
Malnutrition.

Definitions

- MALNUTRITION

  WHO defines Malnutrition as "the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions."

  Undernutrition

  OverNutrition

PROTEIN ENERGY MALNUTRITION

It is a group of body depletion disorders which include kwashiorkor, marasmus and the intermediate stages

MARASMUS

Represents simple starvation . The body adapts to a chronic state of insufficient caloric intake

KWASHIORKOR

It is the body's response to insufficient protein intake but usually sufficient calories for energy

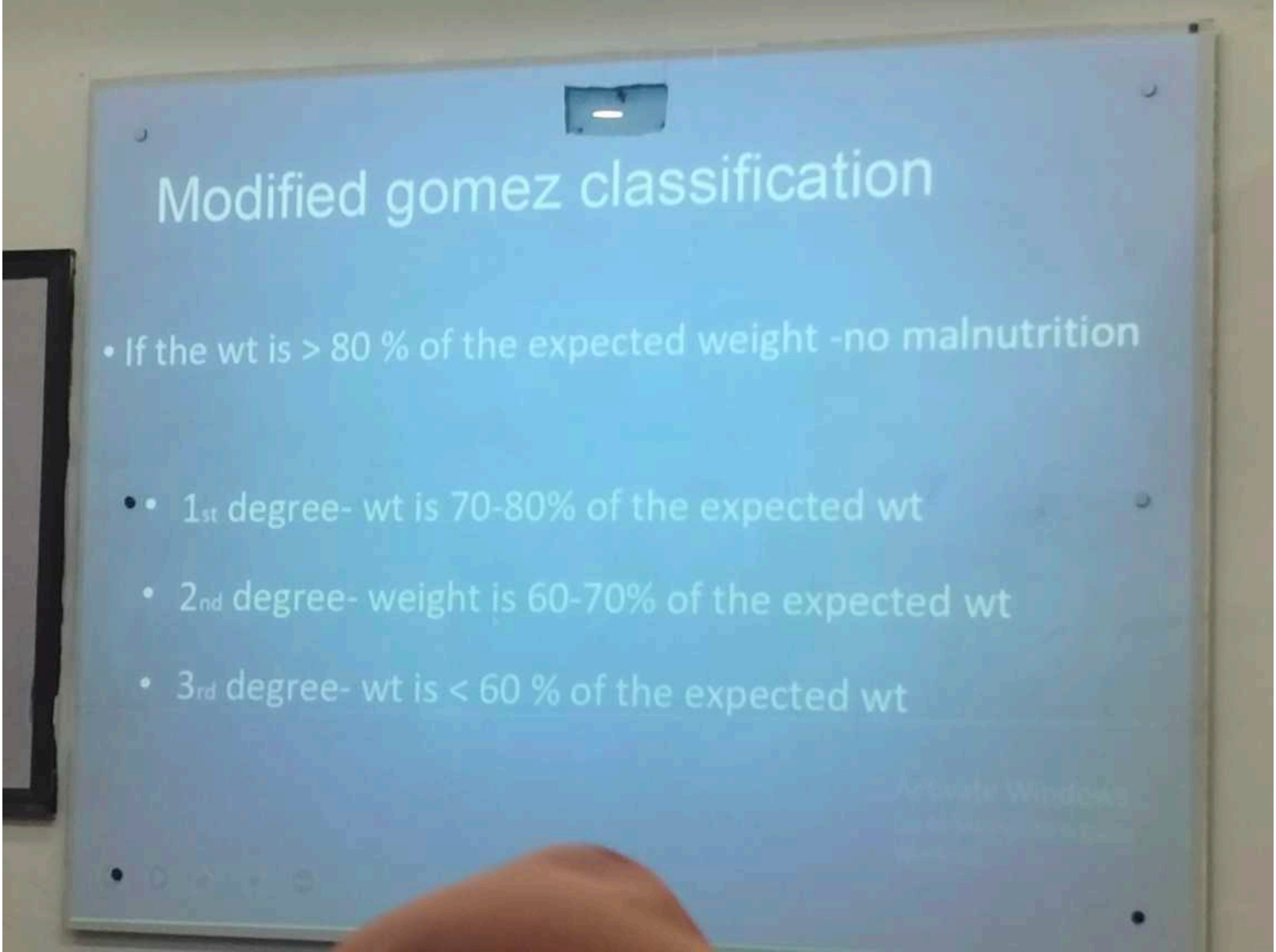
Etiology

Primary malnutrition	Secondary malnutrition
Failure of lactation	Parasitic infestations, Measles, whooping cough, Primary tuberculosis, UTI
Ignorance of weaning	Congenital heart disease, Urinary tract anomalies
Poverty	Giardiasis,Lactose intolerance, Celiac disease, Tuberculosis, Cystic fibrosis
Cultural patterns and food fads	Inborn errors of metabolism,galactosemia
Lack of immunization and primary care	
Lack of family planning	

Gomez classification

- If the wt is > 90 % of the expected weight -no malnutrition

- 1st degree- wt is 75-90% of the expected weight
- 2nd degree- wt is 60-75% of the expected weight
- 3rd degree- wt is < 60 % of the expected weight

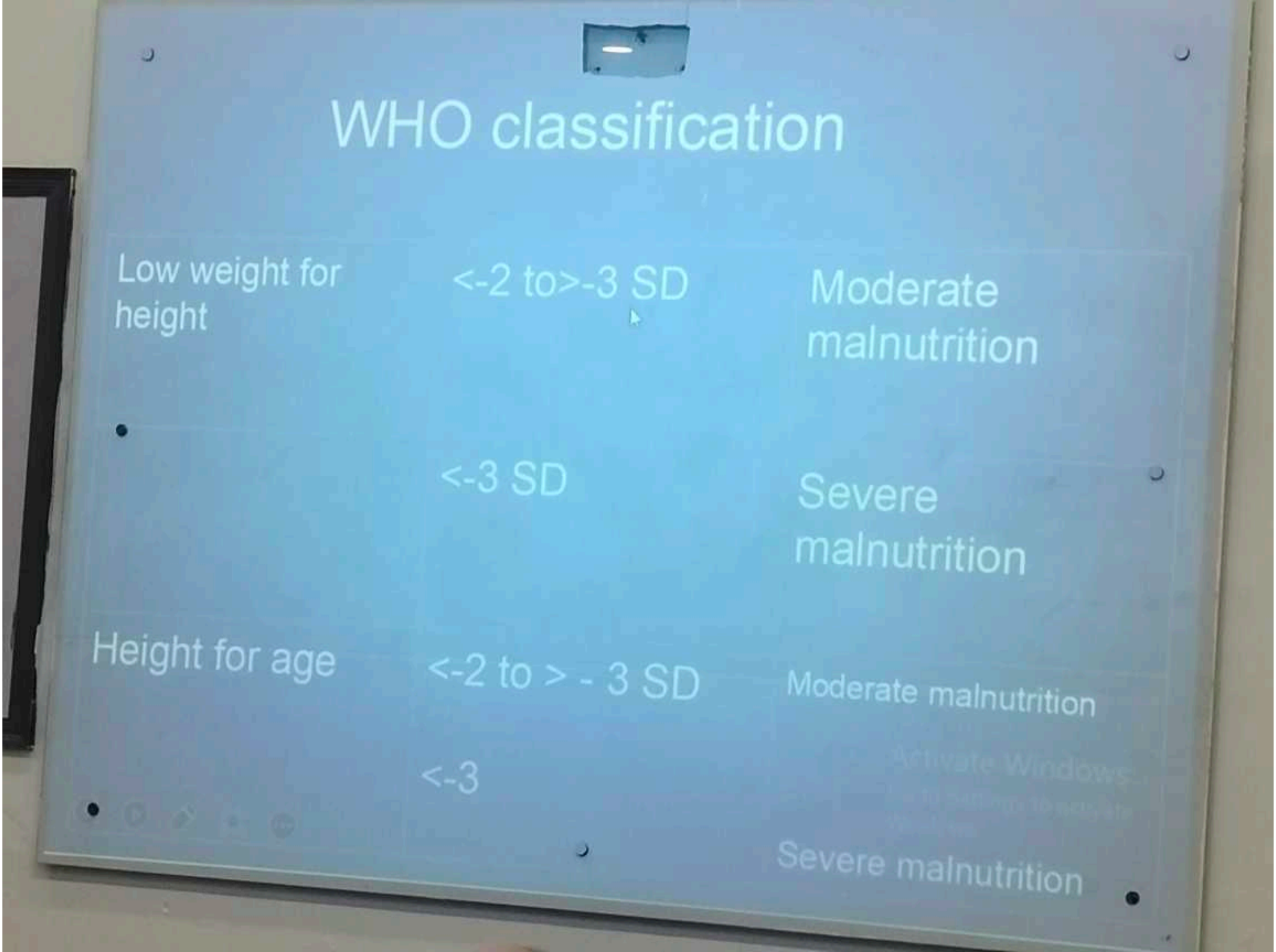

Modified gomez classification
• If the wt is > 80 % of the expected weight -no malnutrition
• 1st degree- wt is 70-80% of the expected wt
• 2nd degree- weight is 60-70% of the expected wt
• 3rd degree- wt is < 60 % of the expected wt

water low classification

Height for age	Weight for age expressed as percentage		
	<80	80-120	>120
<90%	Chronic malnutrition	Stunted but no malnutrition	Stunted and obese
> 90%	Acute malnutrition	Normal	Obese

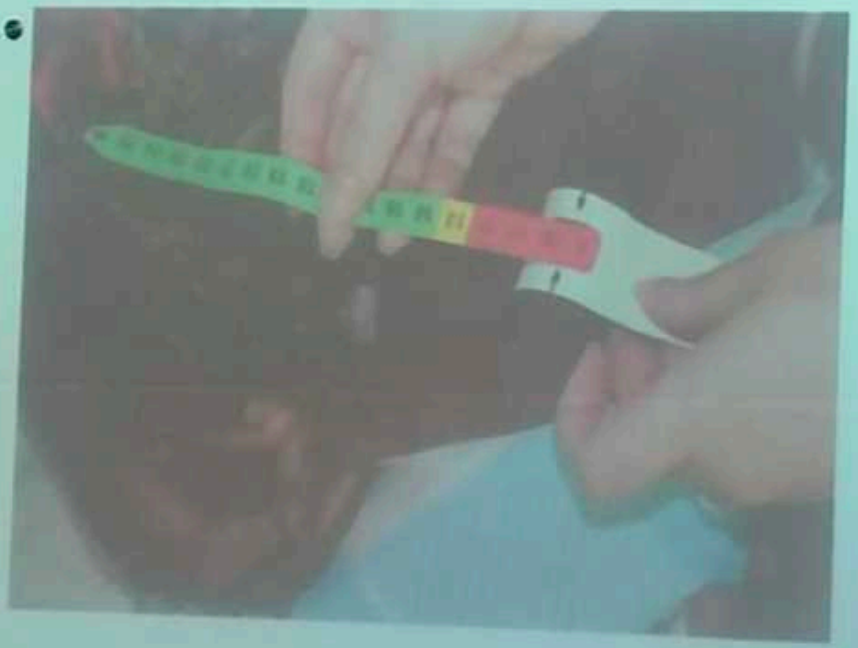
welcome classification

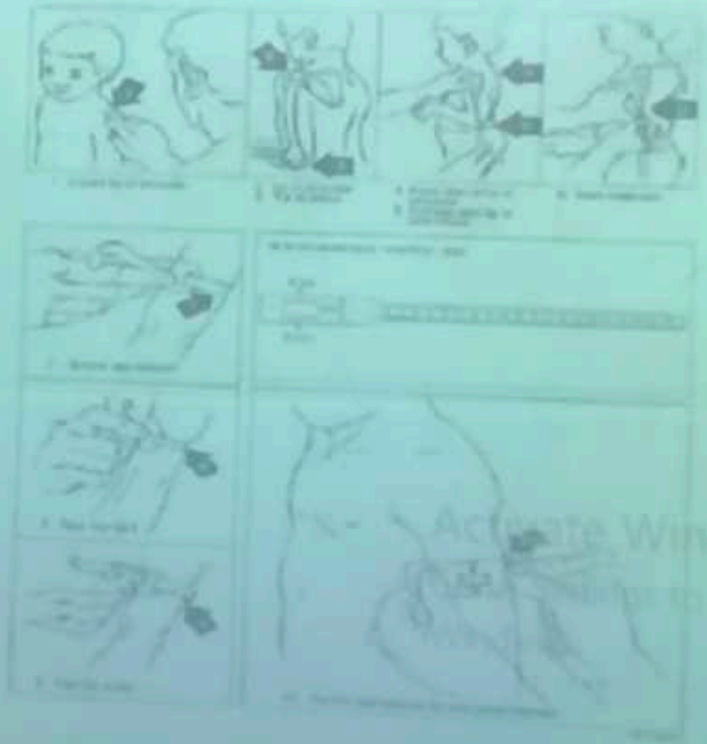
	Edema present	Edema absent
Weight for age 80-60 % of standard	Kwashiorkor	Ponderal Retardation
Weight for age < 60 % of standard	Marasmic kwashiorkor	Marasmus

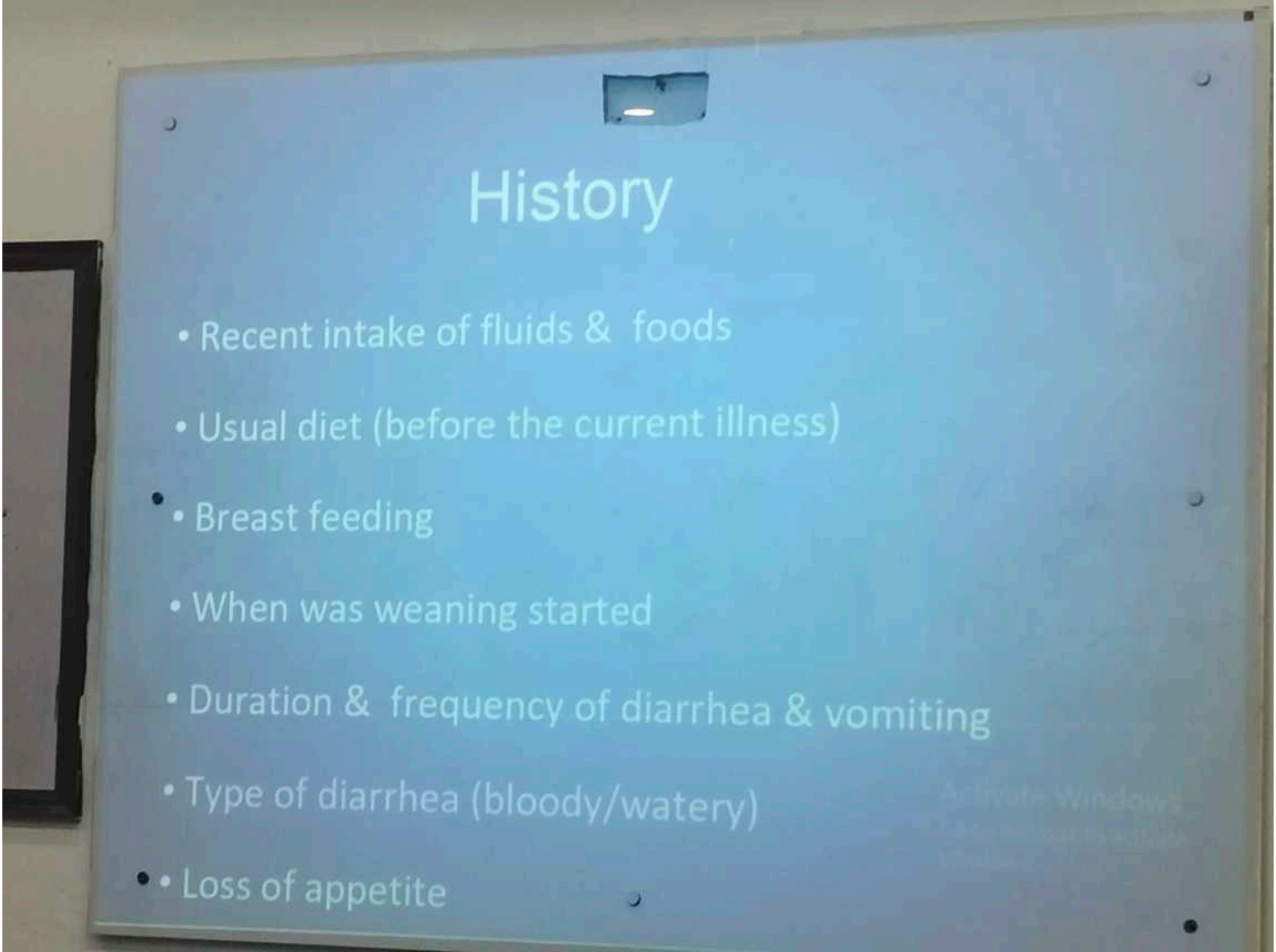

WHO classification
Low weight for height
<-2 to>-3 SD
Moderate malnutrition
<-3 SD
Severe malnutrition
Height for age
<-2 to > - 3 SD
Moderate malnutrition
<-3
Severe malnutrition

Mid-upper arm circumference (MUAC)

- Community based screening programs for severe malnutrition usually use MUAC less than 11.5cm to identify severe wasting.






History
• Recent intake of fluids & foods
• Usual diet (before the current illness)
• Breast feeding
• When was weaning started
• Duration & frequency of diarrhea & vomiting
• Type of diarrhea (bloody/watery)
• Loss of appetite

HISTORY

Time when urine was last passed

- Family circumstances-literacy level, socioeconomic
- status, housing, family members, vaccination
- Chronic cough
- Contact with tuberculosis
- Recent contact with measles
- Milestones reached

Recognize signs of severe malnutrition

Severe wasting	Oedema	Dermatosis	Eye signs
front view -ribs easily seen -upper arms look loose -thighs look loose	+ mild: both feet	+ mild: discoloration or a few rough patches of skin	Bitot's spots –
back view -ribs and shoulder bones easily seen - flesh missing from the buttocks	+ + moderate: both feet, plus lower legs, hands, or lower arms	+ + moderate: multiple patches on arms and/or legs	Pus and inflammation (redness) are signs of eye infection.
	+ + + severe: generalized oedema including both feet, legs, hands, arms and face	+ + + severe: flaking skin, raw skin, fissures (openings in the skin)	Corneal clouding
			Corneal ulceration

KWASHIORKOR VS MARASMUS

- In preschool children (1-5 years of age)
- Due to low protein intake
- Mild growth retardation
- Mild reduction in body weight
- Protruding abdomen and subcutaneous fat reserved
- Ribs not very prominent
- Poor appetite
- Enlarged fatty liver
- Oedema present
- Moonfacies
- Sparse hair
- Flaky paint-like skin
- Lethargic
- Requires adequate amount of protein

Kwashiorkor

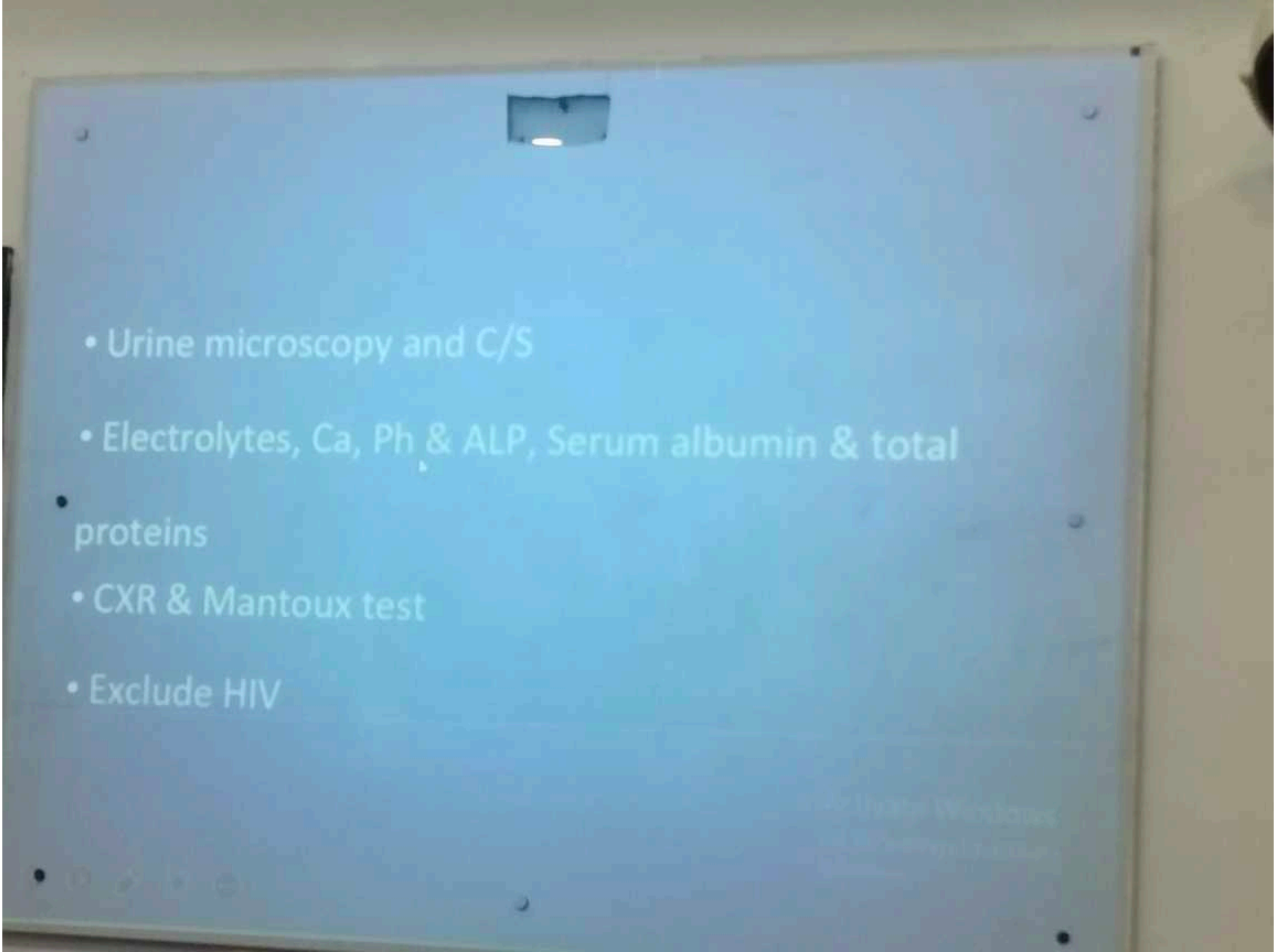
- In weakened infants(<1 year old)
- Due to low calorie intake
- Severe growth retardation
- Severe reduction in body weight
- Shrunken abdomen and subcutaneous fat not preserved
- Prominent ribs
- Voracious feeder
- No fatty liver
- Oedema not present
- An old man like face
- No hair changes noted
- Dry and wrinkled skin
- Alert but irritable
- Requires adequate amount of protein, fat and carbohydrate

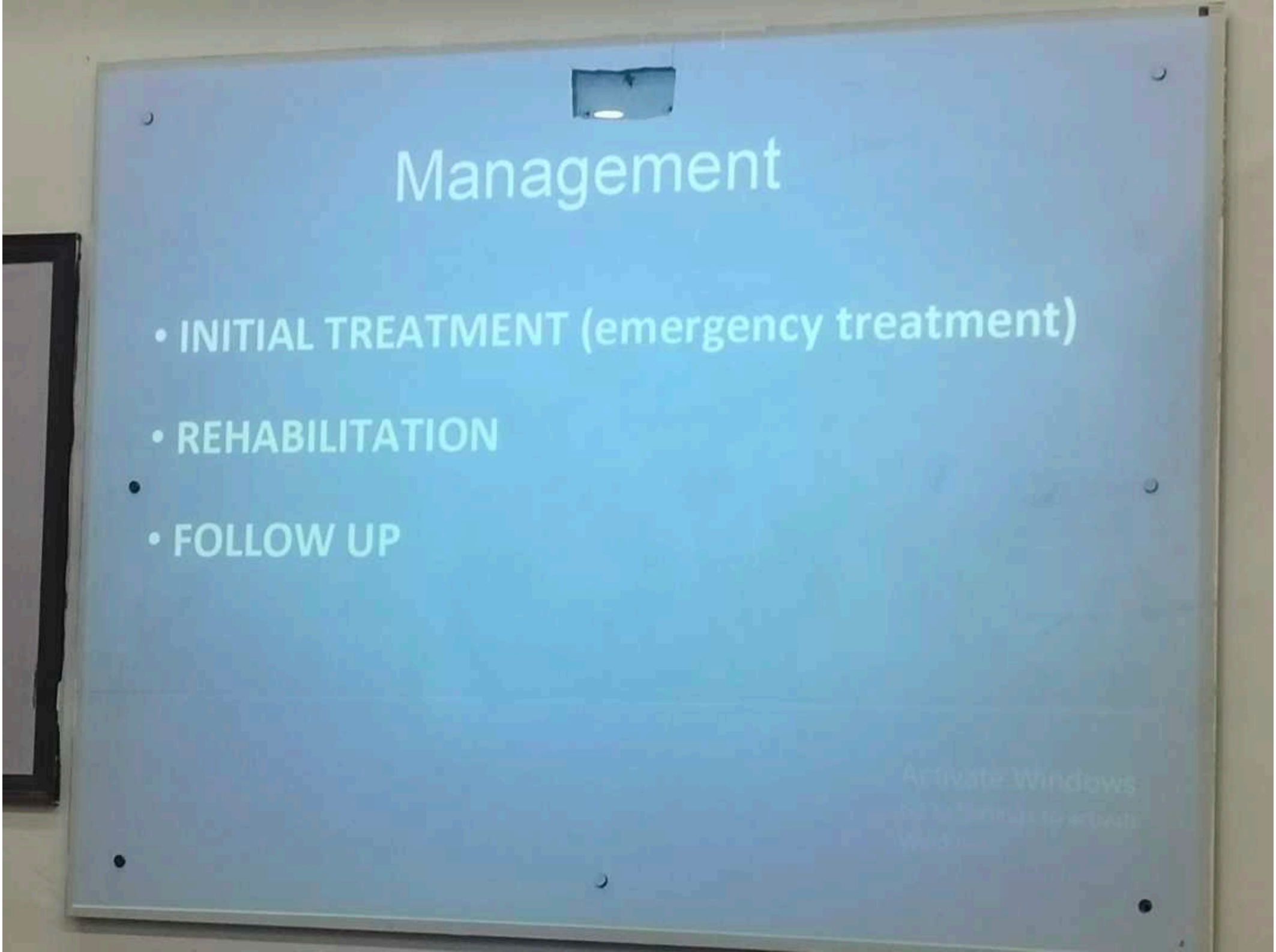
Marasmus

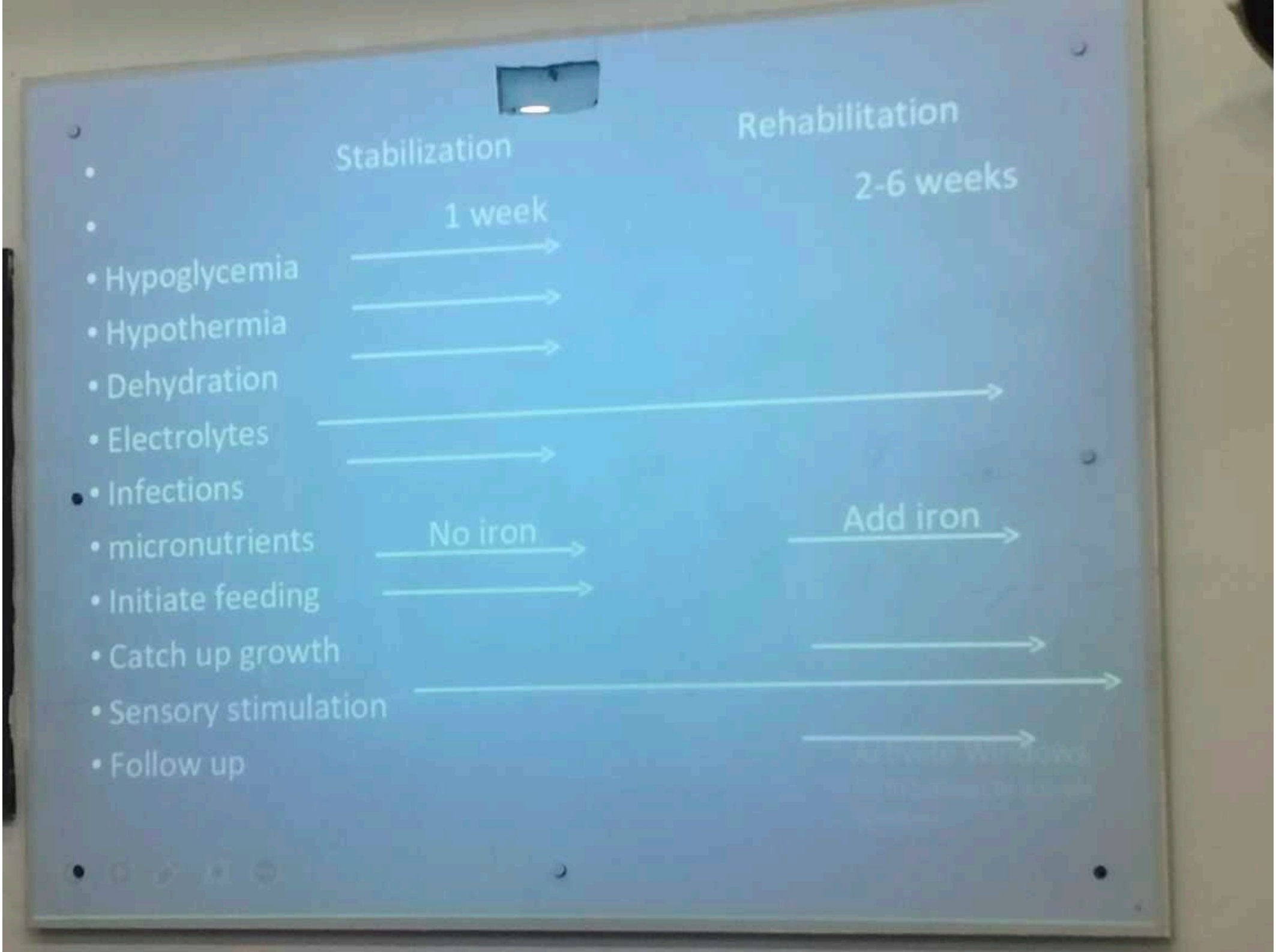
investigations

- Full blood counts, peripheral smear for MP
- Blood glucose level
- Septic screening
- Stool for cysts, ova, and C/S, fat globules

(Malabsorption)


• Urine microscopy and C/S
• Electrolytes, Ca, Ph & ALP, Serum albumin & total
proteins
• CXR & Mantoux test
• Exclude HIV


Management
• INITIAL TREATMENT (emergency treatment)
• REHABILITATION
• FOLLOW UP


Stabilization
Rehabilitation
1 week
2-6 weeks
• Hypoglycemia
• Hypothermia
• Dehydration
• Electrolytes
• Infections
• micronutrients
No iron
Add iron
• Initiate feeding
• Catch up growth
• Sensory stimulation
• Follow up

Phases of Treatment

- Stabilization Phase Day 1 – 2
- Transition Phase Day 3 – 7
- Rehabilitation Phase Week 2 – 6

- It may take up to 7 or more days for the child to stabilize.
- Weight gain is not expected during stabilization

Initial Management

- Hypoglycemia
- Hypothermia
- Shock
- Very severe anaemia
- Corneal ulceration
- Watery diarrhea and /or vomiting

- Prepare Re So Mal
- Appropriate antibiotics
- Record initial findings and treatments

HYPOGLYCEMIA

- RBS less than 54mg/dl (< 3 mmol / L) is hypoglycemia

- Signs of hypoglycemia
  - Lethargy
  - Hypothermia
  - Loss of consciousness

MANAGEMENT of HYPOGLYCEMIA

- Check blood sugar
- If blood sugar is < 54mg.dl (< 3 mmol / L) give 50 ml of 10% glucose orally
- Give by N-G if cannot take orally
- If child drowsy give 5 ml/kg of 10% glucose by IV followed by 50 ml of 10% glucose by N-G.
- START FEEDING f-75 every half hour for 2 hours
- Give ¼ of the 2 hourly feed every half hour.
- Check blood sugar after 2 hours
- If >54 mg/dl (> 3 mmol / L) give F-75 every 2 hours
- If < 54 mg/dl (< 3 mmol / L) keep giving F-75 every half hour for 2 hours

HYPOTHERMIA

- Rectal temperature <35.5 °C or 95.9 °F or
- Axillary temperature <35 °C or 95.0 °F

- Hypothermia is a sign of serious infection
- Hypothermic children should be treated for infection and hypoglycemia

MANAGEMENT OF HYPOTHERMIA

- Cover the child including his head
- Keep windows closed
- Maintain room temperature of 25-30 °C
- Change wet clothes immediately
- Avoid leaving child uncovered during examination and weighing
- Warm your hands before examining the child

- Monitor temperature ½ hourly till normal

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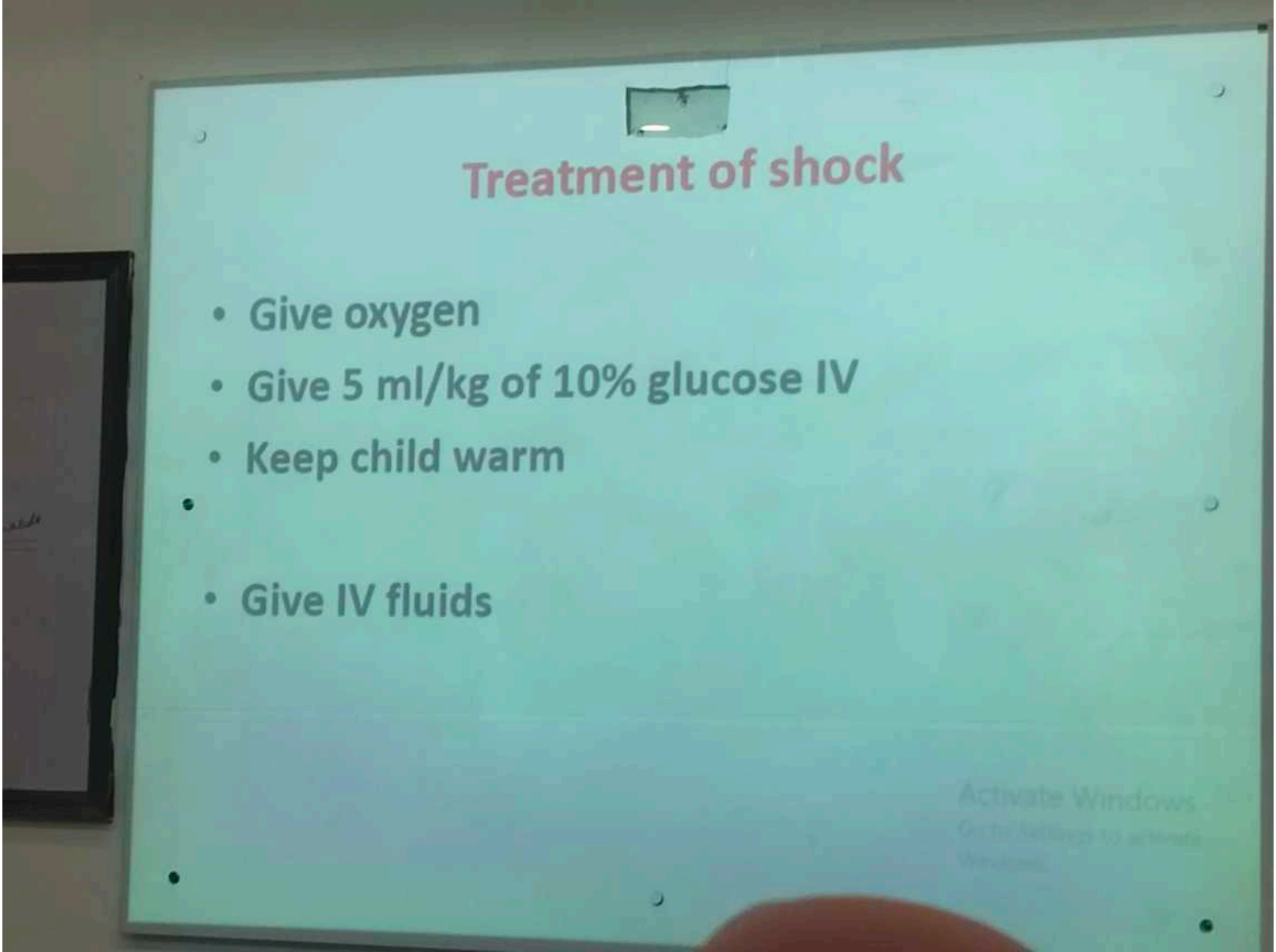
SHOCK

- Lethargic or unconscious
- Cold hands
- Slow capillary refill (>3 seconds)
- Weak or fast pulse
- Shock can be due to dehydration or sepsis
- Difficult to differentiate
- Children with dehydration respond to IV fluids
- Those with sepsis and no dehydration do not respond to IV fluids


Treatment of shock
• Give oxygen
• Give 5 ml/kg of 10% glucose IV
• Keep child warm
• Give IV fluids

IV FLUIDS for SHOCK

- Check respiratory and heart rate and record
- Give D-Ringer's lactate or 5% ½ strength normal saline 15 ml/kg over 1 hour
- Monitor heart rate & respiratory rate every 10 minutes
- Stop IV if RR & HR increase
- At the end of 1 hour if RR & HR decreased, repeat 15 ml/kg over next 1 hour with monitoring of HR & RR
- At the end of 2 hrs start Resomal

- If child fails to improve after 1 hour give 10 ml/kg of fresh blood over 2 hours
- Give lasix with blood
- Give IV fluids 4 ml/kg/hr while blood is being arranged
- At the end of blood transfusion start oral fluids i.e. Resomal as above

ANAEMIA

- Haemoglobin < 4 mg/dl is very severe anaemia
- Very severe anaemia leads to heart failure
- It requires a transfusion

- Mild to moderate anaemia should be treated after the 1st week with Iron

CORNEAL ULCERATION

- Give first dose of vitamin A immediately
- Oral dose is

  50,000 IU for <6 months

  100,000 IU for children 6-12 month

  200,000 IU for <12 months
- Instill one drop of 1% atropine to relax the eye
- It prevents extrusion of lens
- Put tetracycline eye drops and bandage the eye

DIARRHOEA AND DEHYDRATION

- Difficult to assess dehydration in a malnourished child
- History of vomiting diarrhea if present, assume dehydration
- Assess for dehydration even through signs are misleading
- Disappearance of these signs on dehydration indicate improvement

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ORS, low osmolar ORS and ReSoMal

Amount in 1 litre	ORS	Low Osmolality ORS	ReSoMal
Sodium Chloride	3.5 gm	2.6 gm	1.75 gm
Sodium Citrate	2.9 gm	2.9 gm	1.45 gm
Potassium Chloride	1.5 gm	1.5 gm	2.54 gm
Potassium Citrate			0.65 gm
Magnesium Chloride			0.61 gm
Zinc Acetate			0.656 gm
Copper Sulphate			0.0112gm
Glucose	20 gm	13.5 gm	10 gm
Sucrose			25 gm
Osmolality	311	245	300

How often and how much to give?

- 5 ml/kg of Re So Mal every 30 minutes for 2 hours, 5-10 ml/kg every alternate hour for 10 hours (if child not in shock)

- Omit first 2 hours treatment if patient has received treatment for shock

- If child too sick feed through N-G feed

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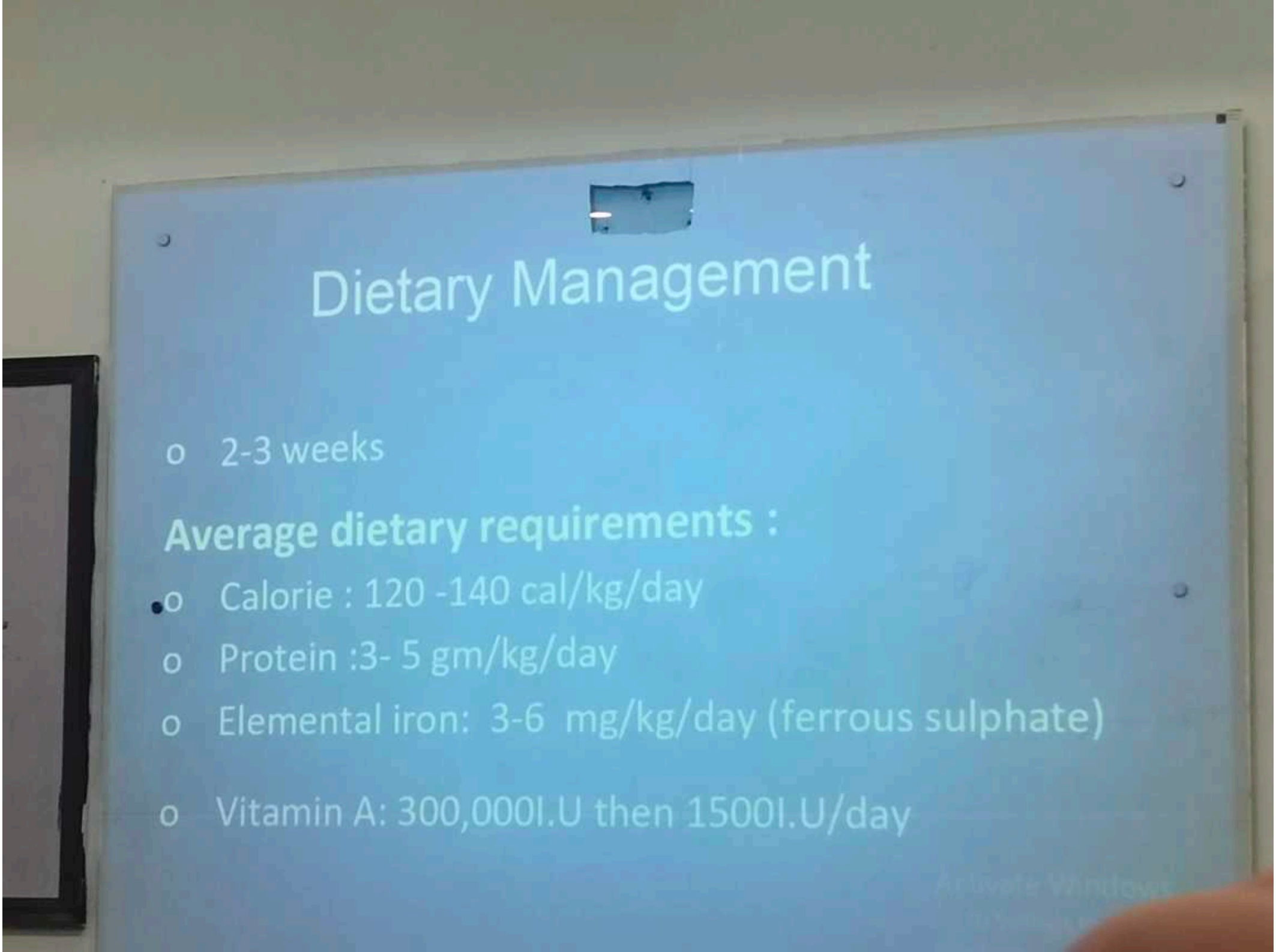
Treat acute infections

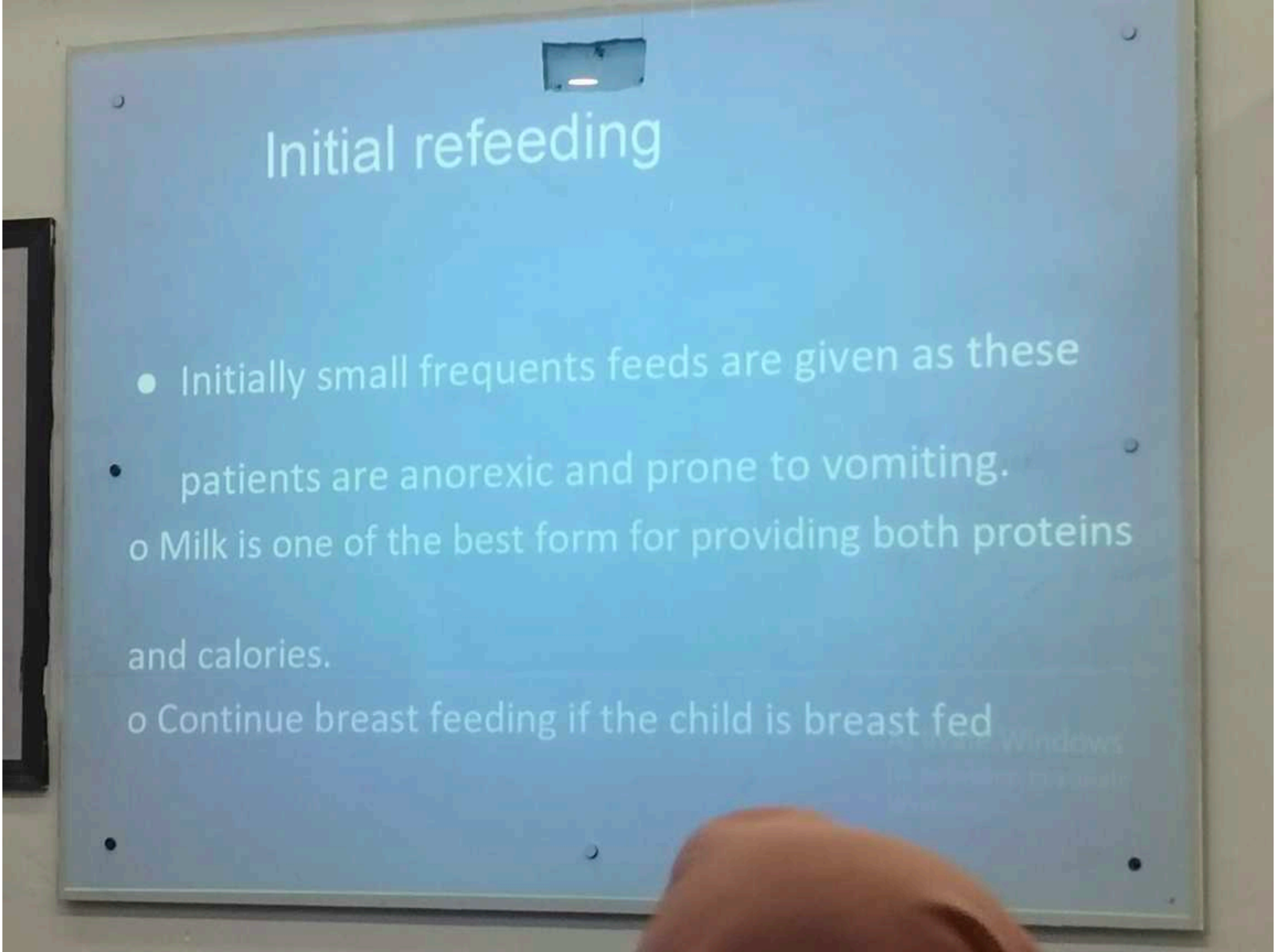
- Pneumonia
- Diarrhoea
- Skin infections
- ENT infections

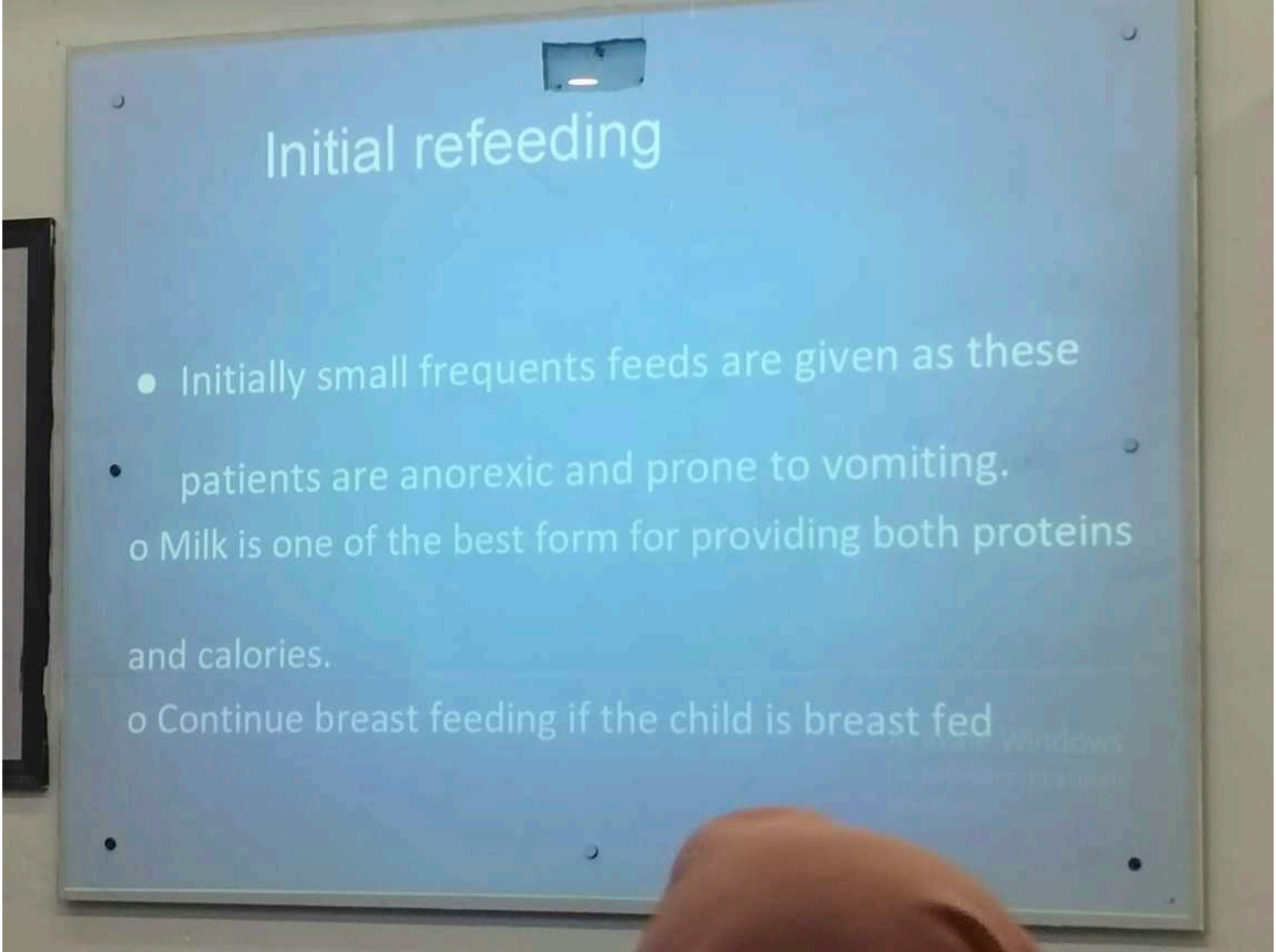
- Note: signs of acute infection may be masked due to severe malnutrition

Congestive cardiac failure

- usually a complication of overhydrationn,very severe anemia, blood or plasma transfusion or giving a diet with high Na content
- When due to fluid overload:
  - stop all oral intake and IV fluids
  - Diuretic IV (furosemide 1 mg/kg)
  - Do not give digitalis unless the diagnosis of heart failure is unequivocal & the plasma K level is normal


Dietary Management
o 2-3 weeks
Average dietary requirements :
o Calorie : 120 -140 cal/kg/day
o Protein :3- 5 gm/kg/day
o Elemental iron: 3-6 mg/kg/day (ferrous sulphate)
o Vitamin A: 300,000I.U then 1500I.U/day


Initial refeeding
Initially small frequents feeds are given as these
patients are anorexic and prone to vomiting.
o Milk is one of the best form for providing both proteins
and calories.
o Continue breast feeding if the child is breast fed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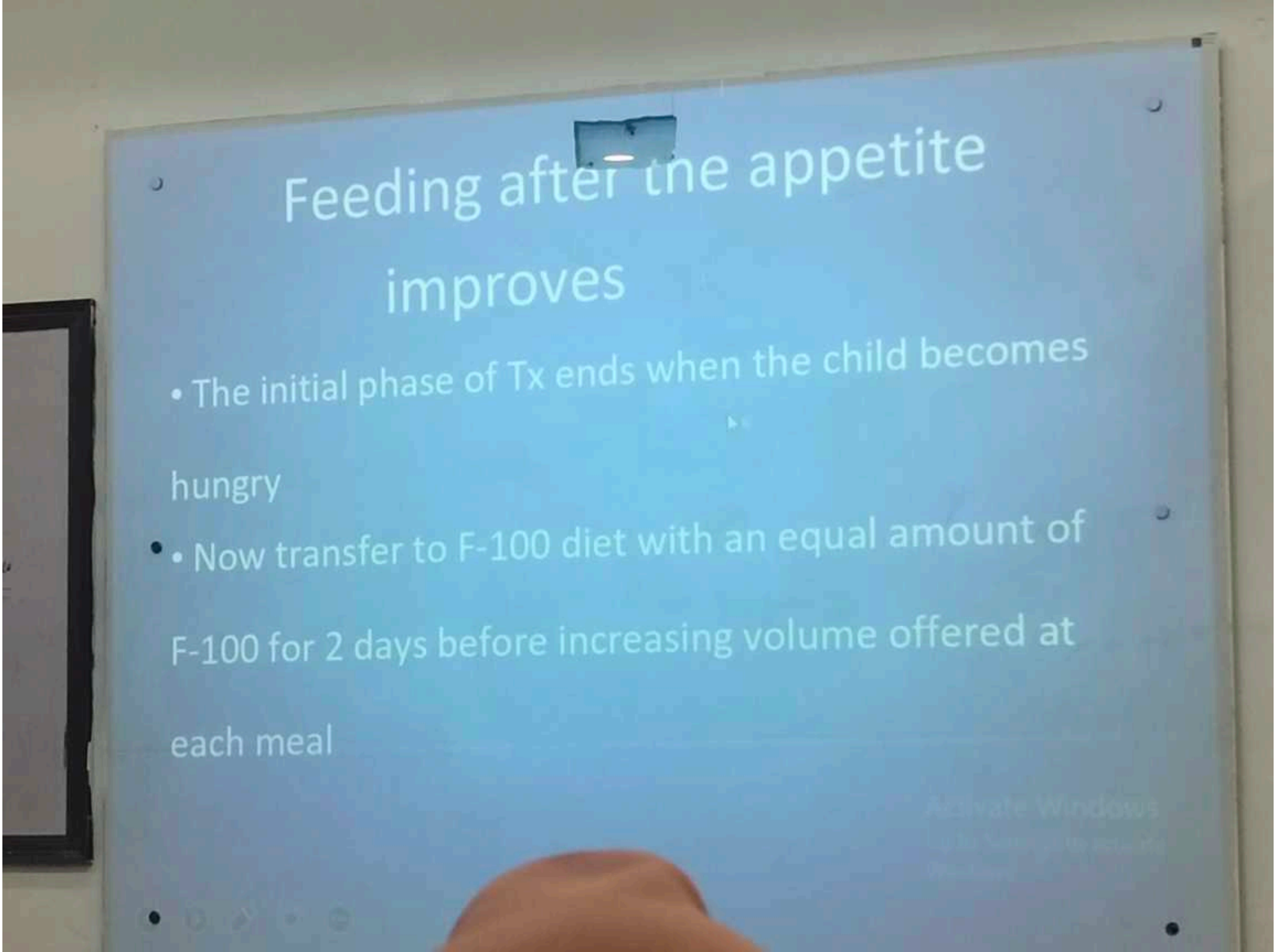
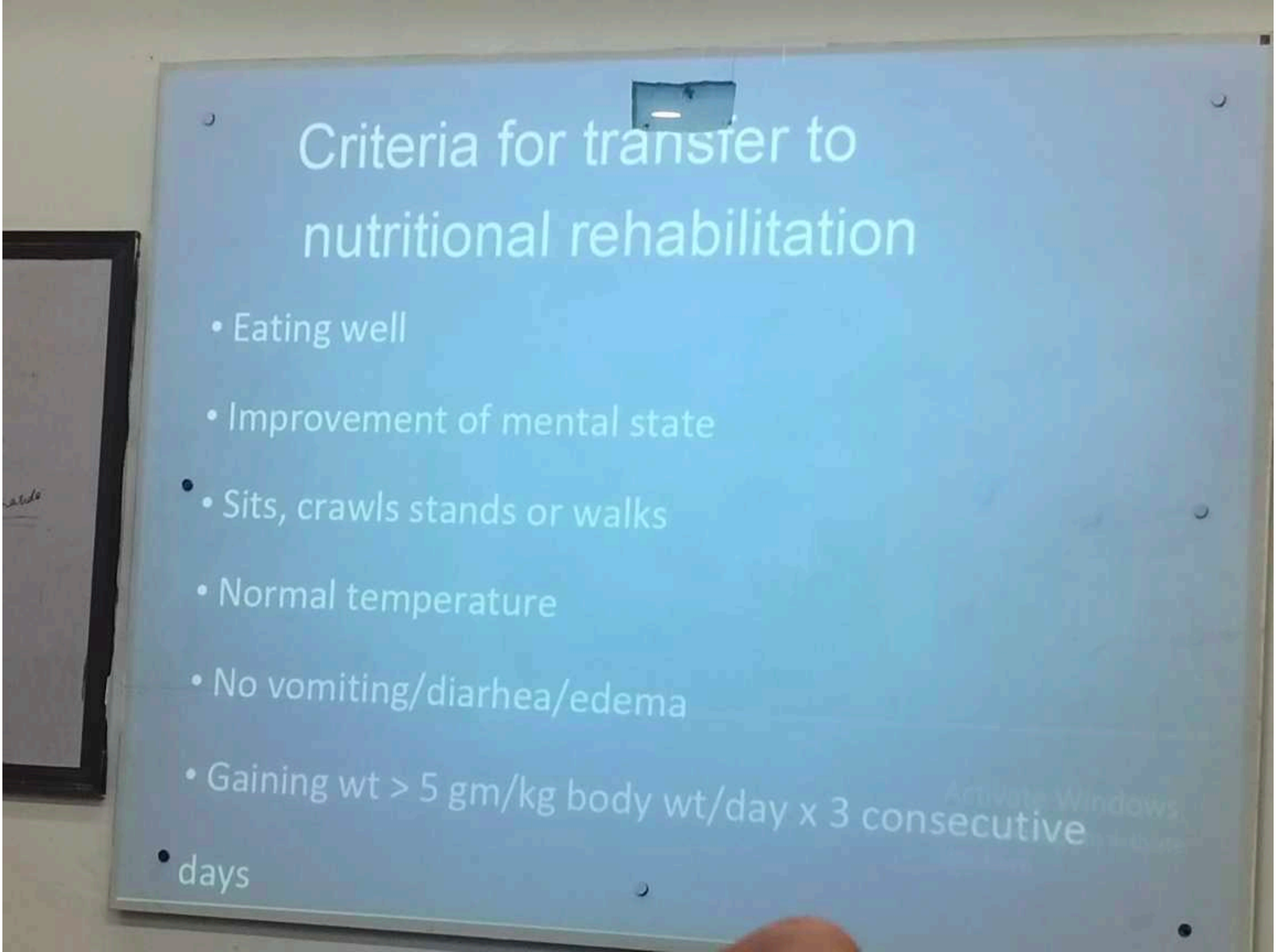
Types of formula feed

- F-75 (75 Kcal/ 3215kJ/100 ml)-used during the initial phase
- F-100 (100 Kcal/420kJ/100 ml)-used during the rehabilitation phase

	F-75 (starter)	F-100 (catch-up)
Dried skimmed milk (g)	25	80
Sugar (g)	70	50
Cereal flour (g)	35	-
Vegetable oil (g)	27	60
Electrolyte/mineral solution (ml)	20	60
Vitamin mix (mg)	140	140
Water, make up to (ml)	1000	1000

Constituent	Amount per 100 ml	
	F-75	F-100
Energy (kCal)	75	100
Protein (g)	0.9	2.9
Lactose(g)	1.3	4.2
Potassium (mmol/l)	3.6	5.9
Sodium (mmol/l)	0.6	1.9
Magnesium (mmol/l)	0.43	0.73
Zinc (mmol/l)	2	2.3
Copper (mmol/l)	0.25	0.25
%age of energy from		
• protein	5%	12%
• fat	32%	33%
Osmolarity (mOsmol)	333	419


Feeding after the appetite improves
• The initial phase of Tx ends when the child becomes hungry
• Now transfer to F-100 diet with an equal amount of F-100 for 2 days before increasing volume offered at each meal


Criteria for transfer to nutritional rehabilitation
• Eating well
• Improvement of mental state
• Sits, crawls stands or walks
• Normal temperature
• No vomiting/diarhea/edema
• Gaining wt > 5 gm/kg body wt/day x 3 consecutive days

Nutritional rehabilitation

Child should be weight daily

- Usual weight gain is 10 to 15Gm/kg/day
- Treatment failure: when the child doesn't gain wt at least 5Gm/kg/day for 3 consecutive days
- target wt for discharge achieved after 2 to 4 wks

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Recovery

- Takes place in 2 phases

INITIAL RECOVERY PHASE

- It takes 2 -3 wks: edema & other signs improve

CONSOLIDATION PHASE

In next 2 to 3 months child regains normal weight

and is clinically recovered

criteria for discharge from hospital

1. CHILD

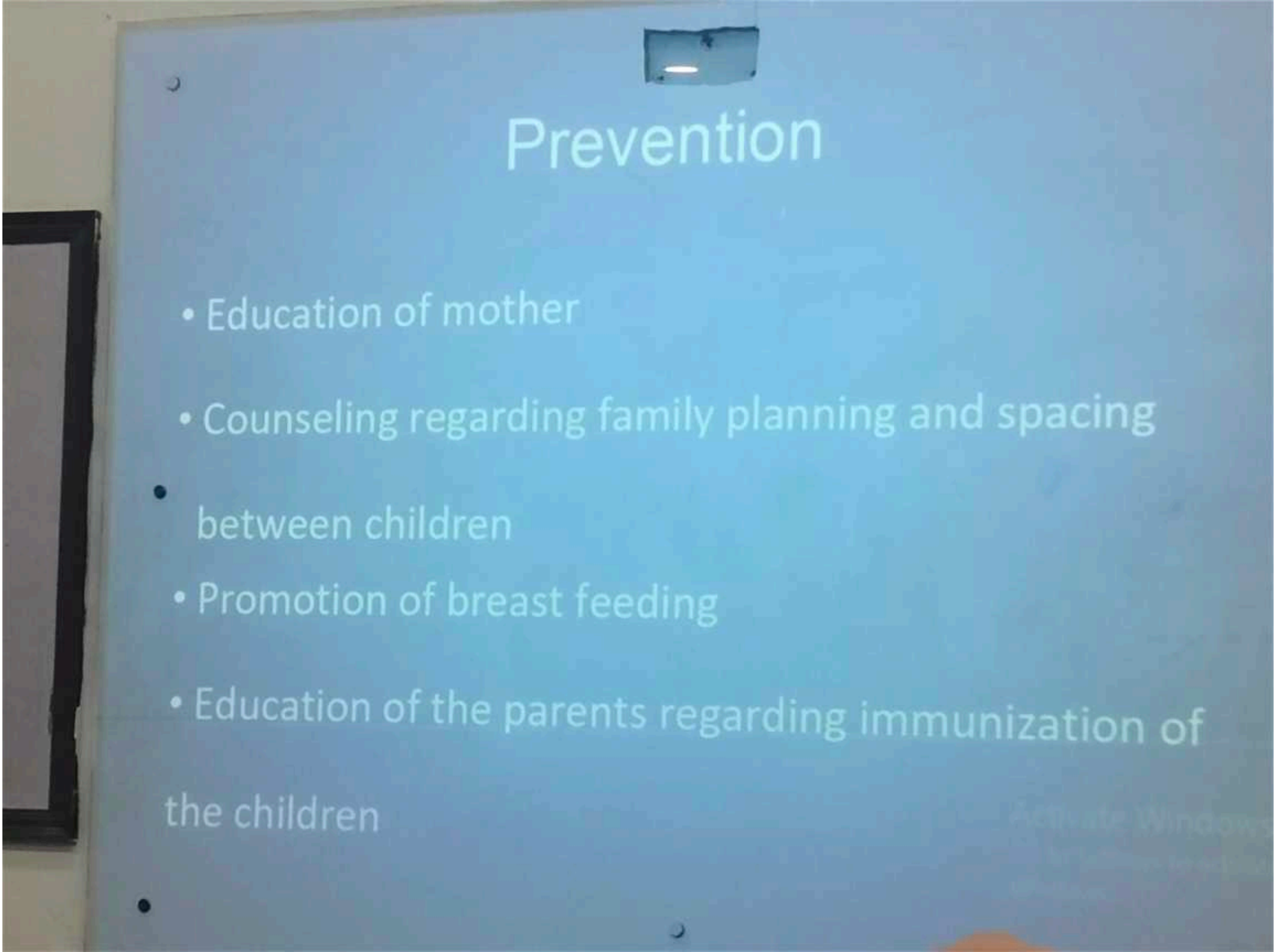
- Weight gain is adequate
- Eating an adequate amount of diet
- Vitamins & mineral deficiencies treated
- All infections & other conditions treated
- Full immunization programme started

2. MOTHER

- Able & willing to look after the child
- Knows how to prepare & feed balance diet
- Knows how to play with child
- Knows how to give home treatment for diarrhea, fever and ARI. Warn for danger signs

FOLLOW UP

- Follow up at regular intervals after discharge
- Child should be seen after
  - every 2 days for 1 wk
  - once weekly for 2nd wk
  - at 15 days interval for 1 - 3 months
  - monthly for 3- 6 months
- More frequent visits if there is problem
- After 6 months, visits twice a year until the child is at


Prevention
• Education of mother
• Counseling regarding family planning and spacing between children
• Promotion of breast feeding
• Education of the parents regarding immunization of the children