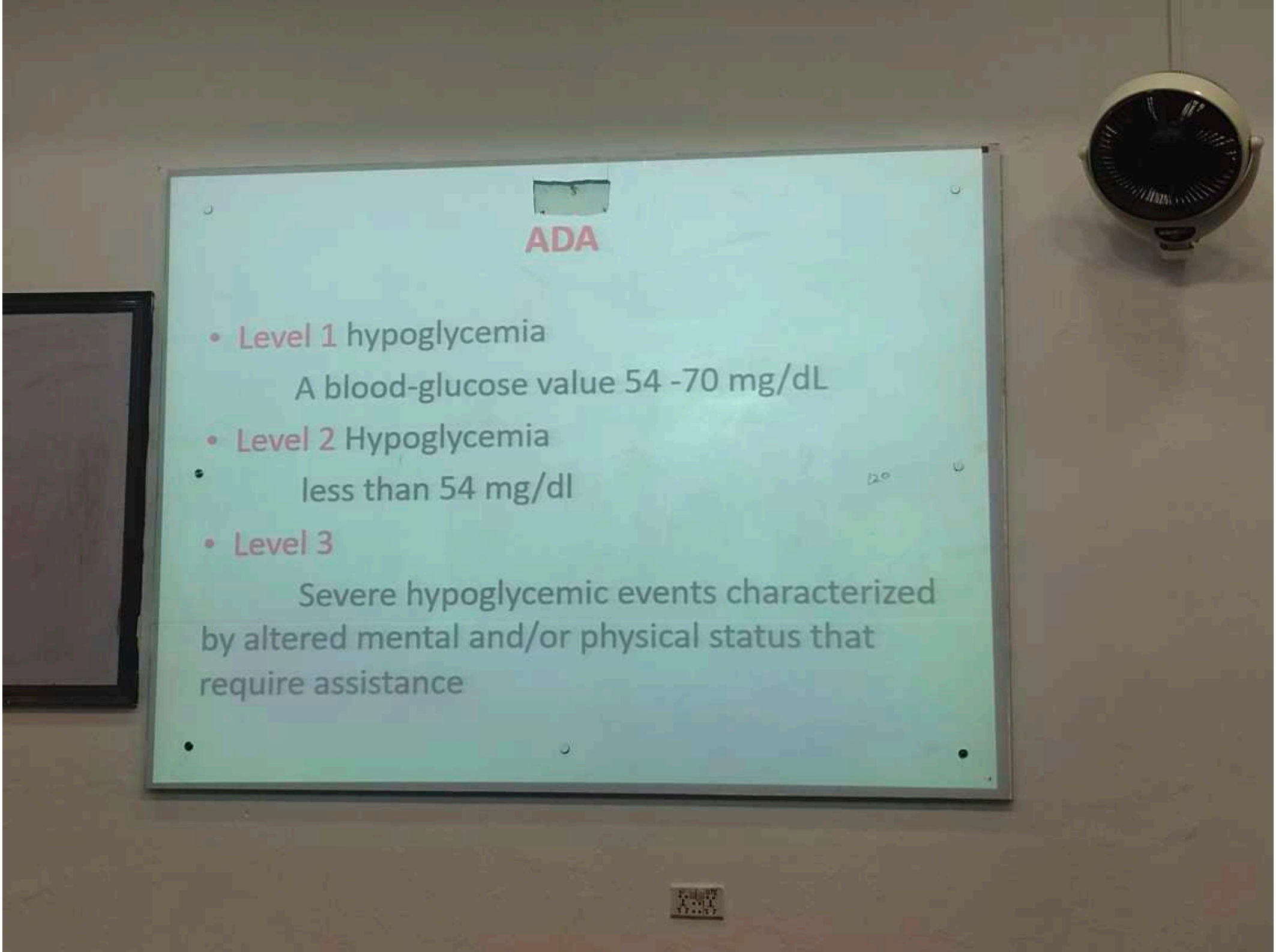
(ADA, IDF)


ADA
• Level 1 hypoglycemia
A blood-glucose value 54 -70 mg/dL
• Level 2 Hypoglycemia
less than 54 mg/dl
• Level 3
Severe hypoglycemic events characterized by altered mental and/or physical status that require assistance

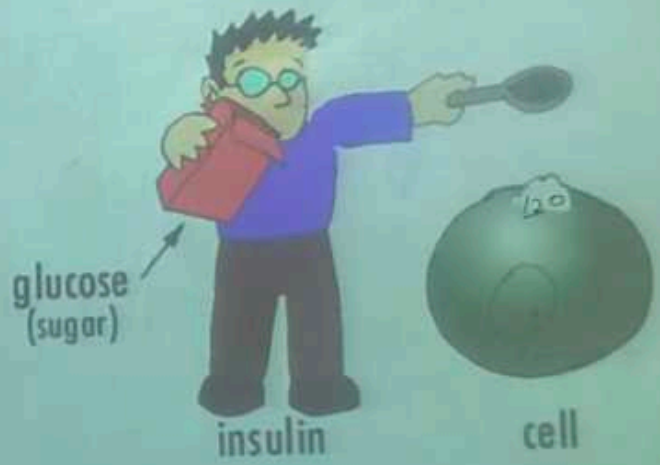
Whipple's Triad

1. Low blood glucose
2. S & S consistent with hypoglycaemia
3. Resolution of S & S after restoring glucose

Hypoglycemia

- ***Common in Diabetics*** as a complication of treatment.
- Mild hypoglycemia ***in > 50 % of diabetics*** on treatment.
- ***Unrecognized infection*** causing hypoglycemia in patients with diabetes may ***result in recurrent hypoglycemic spells.***

MECHANISM OF HYPOGLYCEMIA



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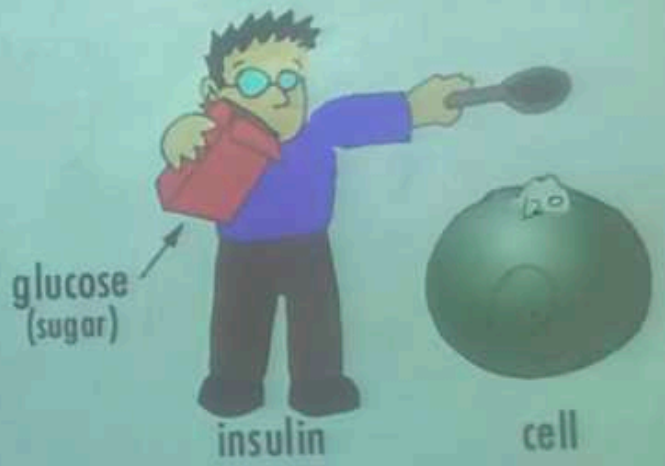

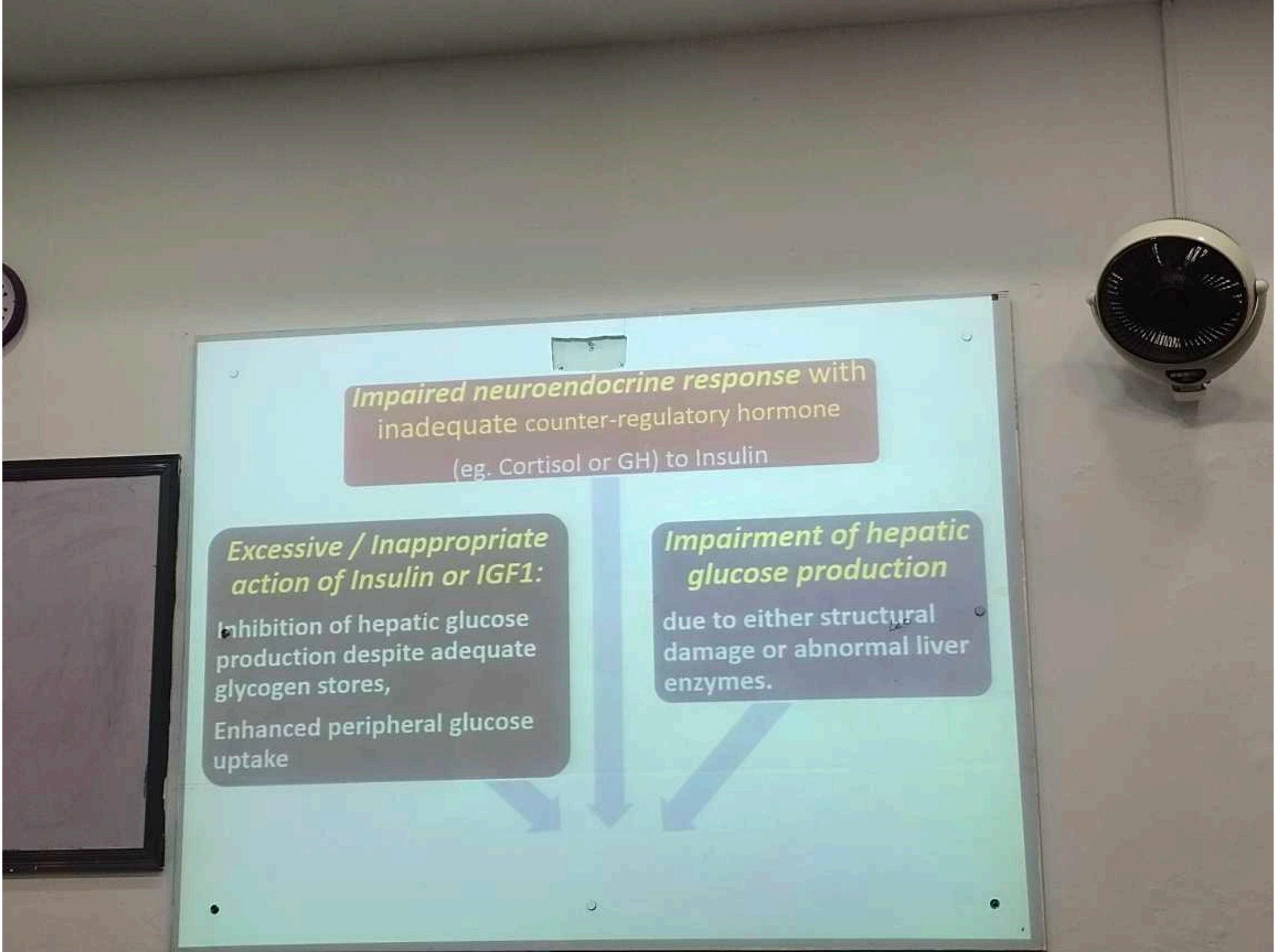
Impaired neuroendocrine response with inadequate counter-regulatory hormone (eg. Cortisol or GH) to Insulin
Excessive / Inappropriate action of Insulin or IGF1:
Inhibition of hepatic glucose production despite adequate glycogen stores,
Enhanced peripheral glucose uptake
Impairment of hepatic glucose production
due to either structural damage or abnormal liver enzymes.

- **Spontaneous Hypoglycemia**
  - **Fasting Hypoglycemia** (several hours, typically > 5 hr after food)
    - Early morning, following prolonged fasting or exercise)
    - almost always indicate underlying disease
  - **Post-prandial (reactive) hypoglycemia:**
    - occurs 2 – 5 hr after food

- **Drug induced Hypoglycemia (Accidental & non-accidental)**
  - **Anti-diabetic agents (Insulins, SU, Prandial glucose regulators, TZD)**
  - Alcohol
  - Quinine
  - Salicylates

- **Organ failure & Critical Illness**
  - Acute liver failure
  - CRF
- **Hormone deficiency**
  - Isolated ACTH deficiency
  - GH deficiency
  - Hypopituitarism
- **Insulinoma**
  - Part of MEN1 (~ 10%)
- **Other tumors**

  myeloma, leukemia, advanced metastatic malignancy.

- **Infections**
  - Septicemia
  - Malaria
- **Starvation / malnutrition**
  - Anorexia nervosa
  - Kwashiorkor or marasmus
- **Beta cell hyperplasia**
  - Antibodies to insulin (Ab-bound insulin dissociates leading to elevated insulin; typically associated with postprandial hypoglycemia)
- **Autoimmune**
  - Insulin receptor activating Abs (rare, commonest in middle aged female; may require Rx with plasmapheresis or immunosuppression)

DIABETICS AND HYPOGLYCEMIA:

- Most common complication of insulin therapy with more type 1 patients attempting "tight" control, even more frequent hypoglycemia

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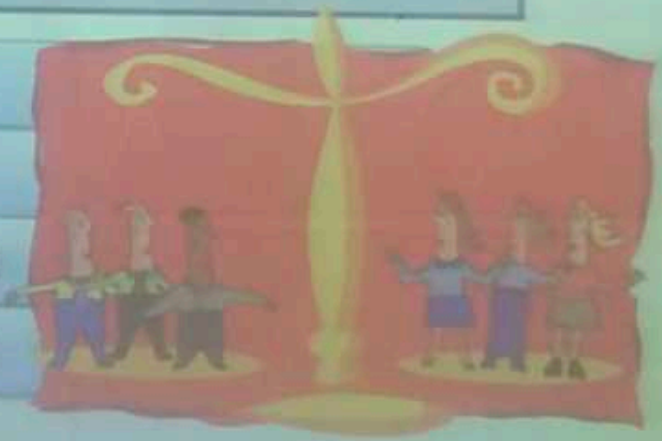
- **Frequent Causes of Hypoglycemia in Diabetics**
  - Meals that are late or missed
  - Unusual Extra exercise or activity
  - An insulin/ Tablet dose which is too high
  - Unplanned changes in working schedule



Reasons for Hypoglycemia

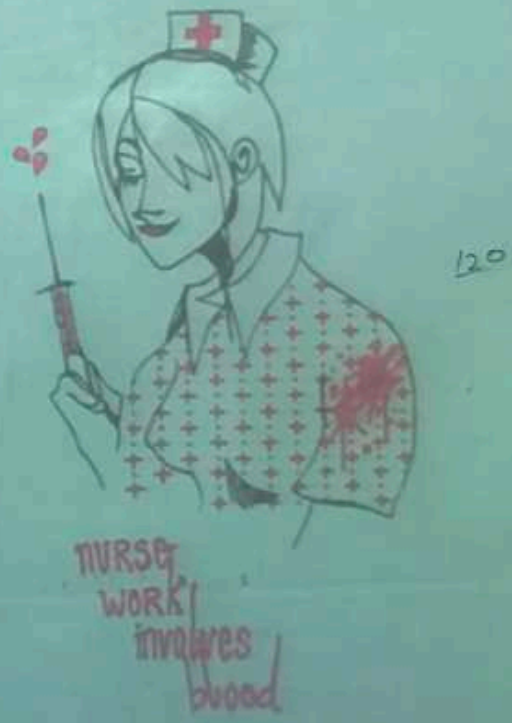
- FOOD
- ACTIVITY
- TIMING

TREATMENT
INSULIN OR
ORAL MEDICINES

- **Obtain blood glucose level:**
  - As **soon** as possible (usually with a glucometer and strips, if available)

- For **symptomatic** patient known to have diabetes and with a low glucose value, **< 70 mg/dl** ***administer Rx.***

- If BG Low (< 55 mg/dl) and patient not diabetic:
  - Draw blood for ;
    - Glucose
    - Insulin
    - C – peptide
    - Oral hypoglycemic agent screen (SU/ Meglitinide)



- **Do not delay treatment:**
  - If ***symptomatic hypoglycemia*** is suspected but rapid blood glucose ***measurement is not available***

Depends upon Severity of Hypoglycemia:

"The patient's medical tag states: 'Insulin dependent,' Doctor."

MedicAlert bracelet, necklace, or card in the wallet or purse

Treatment—The "15-15 Rule"

- The 15-15 rule—have 15 grams of carbohydrate to raise your blood glucose and check it after 15 minutes. If it's still below 70 mg/dL, have another serving.
- Repeat these steps until your blood glucose is at least 70 mg/dL. Once your blood glucose is back to normal, eat a meal or snack to make sure it doesn't lower again.

- **Mild to Moderate Hypoglycemia**
  - Mild if conscious with only autonomic symptoms
  - Moderate if Neuroglycopenic symptoms present
  - Able to drink and swallow safely (i.e. Alert with intact gag reflex

- **Administer rapidly-absorbable carbohydrate (15 gm):**
  - **3 – 4 glucose tablets (15 gm glucose)**
  - **3 tsf of table sugar or a tube of gel with 15 grams,**
  - **4 – 6 oz (175 ml) fruit juice or non-diet soda**
  - **A tablespoon (15 ml) of honey**

- **Severe**
  - Altered mental status/ unconscious requiring assistance of another person/ Unable to swallow
  - Does not respond to oral glucose administration

- **IV bolus of 12.5 to 25 gm of glucose (25 – 50 ml of 50% dextrose)**
  - Measure blood glucose 10 – 15 minutes
  - Re-administer 12.5 to 25 gm of glucose as needed to maintain the blood glucose > 80 mg/dl
- Once conscious, **eat** usual snack or meal due at that time of day or a snack with 15 g carbohydrate plus protein

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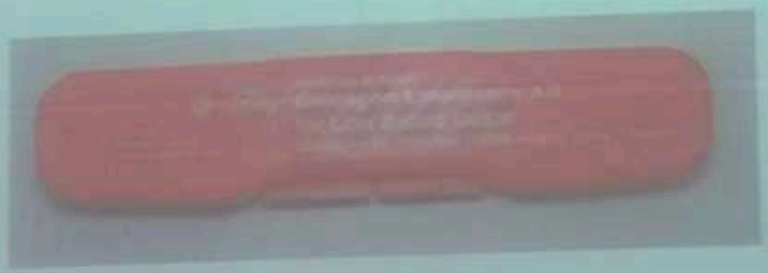
- If glucose cannot be given by parenteral or Oral routes, give ***Glucagon 1 mg IM or SC***

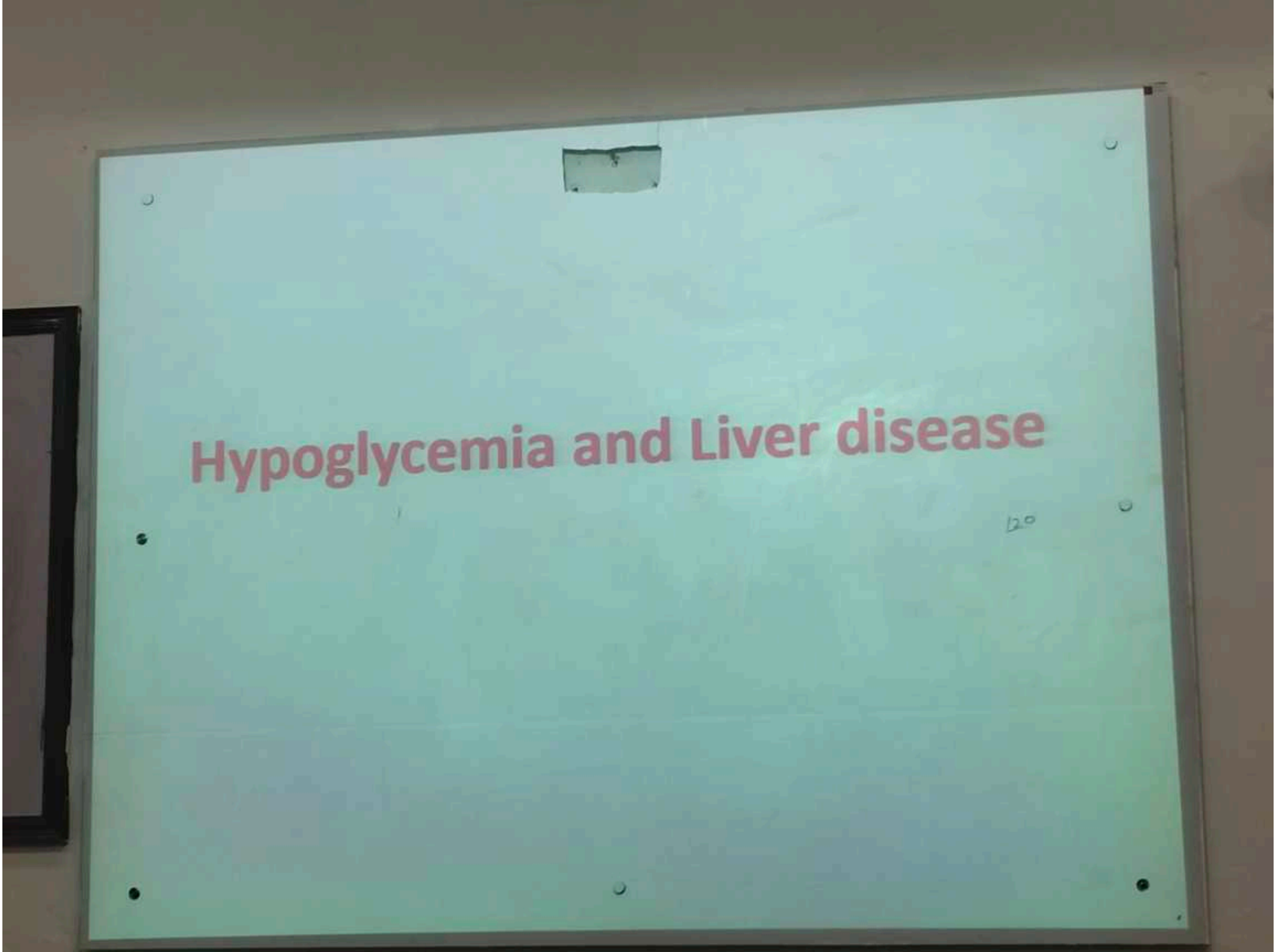


LONG-TERM MONITORING:

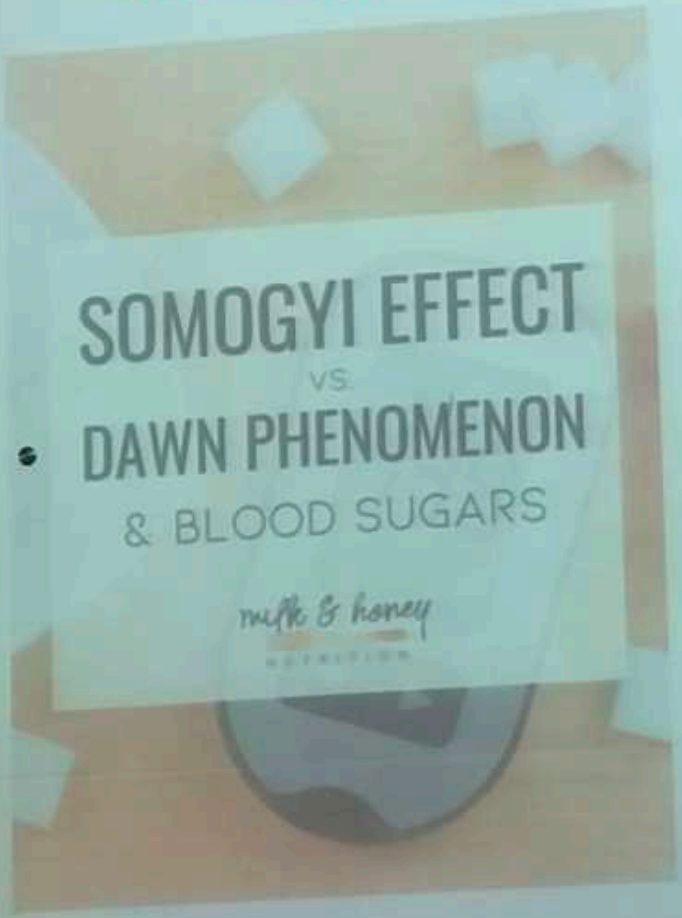
- **Patient Education:**
  - Nutrition, SBGM, Early S/S of hypoglycemia
- **Guidelines for Clinicians:** [9, 10]
  - ***Hypoglycemia patient questionnaire;***
    - About S/S of Hypoglycemia
    - *Frequency of Hypoglycemic*
    - Did they need assistance in past Hypolycemias?
    - Do they check *glucose level before driving*?
    - Do those close to you *know how to administer glucagon*?

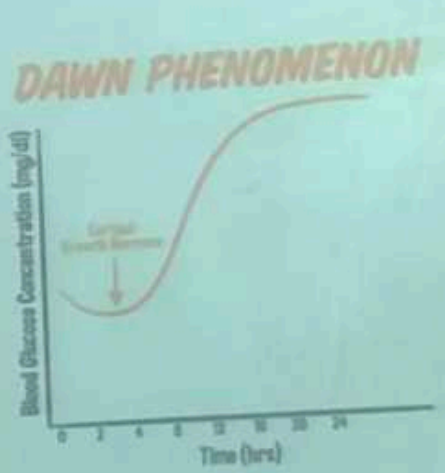
Recurrence after first episode

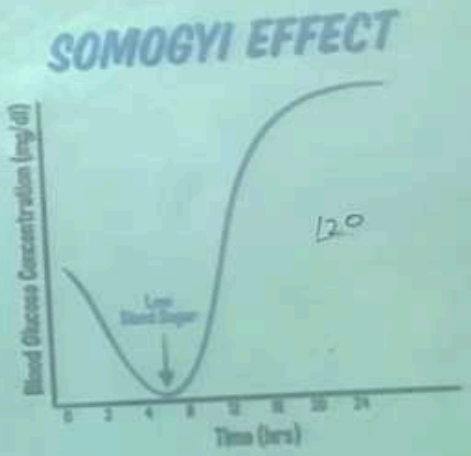
- Duration of observation time
- If on insulins
- If on oral treatment


Hypoglycemia and Liver disease

Somogyi Effect & Dawn Phenomenon







HYPOGLYCEMIA & DRIVING

Safe blood glucose (BG) **prior** to driving	=	BG ≥ 90 mg/dl (5.0 mmol/L)

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Safe blood glucose (BG) **prior** to driving = **BG ≥ 90 mg/dl (5.0 mmol/L)**

- If **BG < 90 mg/dl (5.0 mmol/L)** prior to driving:
  - **Take 15 g** carbohydrate, **re-check** in 15 minutes
  - If BG [illegible] (4.0 mmol/L), wait at least **45 minutes after the BG ≥ 90 mg/dl (5.0 mmol/L)** → safe to drive
  - If BG was 72 – 89 mg/dl (4.0-4.9 mmol/L), safe to drive once BG [illegible] (5.0 mmol/L)

Hypoglycemia occurs often in T1DM & in some T2DM receiving treatment, it is ***Uncommon*** in patients without diabetes.

S/S of hypoglycemia are nonspecific

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Observation / Hospitalization after Hypoglycemia
Insulin induced vs Oral Hypoglycemics induced

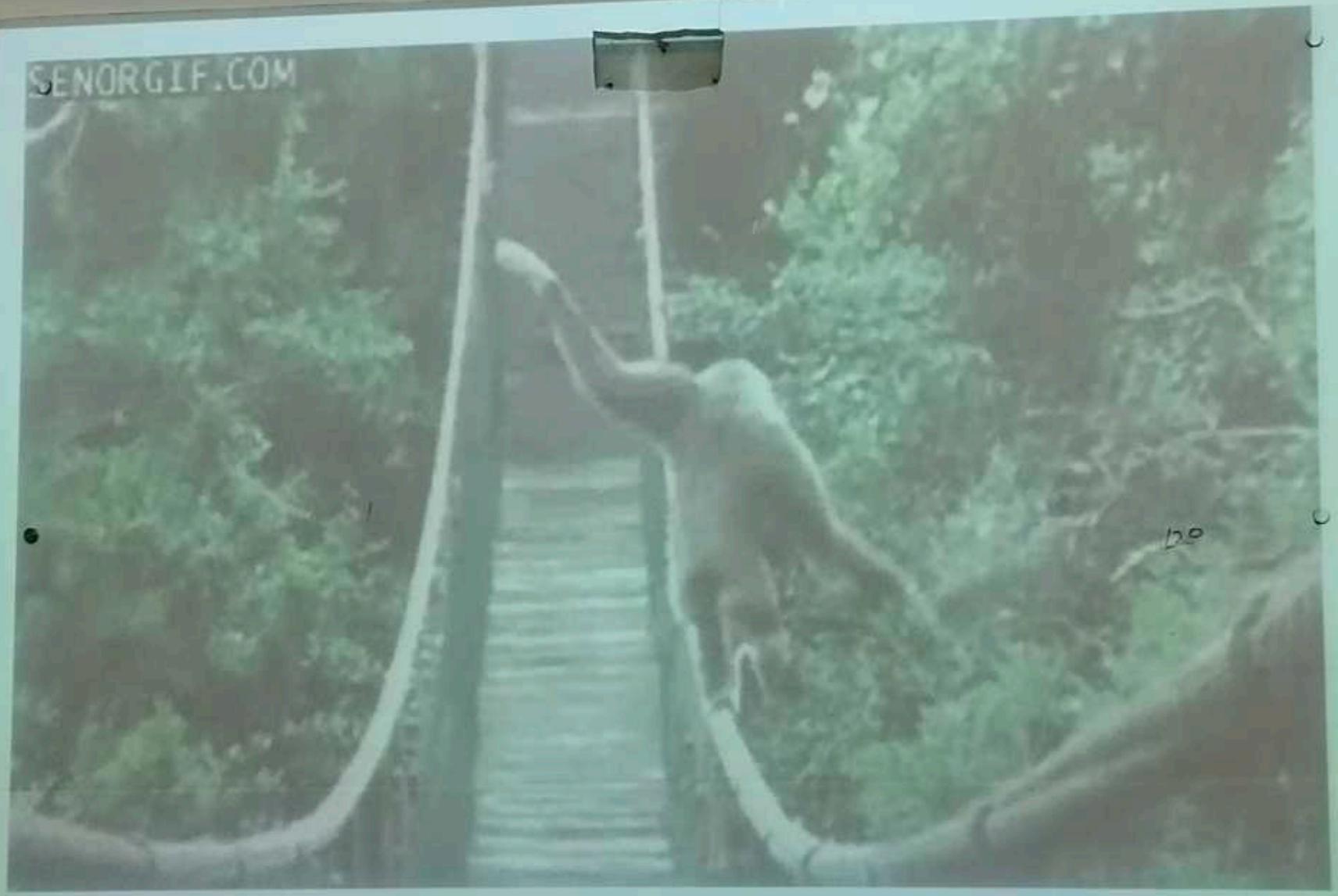
Do not delay treatment, in suspected symptomatic hypoglycemia, If rapid blood glucose measurement is not available.

All diabetics should carry packets of table sugar or a candy roll at all times.

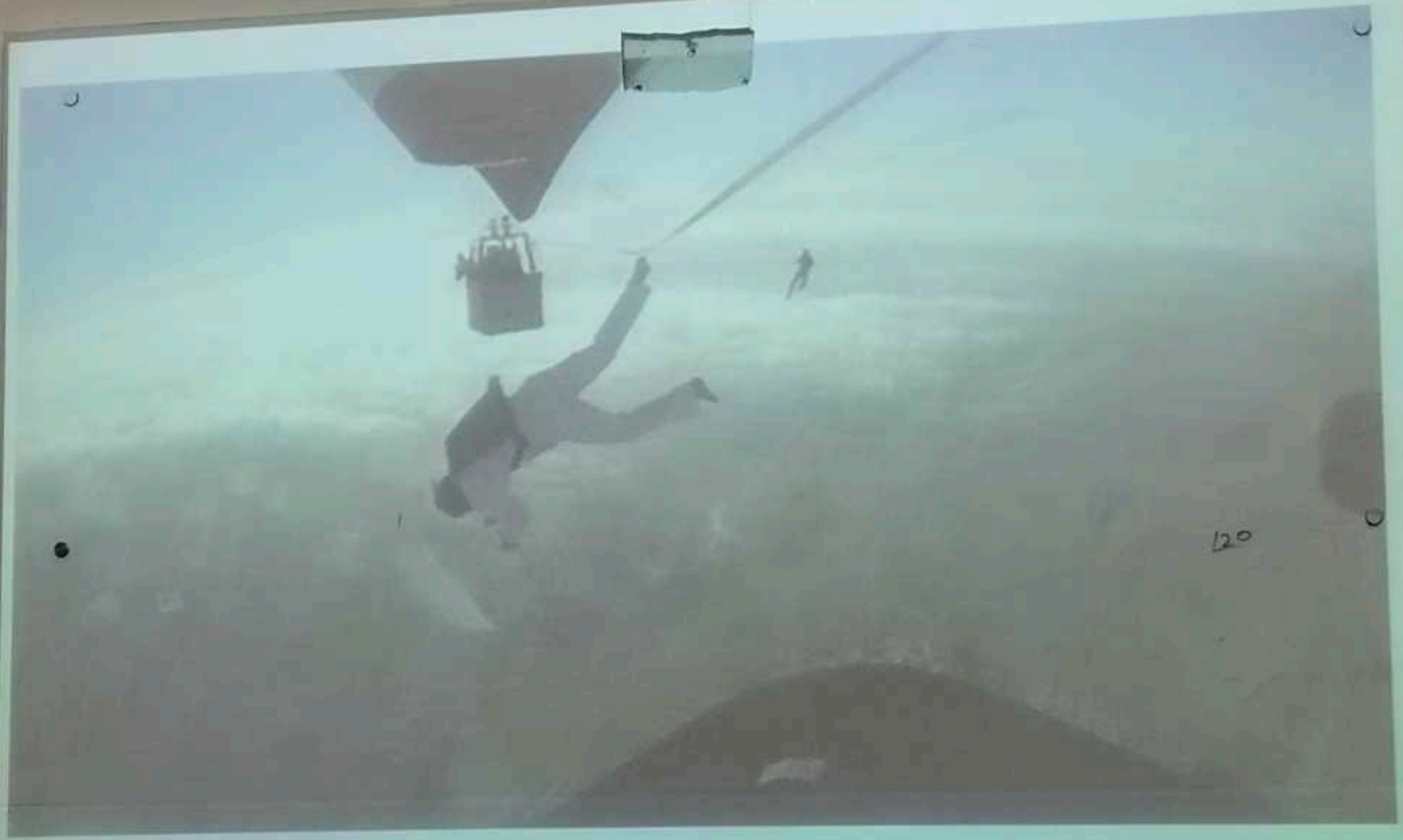
Diabetics should carry ***MedicAlert bracelet/ cards***

Glucagon should be prescribed for all individuals at significant risk of severe Hypoglycemia.

Glucagon administration is not limited to health care professionals but should be known to general public.



Controlling Diabetes is like walking on the rope



If balance is not kept carefully, they fall into Hypoglycemia or Hyperglycemia