



University of Nairobi

# Hypoglycaemia in the early Neonatal period (0-72hrs)



An initiative of ETAT+ Trainers

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# Outline



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**Dr. Fareen Musa**  
Golden hour Approach  
and prevention of  
hypoglycemia



**Dr. Rachael Kanguha**  
(Host)  
Introduction and risk  
factors of hypoglycemia



**Dr. Joy Odhiambo**  
Definition and  
consequences of  
hypoglycemia

# Outline



**Dr. Allan Kayiza**  
Neonates response to  
hypoglycemia



**Edith Gicheha**  
Use of expressed  
breastmilk and  
monitoring of  
hypoglycemia



**Dr. MaryAnne  
Murugami.**  
Management of  
hypoglycemia



**Simon Pkemoi**  
Using glucose gel &  
Performing a heel  
prick

# The Golden hour Approach



# What is the Golden hour concept?

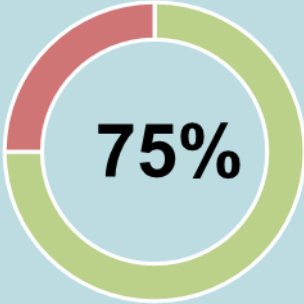


- The “**Golden hour**” of neonatal life refers to the first 60mins of post natal life for both term and preterm infants.
- **Golden hour concept-** Aimed at practicing evidence based interventions within the first 60 mins of life to improve outcomes in neonatal life.

*Golden hour of neonatal life: Need of the hour by [Deepak Sharma](#) 2017*

# Why focus on the golden hour?

- First hour of life is a time of critical adaption for the baby



- Neonatal deaths within the first week of life<sup>1</sup>
- Of these 1 million deaths- occur during the first 24 hours<sup>1</sup>





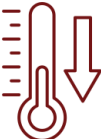










Infant’s risk of mortality is at its highest immediately after birth



Studies suggest that management during this time period can have a significant impact on short and long term outcomes.

1. <https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality>

# Components of golden hour approach

- 1 Antenatal counselling 
- 2 Delayed cord clamping 
- 3 Prevention of hypothermia 
- 4 Support the respiratory system 
- 5 Support cardiovascular system 
- 6 Prevention of sepsis 
- 7 Prevention of hypoglycemia 
- 8 Early nutritional care 
- 9 Initiation of breast feeding 
- 10 Starting of therapeutic hypothermia for birth asphyxia 
- 11 Laboratory investigation 
- 12 Vitals monitoring 
- 13 Counselling of parents. 

Steps 1,3,6,7,8,9,12 relevant to our discussion today

# Definition and consequences of Neonatal hypoglycemia

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# Defining Neonatal Hypoglycemia : continuing debate!!

“The definition of clinically significant hypoglycemia remains one of the most confused and contentious issues in contemporary neonatology.” Cornblath et al

## WHO<sup>2</sup>

- Newborn with sign of illness- BG <2.5mmol/l ( 45mg/dl)
- Healthy term/preterm newborn-feeding well'- BG <1.1mmol/l (19.8mg/dl)

## Other societies/ organizations

- American Academy of Paediatrics
- Paediatric Endocrine Society

## Kenya

0-72 hours

**>2.6  
mmol/L**

**Therapeutic  
goals**

After 72 hours-  
28 days

**>3.3  
mmol/L**



1. Neonatal Hypoglycemia [Ashley Abramowski<sup>1</sup>](#), [Ashraf H. Hamdan<sup>2</sup>](#) . Treasure Island (FL): StatPearls Publishing; 2020 Jan. 2020 Jan 16  
 2. Pocket book of hospital care for children: Guidelines for the management of common childhood illnesses, WHO

# What now? Pragmatic approach!

Concentration of glucose in the blood or plasma at which the individual demonstrates a unique response to the abnormal milieu caused by the inadequate delivery of glucose to a target organ<sup>1</sup>

**Operational  
threshold**

Provides large margin of safety by designating the lower level of glucose that a neonate can safely tolerate based on physical maturity and influence of pathology

“ According to Kenyan guidelines:

- Neonatal hypoglycemia is defined as **blood glucose <2.6mmol/l**
- Asymptomatic neonates with hypoglycemia- Buccal glucose and immediate EBM
- Symptomatic or BG < 1.8mmol/l – (buccal glucose)- IV 10% glucose and IV maintenance fluids.

”

1. Abramowski A, Hamdan AH. *maintainceycemia*. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2020

2. *Comprehensive newborn care protocols: Integrating technologies with clinical care* Jan 2020

# Why worry about hypoglycemia?


## 1. Long term neurological sequelae


The brain primarily uses glucose to meet its metabolic demands





Systematic review and meta-analysis: Rajesh S et al, 2019<sup>2</sup>

Mahajan et al, 2017<sup>1</sup>

 **72 - Hypoglycemic**  
**70 - Euglycemic**

 At 1 year:  
**8% of hypoglycemic had cerebral palsy**

 **1,665 studies were screened**

 Early childhood:

- **Epilepsy** OR 1.93
- **Specific cognitive deficit**  
2 -3 fold increase risk

Late childhood:

- **Neurodevelopmental impairment** OR 3.2
- **Low literacy/numeracy** OR 2.04

1. Neurodevelopmental Outcome of Asymptomatic Hypoglycemia Compared With Symptomatic Hypoglycemia and Euglycemia in High-Risk Neonates

Gagan Mahajan et al 2017

2. Neonatal Glycaemia and Neurodevelopmental Outcomes: A Systematic Review and Meta-Analysis Rajesh Shah et al, 2019

# Sequelae of hypoglycemia



- Hypoglycemic encephalopathy
- Suboptimal head growth
- Intellectual disability
- Behavioral difficulties
- Cerebral palsy
- Visual impairment
- Recurrent seizures

# Why worry??

## 2. Increased risk of mortality

- Hypoglycemia significantly contributes to neonatal mortality.
- Tanzania- hypoglycemia was found to be a major cause of neonatal mortality, contributing to **20%** of the causes.



Incidence of neonatal hypoglycemia is high- **33.7%**<sup>1</sup>

## 3. Others

- ❖ Newborn Intensive Care Unit admission leading to<sup>3</sup> :
  - increased cost to family
  - separation from mother

1. Mitchell NA, Grimby C, Rosolowsky ET, et al. Incidence and Risk Factors for Hypoglycemia During Fetal-to-Neonatal Transition in Premature Infants. *Front Pediatr.* 2020;8:34. Published 2020 Feb 11. doi:10.3389/fped.2020.00034.
2. The Hidden Burden of Hypoglycemia in Neonatal Mortality in Tanzania - The Case of Saint Francis Hospital, Ifakara (Africa Online Journal-2012)
3. Thompson-Branch A, Havranek T. Neonatal Hypoglycemia. *Pediatr Rev.* 2017;38(4):147-157. doi:10.1542/pir.2016-0063

# Neonatal and maternal risk factors of hypoglycemia



# Neonatal & maternal risk factors of hypoglycemia

## Neonatal factors


- Prematurity <37wks
- SGA&IUGR
- Infant of diabetic mother
- Infection
- Perinatal asphyxia
- Congenital cyanotic heart disease
- Cesarean delivery
- Persistent hyperinsulinism
- Delayed start of breastfeeding



## Maternal/family factors

- Maternal diabetes or obesity
- Iatrogenic factors e.g. Glucose infusions during labor/ B agonists used to suppress preterm labor
- Family history of early onset DM
- Sibling with history of sudden seizure/ collapse

# Neonatal risk factors of hypoglycemia




**Neonatal sepsis**

**X40**

(OR 40.6)

(95% CI 10.84-152.01)




**Large for gestational age (LGA)**

**x37**

(OR 37.2)

(95% CI 6.28-219.85)

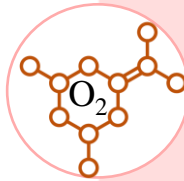


**Low birth weight (LBW)**

**X7**

(OR 7.1)

(95% CI 1.54-32.37)



**Asphyxia**

**X2.8**

(OR= 2.8 )

(95% CI: 1.01 – 7.80)

Mufidati L, Anggraini A, Wibowo T. Asphyxia as a risk factor for neonatal hypoglycemia. *Journal of nepal paediatric society* 2017; 37(2): 111-116.  
Melkonian EA, Schury MP. *Biochemistry, Anaerobic Glycolysis*. [Updated 2019 Aug 21]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546695/>



# Prematurity

## Inadequate glycogen stores

Glycogen- storage built up in 3<sup>rd</sup> trimester.

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## Inadequate muscle stores

Inadequate muscle stores- a source of amino acids to be used for gluconeogenesis

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## Immature central nervous system

Too immature to suckle on demand

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## Inadequate lipid/fat stores

Built up in 3<sup>rd</sup> trimester.

Adipose tissue- alternative source of energy (adipose tissue store is low)

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## Immature gluconeogenic pathways

Low levels of enzymes used in gluconeogenesis- limited gluconeogenesis

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## Larger brain-to-body mass ratio

Increased metabolic demands because of their relatively large brain size

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Abramowski A, Hamdan AH. Neonatal Hypoglycemia. [Updated 2020 Jan 16]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537105/>

Rao PN, Shashidhar A, Ashok C. In utero fuel homeostasis: Lessons for a clinician. *Indian J Endocrinol Metab.* 2013;17(1):60-68. doi:10.4103/2230-8210.107851  
Thompson-Branch A., Havranek T. Neonatal hypoglycemia. *Pediatrics in Review* April 2017, 38 (4) 147-157; DOI: [https://login.research4life.org/tacsgr1doi\\_org/10.1542/pir.2016-0063](https://login.research4life.org/tacsgr1doi_org/10.1542/pir.2016-0063)

# Small for gestational age (SGA) & intrauterine growth restriction

## Inadequate glycogen stores

Glycogen- used for growth instead of storage

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## Inadequate muscle stores

Inadequate muscle stores- a source of amino acids to be used for gluconeogenesis

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## Genetic predispositions to hypoglycemia

May have genetic predisposition to hyperinsulinism, GH/cortisol deficiency & inborn errors of metabolism.

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## Immature gluconeogenic pathways

Low levels of enzymes used in gluconeogenesis- limited gluconeogenesis

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## Larger brain-to-body mass ratio

Increased metabolic demands because of their relatively large brain size

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bramowski A, Hamdan AH. Neonatal Hypoglycemia. [Updated 2020 Jan 16]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from:

<https://www.ncbi.nlm.nih.gov/books/NBK537105/>

Rao PN, Shashidhar A, Ashok C. In utero fuel homeostasis: Lessons for a clinician. Indian J Endocrinol Metab. 2013;17(1):60-68. doi:10.4103/2230-8210.107851

Thompson-Branch A., Havranek T. Neonatal hypoglycemia. Pediatrics in Review April 2017, 38 (4) 147-157; DOI:

[https://login.research4life.org/tacsgr1doi\\_org/10.1542/pir.2016-0063](https://login.research4life.org/tacsgr1doi_org/10.1542/pir.2016-0063)

# Infant of diabetic mother (IDM)



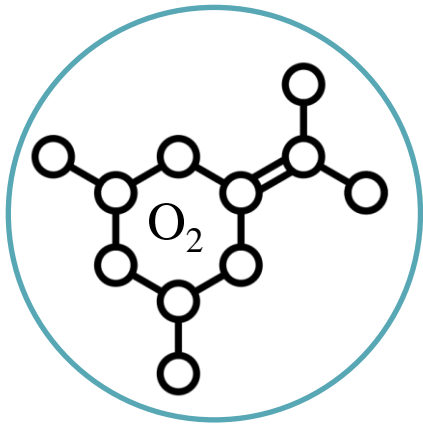
↑↑ in maternal glucose - fetal hyperglycemia & ↑↑ endogenous fetal insulin - neonatal hypoglycemia

IDM have a ↓ ability to mobilize glycogen stores after birth & have a relative adrenal insufficiency & ↓ levels of catecholamines contributing to hypoglycemia

Premature IDMs or SGA are at ↑ risk of hypoglycemia  
2<sup>o</sup> reduced glycogen stores & hyperinsulinemia -  
decreases the ability to mobilize hepatic glycogen

Maternal use of oral hypoglycemic agents .  
Metformin and sulfonylureas can cross the placenta &  
cause hypoglycemia in the fetus

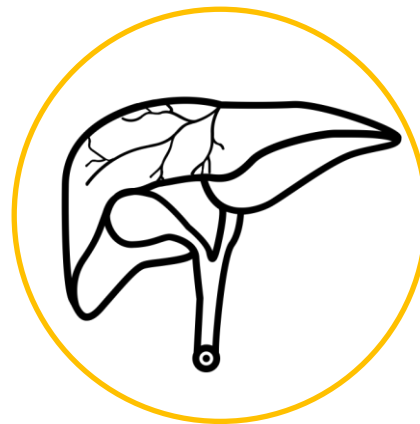
# Perinatal asphyxia



Associated with decreased tissue perfusion, poor oxygenation & biochemical defects that lead to anaerobic glucose metabolism

Anaerobic glycolysis (2 ATP vs 32 ATP in aerobic)

Leads to excessive glycogenolysis which leads to hypoglycemia



Ischemic liver injury in asphyxia leads to reduced capacity for gluconeogenesis

# Infections – sick neonate



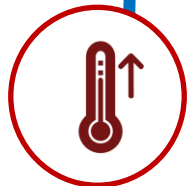
Inadequate intake of feeds to supports the maintenance of blood glucose concentrations leads to hypoglycemia

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In sepsis, circulatory failure may lead to hypoxic/ischemic liver injury with reduced gluconeogenesis and anaerobic metabolism

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Presence of hyperthermia increases metabolic rate which increases glucose utilization

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Perinatal stress causes a state of 'hypoglycemic hyperinsulinism' that can persist for days to weeks, resulting in persistently low glucose

Sharma A, Davis A, Shekhawat PS. Hypoglycemia in the preterm neonate: etiopathogenesis, diagnosis, management and long-term outcomes. *Transl Pediatr*. 2017;6(4):335-348. doi:10.21037/tp.2017.10.06

Thompson-Branch A., Havranek T. Neonatal hypoglycemia. *Pediatrics in Review* April 2017, 38 (4) 147-157; DOI: [https://login.research4life.org/tacsgr1doi\\_org/10.1542/pir.2016-0063](https://login.research4life.org/tacsgr1doi_org/10.1542/pir.2016-0063)

urukawa, M., Kinoshita, K., Yamaguchi, J. et al. Sepsis patients with complication of hypoglycemia and hypoalbuminemia are an early and easy identification of high mortality risk. *Intern Emerg Med* 14, 539–548 (2019). <https://doi.org/10.1007/s11739-019-02034->

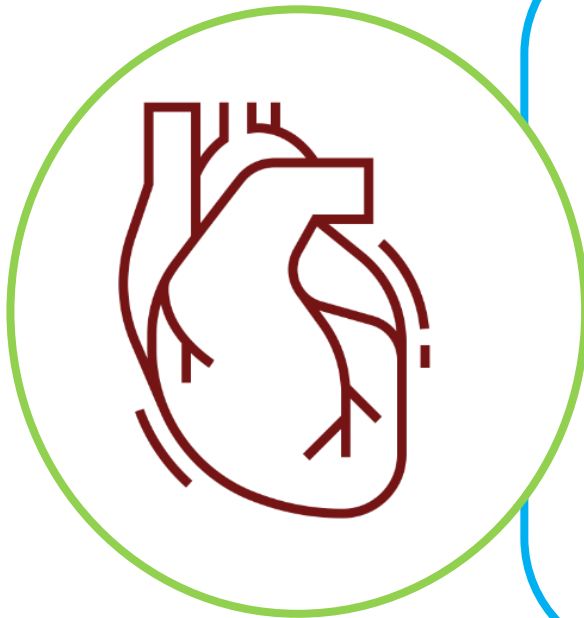
# Cesarean delivery

During labor and SVD delivery, there is a surge in counter regulatory hormones e.g. catecholamines which play a crucial role in gluconeogenesis



Infants born via CS have lower catecholamine levels compared to those born via SVD & hence are more prone to hypoglycemia.

# Cyanotic heart disease

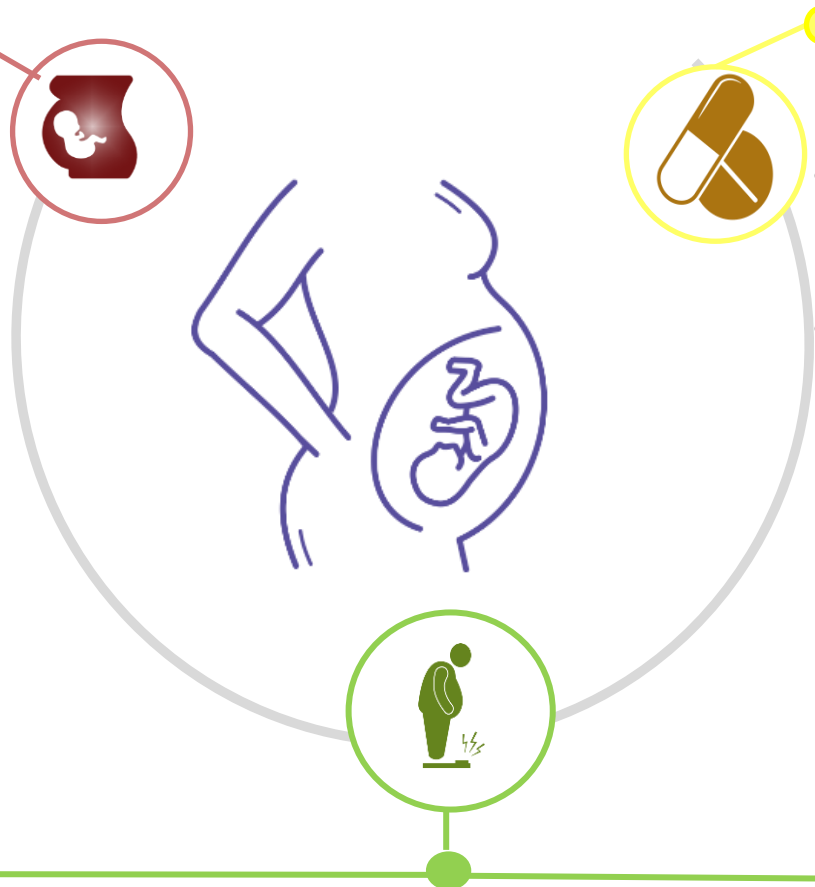


Associated with decreased tissue perfusion & poor oxygenation that lead to anaerobic glucose metabolism that needs increased metabolic energy, which puts neonates at risk for hypoglycemia.

# Maternal causes

## Maternal diabetes

- Increased fetal glucose load & fetal hyperinsulinaemia that persists after birth - transient hypoglycemia
- Oral hypoglycemics metformin and sulfonylureas



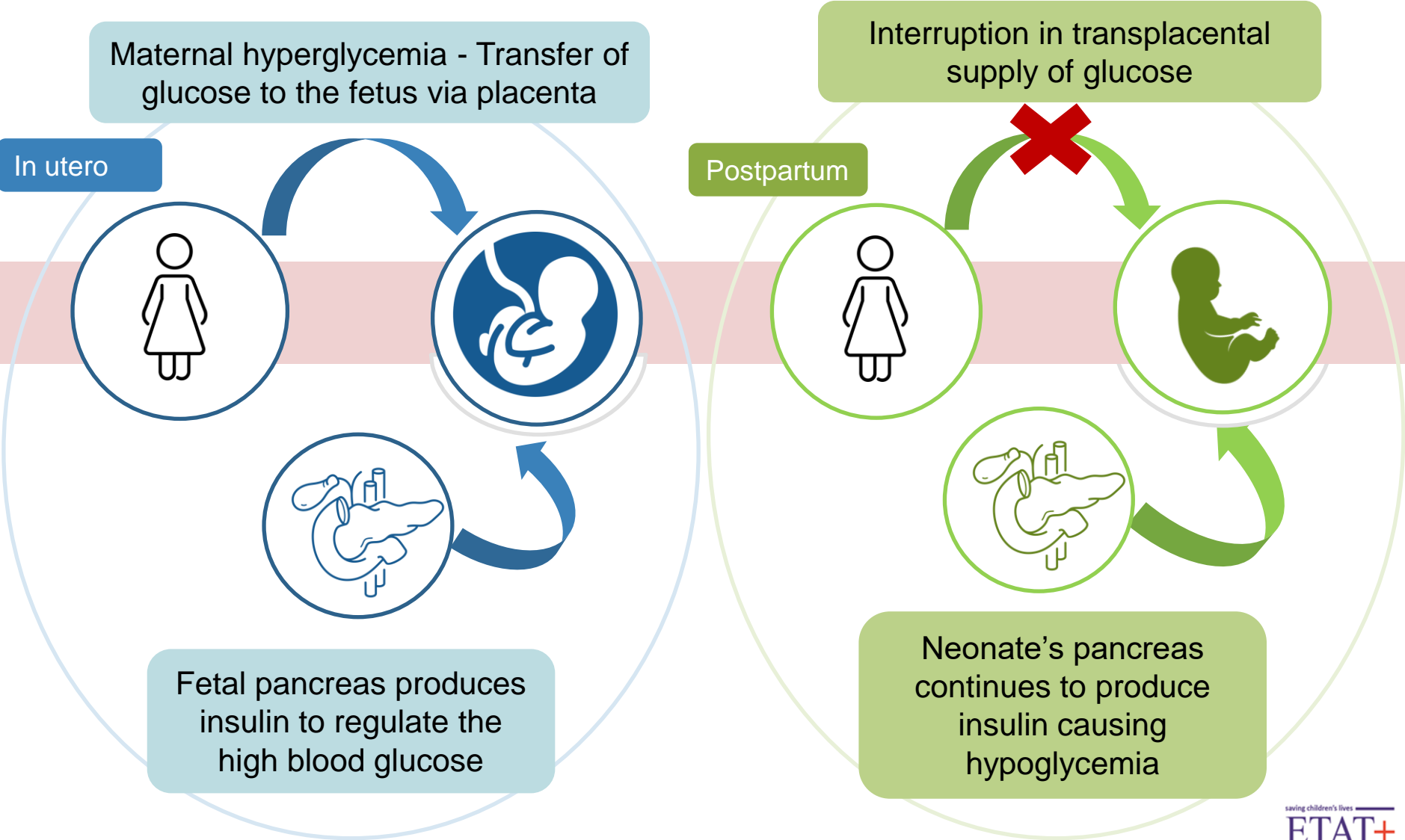
## Iatrogenic

- Glucose infusions during labor
- Administration of **B-agonists** to suppress preterm labor may cause maternal hyperglycemia and associated fetal hyperinsulinism

**Maternal obesity** & weight gain above the recommended - fetal overnutrition & hyperinsulinemia



# Mechanism of hypoglycemia in IDM




# What if the neonate has persistent hypoglycemia???



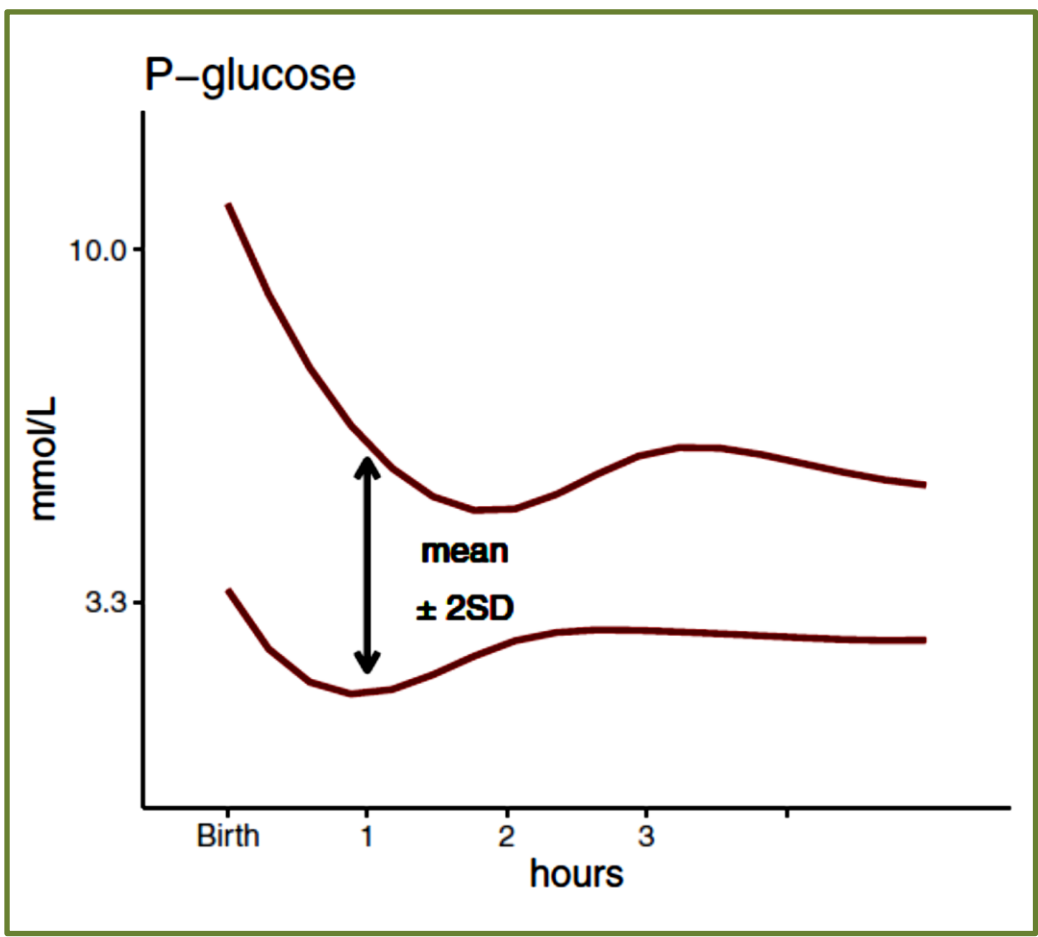
**Early referral and  
Consult Endocrinologist**



# How the neonate responds to hypoglycemia



# Postnatal Plasma glucose levels



## Fetal blood glucose

0.5 mmol/l lower than maternal level

## At 1 hr postnatal

In a well term neonate  
1.4–1.7 mmol/L

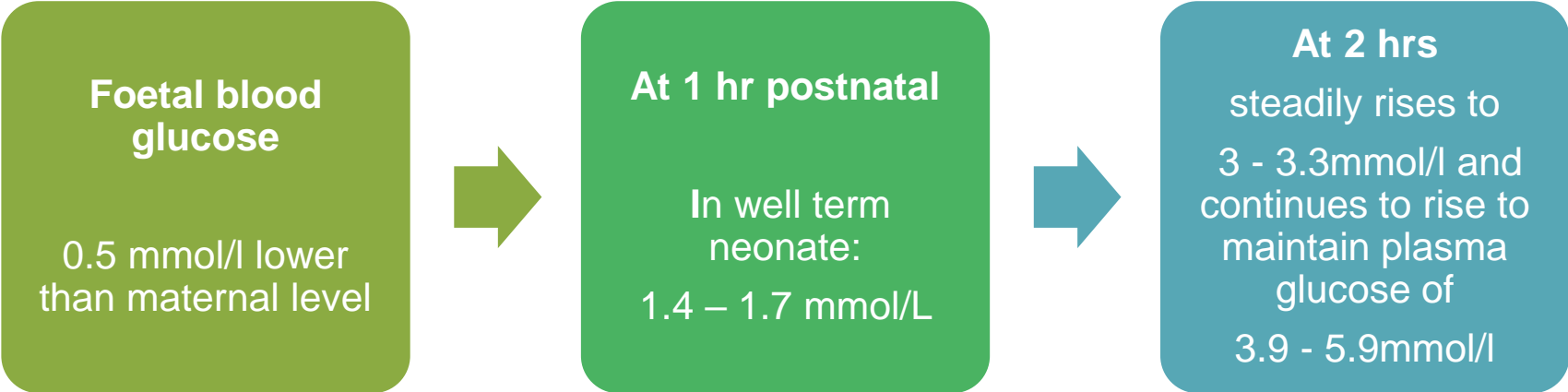
## At 2 hrs

Steadily rises to 3-3.3mmol/l and continues to rise to maintain plasma glucose of 3.9-5.9mmol/l

Wackernagel et al, Swedish national guidelines for prevention and treatment of neonatal hypoglycemia in new born infants with gestational age  $\geq 35$  weeks, *acta paediatrica*, Wiley July 2019

# Target blood glucose levels of infants at risk at varying postnatal age

Postnatal age	Target blood sugar
0- <3hrs	1.4mmol/l
3 – 72 hours	> 2.6 mmol/L
> 72 hours	> 3.3 mmol/L



Wackernagel et al, Swedisch national guidelines for prevention and treatment of neonatal hypoglycemia in new born infants with gestational age  $\geq 35$  weeks, *acta paediatrica*, Wiley July 2019

# Why is the new born at an increased risk of hypoglycemia?



Relatively hyperinsulinemia due to incomplete suppression of insulin resulting in inappropriate retention of the limited glycogen stores in the face of hypoglycemia

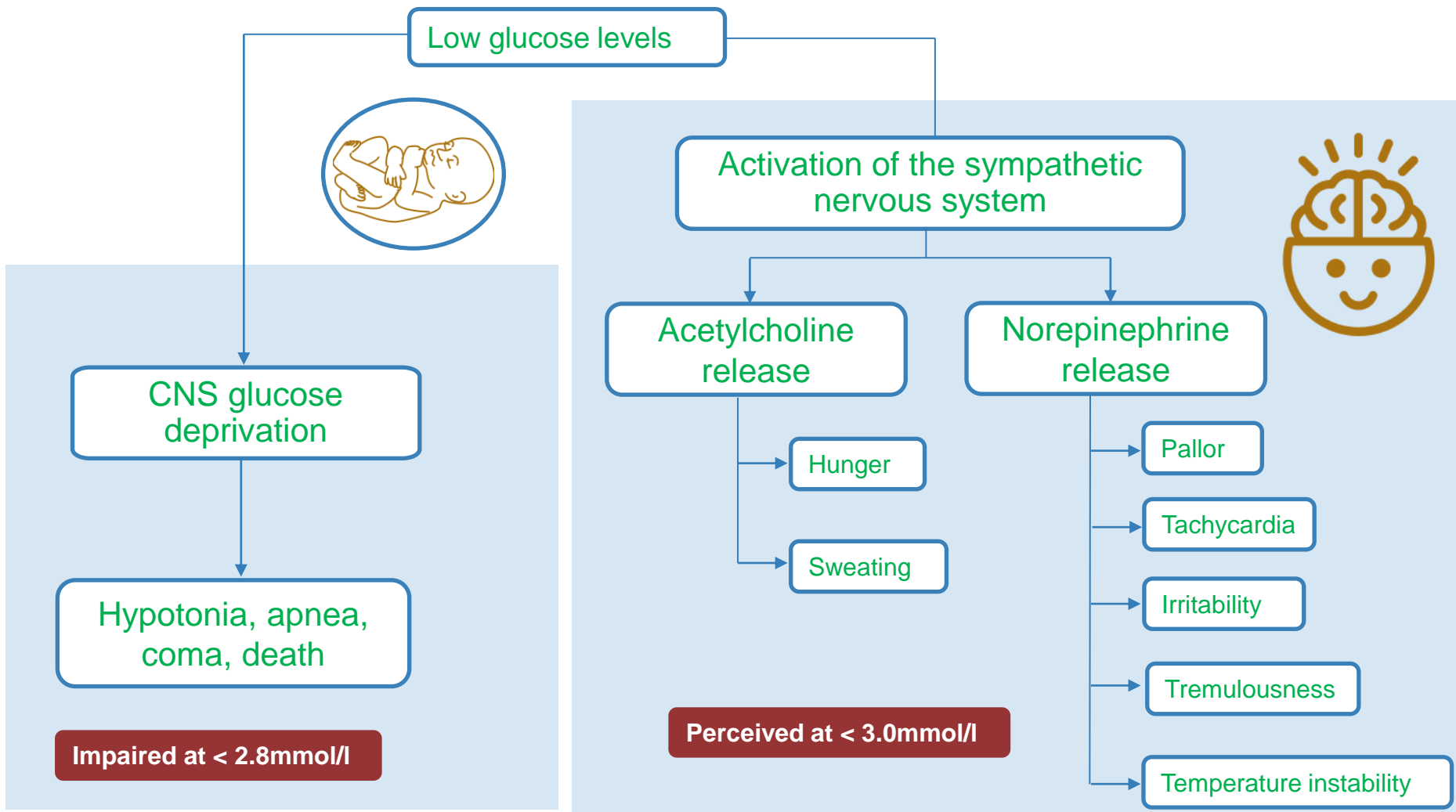


Liver glycogen stores are rapidly depleted within hours of birth in an attempt to maintain euglycemia,



Generally inefficient at producing ketones and have lower amounts of free fatty acids to use as an alternate fuel source

# Signs and symptoms of hypoglycemia



Thornton et al; Recommendations from the Pediatric Endocrine Society for Evaluation and Management of Persistent Hypoglycemia in Neonates, Infants, and Children, Journal of pediatrics, Vol. 167, No 2; August 2015

# Signs and symptoms of hypoglycemia



## Mild – Moderate



Jitteriness, Irritability,  
High pitched cry  
Lethargy, Hypotonia  
Tremors  
Hypothermia



Tachycardia  
Sweating



Tachypnoea



Poor feeding,  
Vomiting



## Severe



Seizure  
Coma  
Sudden death



Pallor  
(Circulatory collapse)



Apnea  
Cyanosis

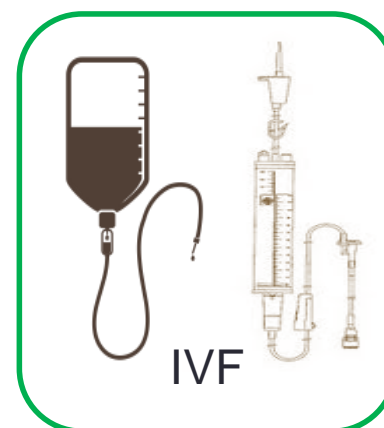


# Prevention of hypoglycemia



# Prevention of hypoglycemia

1. Breastfeeding immediately after birth
2. Neonates of mothers not available to give breastmilk should receive supplementary feeding **NO LATER than ONE HOUR after birth**

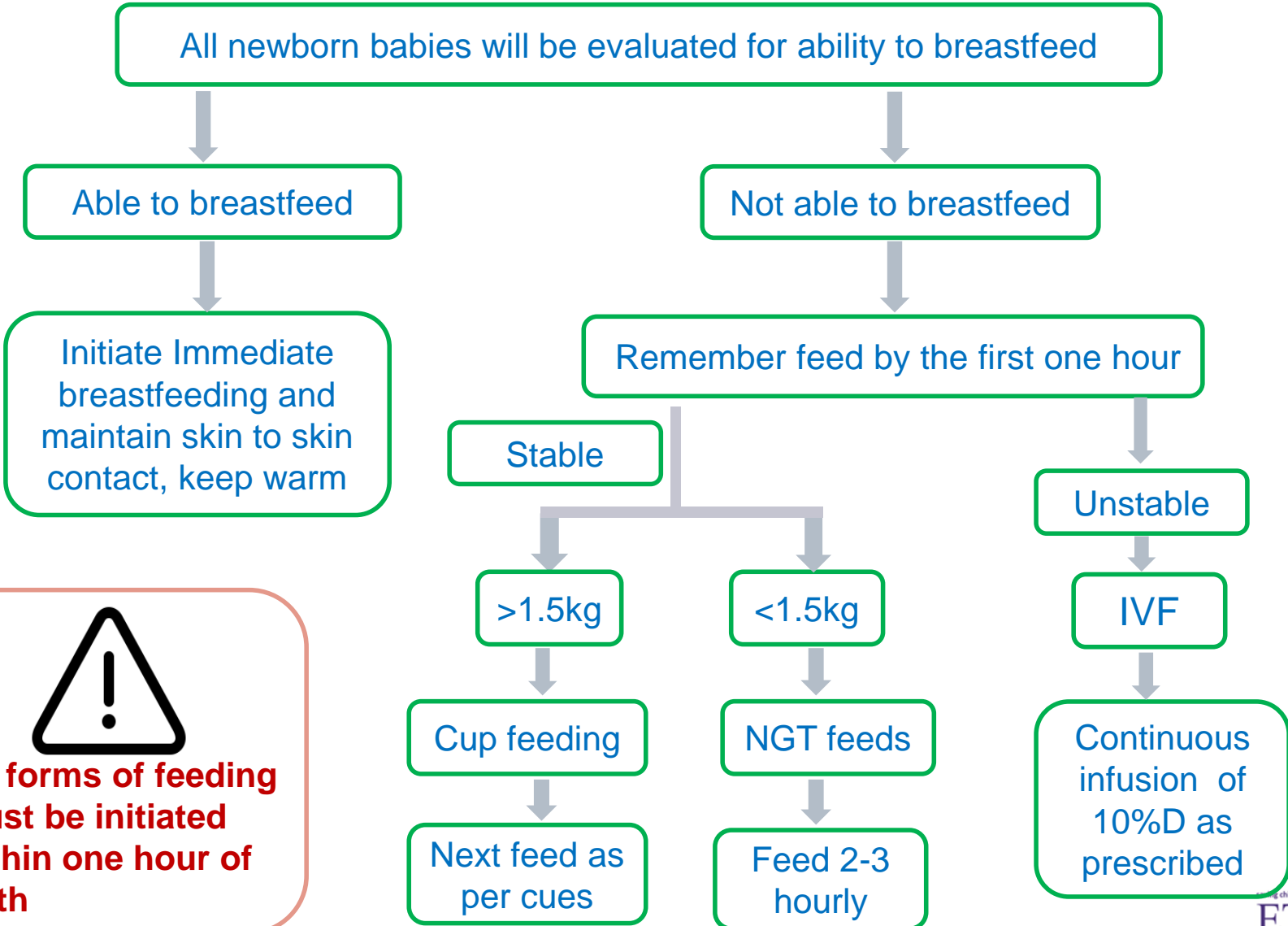


3. To be cared for with **skin-to skin contact**
4. **Keep warm** – prevent hypothermia
5. Postponing the first bath (6 hrs and if acceptable upto 24 hours)
6. After first feed, babies breastfed as per infants cues/signal and at least every 2-3hrs

1. Queensland Clinical Guidelines. Neonatal hypoglycaemia 2018

2. Wackernagel D, et al. Swedish national guideline for prevention and treatment of neonatal hypoglycaemia in newborn infants with gestational age  $\geq 35$  weeks. *Acta Paediatr.* 2020; 109: 31– 44

# How do we prevent hypoglycemia



  
**All forms of feeding must be initiated within one hour of birth**

# Risk Factors for Hypoglycaemia- Do blood sugar at 2 hours after birth

## Decreased substrate

- Prematurity
- SGA
- IUGR



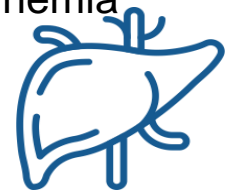
## The ill neonate

- Sepsis
- Intrapartum complications
- MAS
- CHD



## Increased insulin levels in the neonate

- Persistent hyperinsulinemia
- IDM.



## Maternal factors

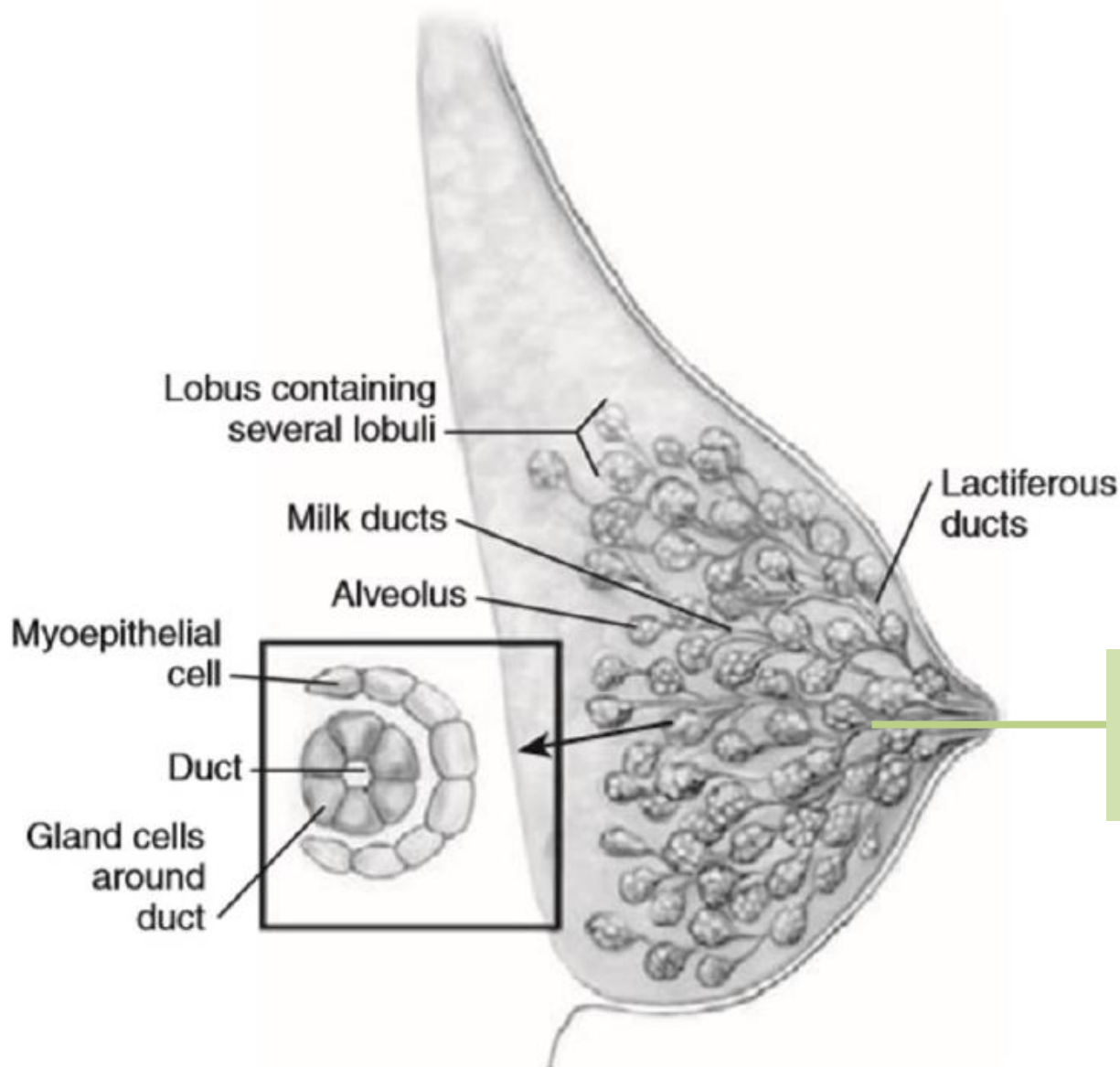
- Maternal diabetes
  - Oral hypoglycemics-
  - Metformin and sulfonylureas
- Glucose infusions during labour
- Administration of Beta sympathomimetics.



# Using Expressed Breast Milk to Prevent Hypoglycaemia



# The Lactating Breast



Temporary Milk Containers

# Hand expression of breastmilk



- Hold the breast using the 'C' grip
- Push the breast back towards the chest wall
- Press the thumb and the supporting fingers together and then release.
- Repeat this step until breast is empty



# Cup Feeding Technique

1. Observe for hunger cues
2. Prepare and put appropriate volume of milk in a cup
3. Sit the baby at 90° supporting the baby's head, neck and back.
4. Place the cup on the lower lip and tilt the cup so the milk reaches the baby lips
5. Let the baby lick the milk using the tongue
6. Continue tilting the cup as the baby continues to lick the milk.
7. When baby has taken enough, he will start closing his mouth and even fall asleep



- Do not feed baby when lying down
- Do not pour milk into the mouth
- Do not feed a sleeping baby





# Nasal Gastric Tube Feeding

a) 3 hourly NGT EBM feeds and ONE hourly IVF for UNSTABLE NEWBORNS with birth weight less than 1500-3000grams

	1.5-1.6kg		1.7-1.8kg		1.9-2.0kg		2.1-2.2kg		2.3-2.4kg		2.5-2.6kg		2.7-2.8kg		2.9-3.0kg	
	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr
D-1	3	4	4	4	4	5	4	5	5	6	5	6	6	7	6	7
D-2	6	3	7	4	7	4	8	4	9	5	10	5	10	6	11	6
D-3	12	3	13	3	15	3	16	4	18	4	19	4	21	5	22	5
D-4	17	2	20	2	22	2	24	3	26	3	29	3	31	3	33	4
D-5	23	1	26	2	29	2	32	2	35	2	38	2	41	2	44	2
D-6	29	1	33	1	37	1	40	1	44	1	48	1	52	1	55	1
D-7	35	0	39	0	44	0	48	0	53	0	57	0	62	0	66	0

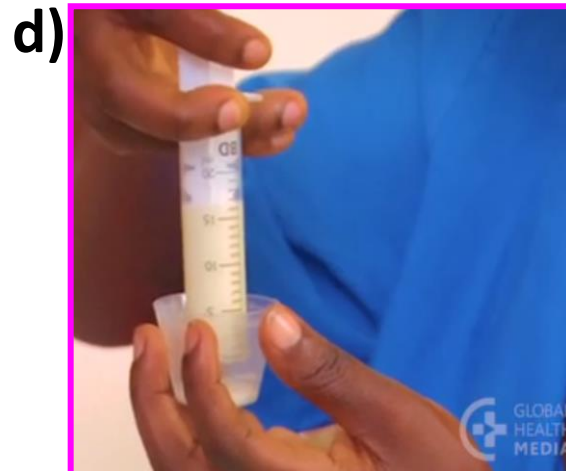
Confirm the correct volume to feed. Adjust the volume if on 10% dextrose or breastfeeding



Hand hygiene



Check the correct tube placement

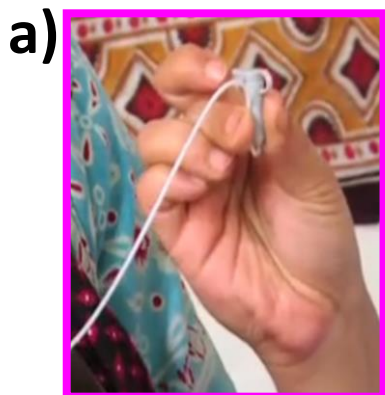


Put volume of EBM needed in a cup

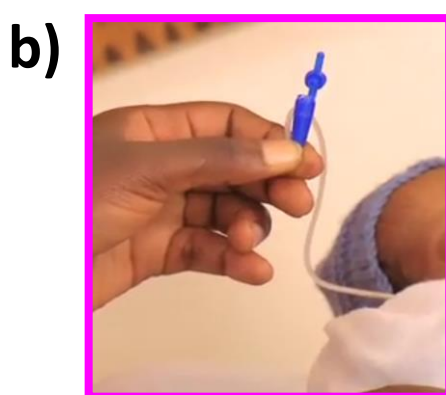


Remove the syringe burrel

# Nasal Gastric Tube Feeding



Pinch of the tube



Open the end of the tube



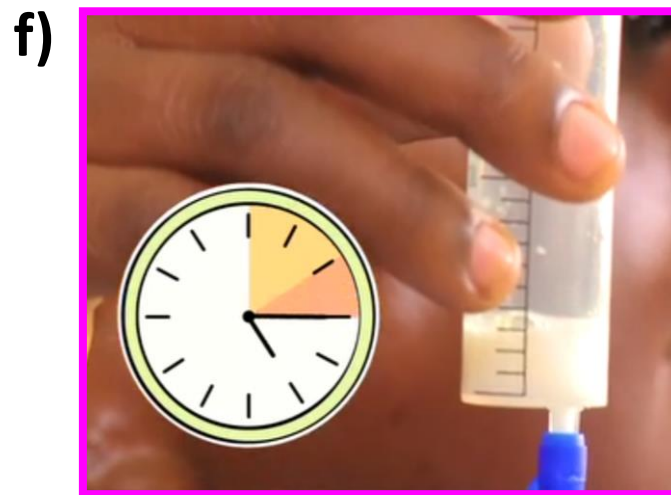
Attach the empty syringe



Pour milk into the syringe




Remove the pinch & hold the tube above the baby



Let the milk flow slowly by gravity

# Nasal Gastric Tube Feeding

## Caution

- 
- If the milk doesn't flow using gravity, **DO NOT** push the milk using a syringe
  - Always observe the baby for spitting, vomiting and choking
  - Always check if the baby is able to breastfeeding
  - All containers used for NGT feeding should always be cleaned and air dried after use
  - Replace the NG tube after 72 hours

# Feed Volume Guidelines



3 hourly NGT EBM feed volumes for stable newborns with birth weight less than 1500grams NGT

Age	0.6kg	0.7kg	0.8kg	0.9kg	1.0kg	1.1kg	1.2kg	1.3kg	1.4kg	1.5kg
D-1	6	7	8	9	10	11	12	13	14	15
D-2	8	9	10	11	13	14	15	16	18	19
D-3	9	11	12	14	15	17	18	20	21	23
D-4	11	12	14	16	18	20	21	23	25	26
D-5	12	14	16	18	20	22	24	26	28	30
D-6	14	16	18	20	23	25	27	29	32	34

3 hourly NGT EBM feeds and ONE hourly IVF for UNSTABLE NEWBORNS with birth weight less than 1500-3000grams

	1.5-1.6kg		1.7-1.8kg		1.9-2.0kg		2.1-2.2kg		2.3-2.4kg		2.5-2.6kg		2.7-2.8kg		2.9-3.0kg	
	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr
D-1	3	4	4	4	4	5	4	5	5	6	5	6	6	7	6	7
D-2	6	3	7	4	7	4	8	4	9	5	10	5	10	6	11	6
D-3	12	3	13	3	15	3	16	4	18	4	19	4	21	5	22	5
D-4	17	2	20	2	22	2	24	3	26	3	29	3	31	3	33	4
D-5	23	1	26	2	29	2	32	2	35	2	38	2	41	2	44	2
D-6	29	1	33	1	37	1	40	1	44	1	48	1	52	1	55	1
D-7	35	0	39	0	44	0	48	0	53	0	57	0	62	0	66	0

## 14. Common Clinical Procedures performed on newborns

## 15. Standard Operating Procedures



## BASIC PAEDIATRIC PROTOCOLS

for ages up to 5 years

January 2016  
4th Edition

# Management of Neonatal Hypoglycaemia

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# Screening for neonatal hypoglycaemia

## At-risk neonates

- Preterms, IUGR, SGA
- Sick neonate, sepsis
- Hypothermia
- Perinatal asphyxia
- IODM, LGA
- Delayed start of feeding
- Maternal risk factors:
  - Beta agonists
  - Hx of DM (maternal/family)
  - Obesity
  - Sibling hx of seizures/sudden death

- **Symptomatic/unwell-** assess **immediately**
- **Well-** Start at **2 hrs** of age after initial feed



- Frequency- Every **3-6 hours**

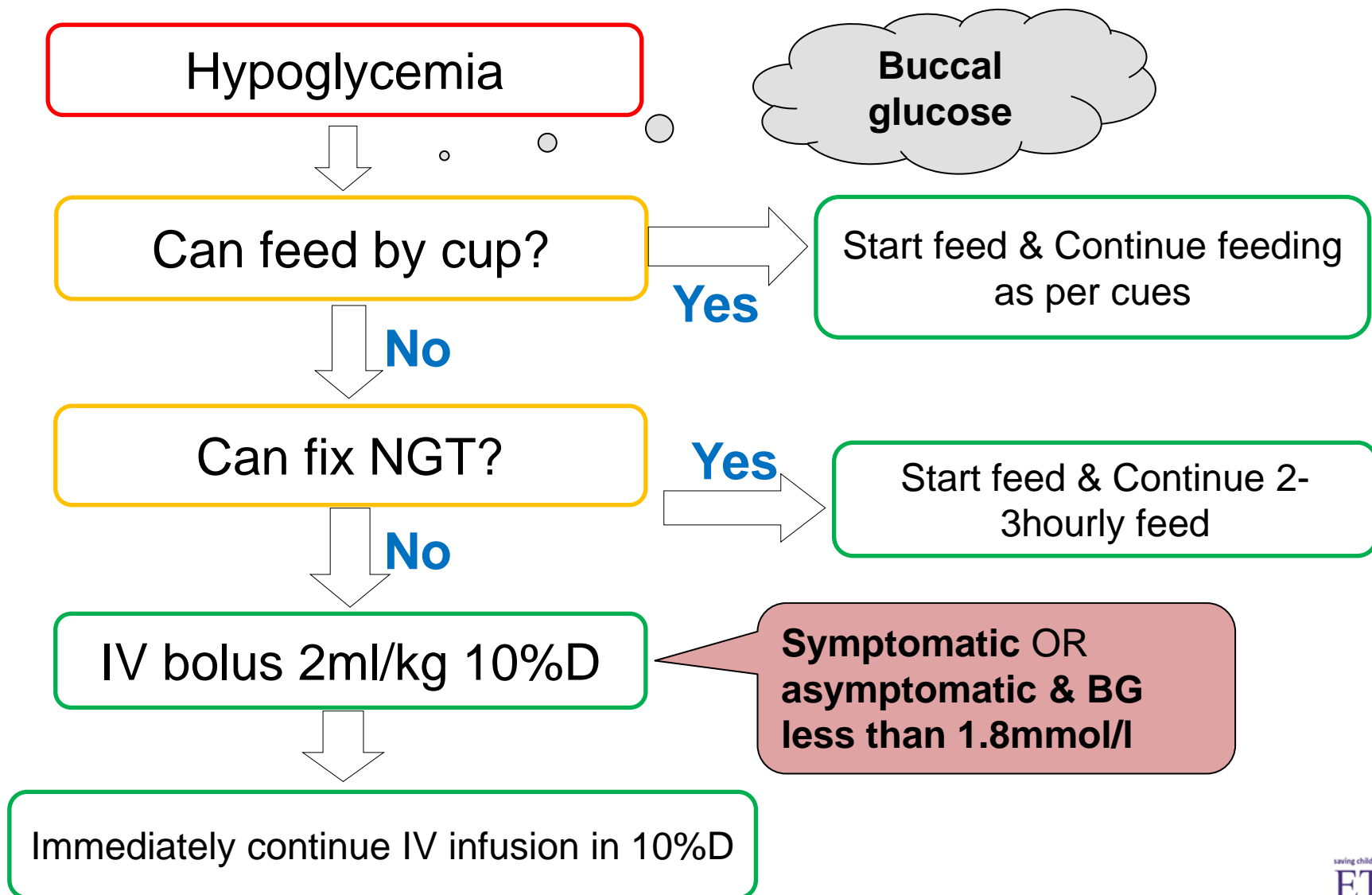


- If BG  $\geq 2.6$ mmol/L and baby feeding well, cease monitoring after:
- IODM/LGA – **12 hrs**
  - Preterms/SGA – **24 hrs**

1. Narvey MR, Marks SD. The screening and management of newborns at risk for low blood glucose. *Paediatr Child Health*. 2019 Dec 9;24(8):536–44.

2. Wackernagel D, et al. Swedish national guideline for prevention and treatment of neonatal hypoglycaemia in newborn infants with gestational age  $\geq 35$  weeks. *Acta Paediatr*. 2020; 109: 31– 44

# Approaches in the correction of hypoglycemia



# Buccal glucose (0.4ml/kg 50%D)

## No difference in:

1. Major neurosensory disability at 2 year followup
2. Need for IV treatment for hypoglycaemia

1. Reduces risk of admission to neonatal wards<sup>2</sup>
2. Reduces separation of infants from parents
3. Increases chances infant is exclusively breastfed at discharge



Buccal glucose doesn't obviate the need for IV treatment

1. Weston PJ, et al. Oral dextrose gel for the treatment of hypoglycaemia in newborn infants. *Cochrane Database of Systematic Reviews* 2016
2. Harris DL, et al. Dextrose gel for neonatal hypoglycaemia (the Sugar Babies Study): a randomised, double-blind, placebo-controlled trial. *Lancet* 2013;382(9910):2077-83



# IV 10% Dextrose mini- bolus for rapid correction of hypoglycemia

Symptomatic hypoglycaemia causes neuronal injury

At-risk asymptomatic neonates with **recurrent hypoglycaemic episodes (3+) or severe (<2mmol/l) hypoglycaemia** have increased risk in some measures of neurological impairment.<sup>2</sup>

**Urgent intervention to maintain  $\geq 2.6$ mmol/l**

IV 2ml/kg 10%Dextrose given to **promptly correct and attain adequate levels of BG**

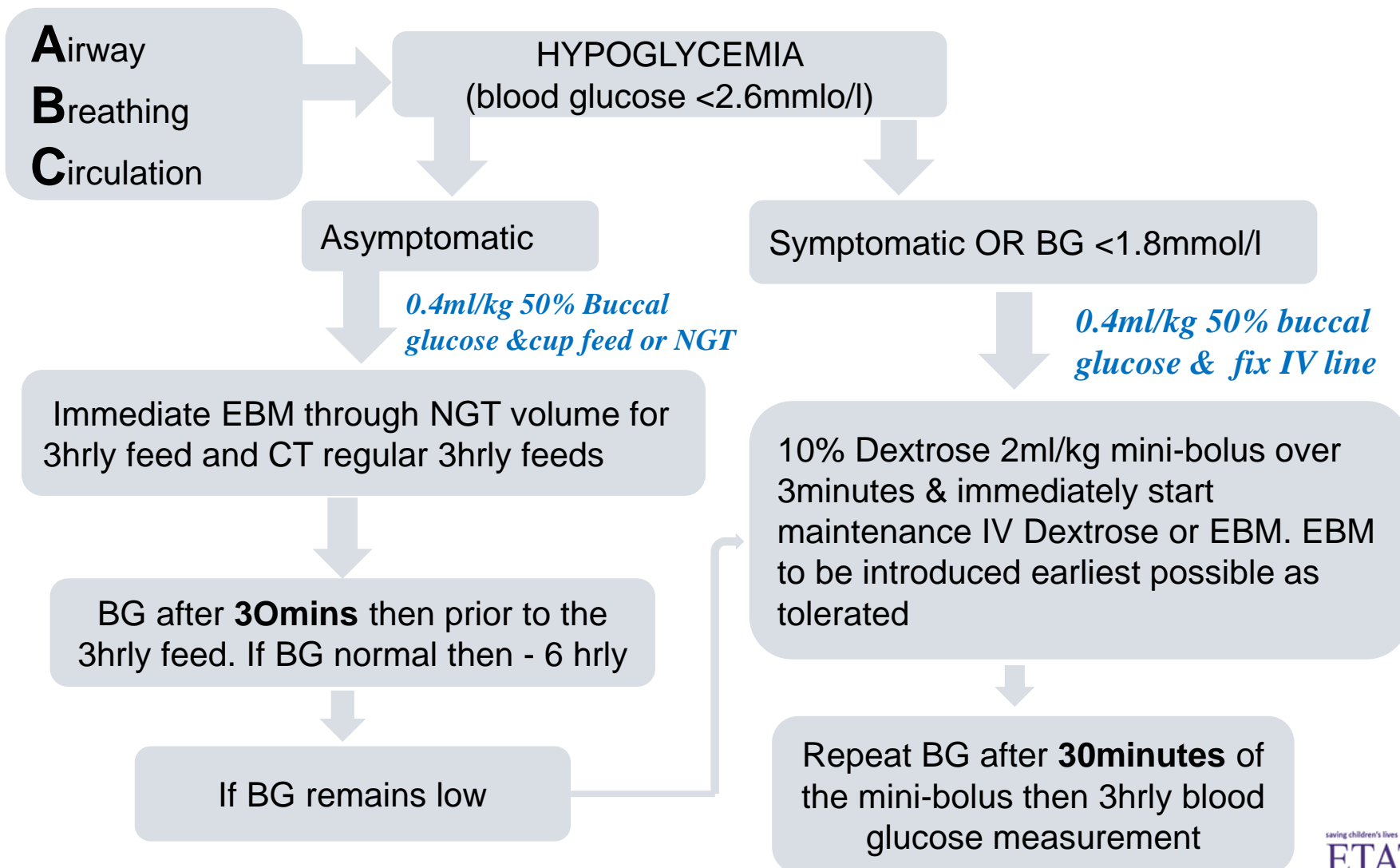


1. Narvey MR, Marks SD. The screening and management of newborns at risk for low blood glucose. *Paediatr Child Health*. 2019 Dec 9;24(8):536–44.

2. McKinlay CJD, et al. ; Children with Hypoglycemia and their Later Development (CHYLD) Study Team. Association of neonatal glycaemia with neurodevelopmental outcomes at 4.5 years. *JAMA Pediatr* 2017

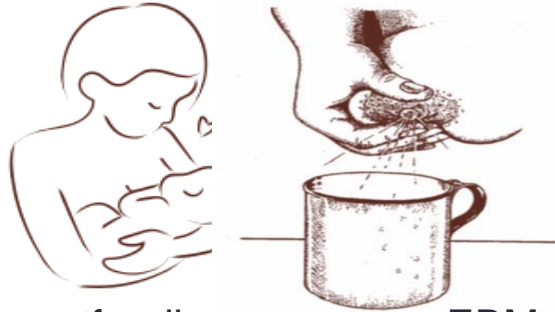
# Treatment for hypoglycaemia

Do blood glucose for all high risk neonates at 2 hrs after birth . All sick neonates (immediately)



# Why is breastmilk the preferred option?

## Breastmilk



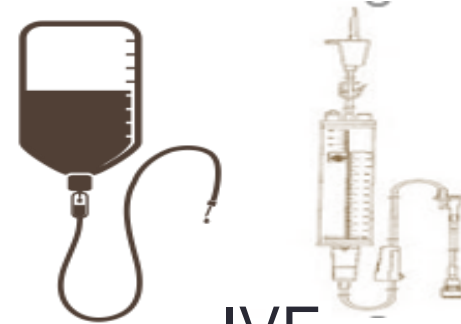
Breastfeeding

EBM

- Breastmilk contains 67 kcal / 100ml

**Contains almost X2 energy as compared to 10% dextrose**

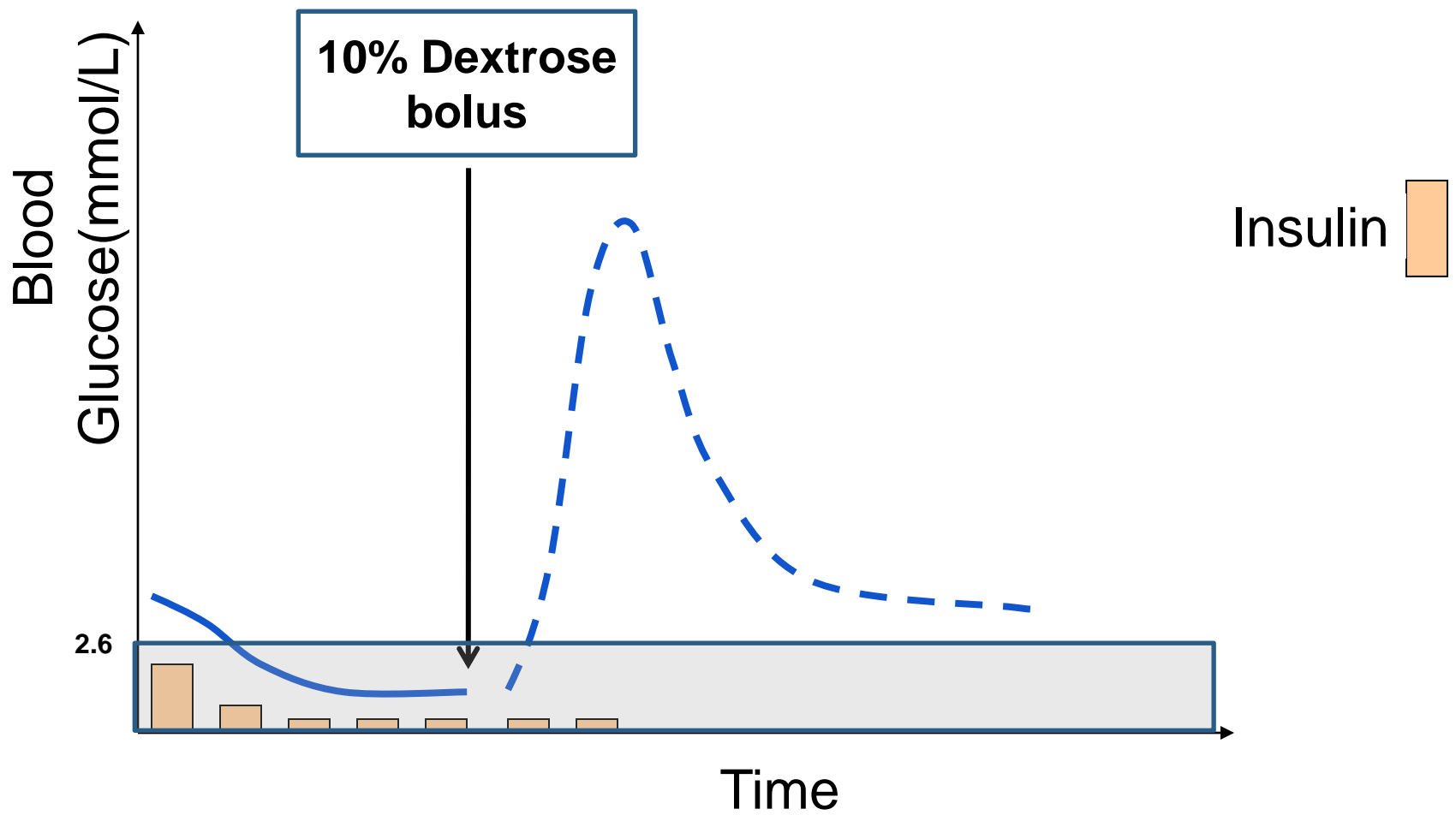
## 10% Dextrose



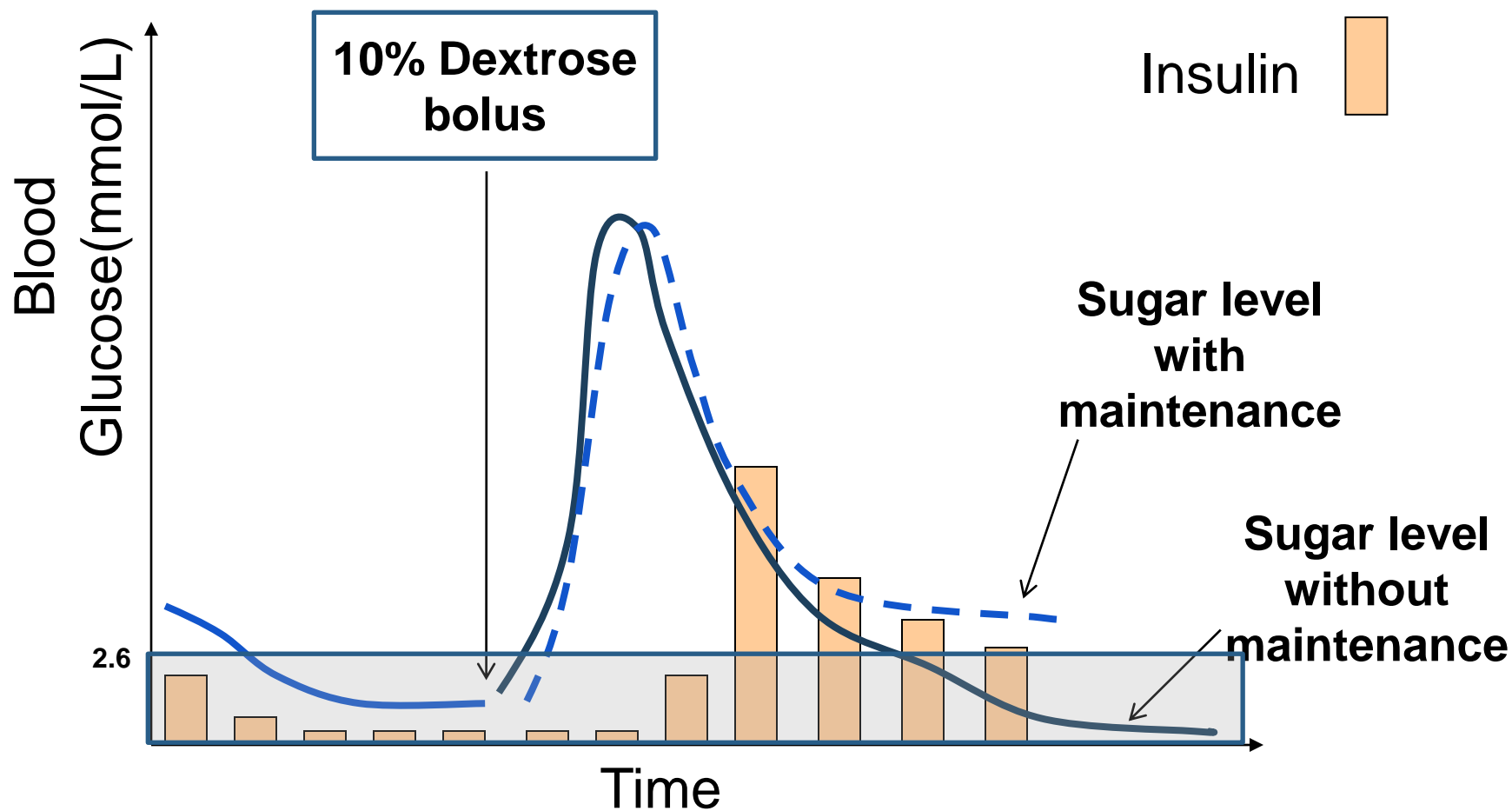
IVF

- Dextrose 10% (10g of glucose/100mls) contains 34kcal/100mls

# What happens after a dextrose bolus?



# Rebound hypoglycaemia



**A plan must be made for continuous glucose supply after a bolus**

# Administering Buccal glucose & Performing a heel prick



# Administering the buccal glucose

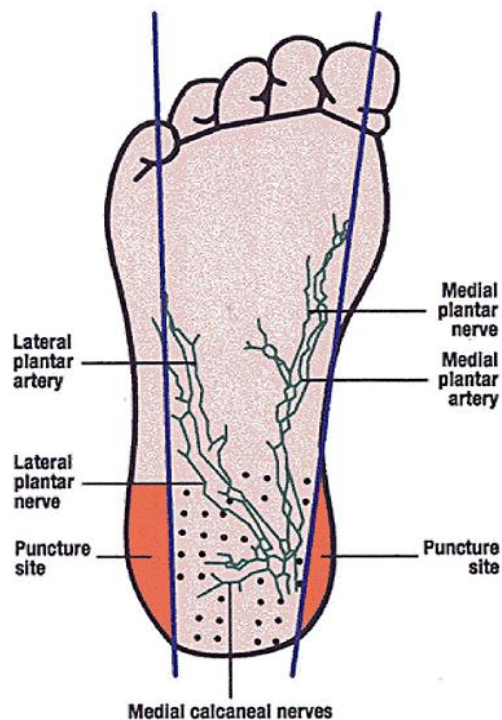
1. Observe hand hygiene
2. Wear clean gloves
3. Prepare the 0.4mls/kg of 50% dextrose in a syringe
4. Dry the baby's mouth using a sterile gauze.
5. Apply a small amount of the prepared 50% glucose on one of your clean gloved finger
6. Gently apply and massage the gel into the baby's left gum and buccal mucosa. Avoid squeezing the gel into the mouth
7. Repeat the same procedure on the right gum and buccal mucosa and vice versa until all the gel in the syringe is over.
8. Continue exploring other available means of correcting hypoglycemia.



# The Heel Prick

**Goal:** To obtain blood for random blood sugar analysis

1. Observe hand hygiene
2. Manage pain – breastfeeding 2min before, during and after
3. Clean site with 70% alcohol; allow to dry for 30sec
4. Prick the heel with a disposable lancet to a depth of not more than 1mm
5. Wipe off the first drop and allow a large drop to collect.
6. Collect large drop using a capillary tube and place on point of diagnostic strip
7. Apply pressure on the site pricked to stop the bleeding.





# Monitoring newborns at risk of hypoglycemia



# Monitoring

[HOSPITAL NAME]

NEONATAL MONITORING CHART + CPAP

Version 2.5

Name		IP NO	Sex M <input type="checkbox"/> F <input type="checkbox"/>	D.O.A	D.O.B
Date today		Diagnosis			
Birth Wt	gm	Interventions: CPAP <input type="checkbox"/> Oxygen <input type="checkbox"/> Phototherapy <input type="checkbox"/> Blood tranfusion <input type="checkbox"/> Exchange transfusion <input type="checkbox"/> KMC <input type="checkbox"/>			
<b>Daily Clinician Feed and Fluid prescription</b>					
Day of Life	Current Wt =	gm	Monitoring Freq hrs   Time		
Total input(feed and fluid) 24hrs =		ml			
Feed: BF <input type="checkbox"/> EBM <input type="checkbox"/> Term Formula <input type="checkbox"/> Pre-Term Formula <input type="checkbox"/>		<b>Vitals</b> Temp (°C) Pulse (b/min) Resp Rate (b/min) Oxy Sat (%) or Cy <sup>0</sup> Cy <sup>+</sup>			
Route: Cup <input type="checkbox"/> NGT <input type="checkbox"/> OGT <input type="checkbox"/>					
Volume & Frequency = _____ ml 3hrly <input type="checkbox"/> 2hrly <input type="checkbox"/>		<b>Assessment</b> Resp Distress 0,+ ,+++ CPAP Pressure (cm H <sub>2</sub> O) FIO <sub>2</sub> (%) Jaundice 0,+ ,+++ Apnoea Y/N			
Total 24hr Volume = _____ ml					
IV Fluid & Additives	Vol (ml)	Duration	<b>Feed</b> Breastfeeding sufficient Y/N EBM vol given (ml) Formula vol given (ml)		
Other prescribing instructions		<b>Fluid</b> IV volume given IV Line working Y/N			
Cl clinician's name	Time:				
<b>Daily IV Fluid Nursing plan</b>					
Start time:		<b>Output</b> vomit Y/N Urine(diapers changed) Stool Y/N Completed by (name)			
Hourly rate=	_____ ml (____ drops/min)				
Planned vol =	_____ ml in _____ hrs				
Morning shift notes		Category: A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		Total feed+fluid in this shift _____ ml	
Afternoon shift notes		Category: A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		Total feed+fluid in this shift _____ ml	
Night shift notes		Category: A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		Total feed+fluid in this shift _____ ml	
				Total feed+fluid in 24hrs _____ ml	
				Deficit _____ ml	

Jaundice 0 none, +mild(face),+++severe(feet)

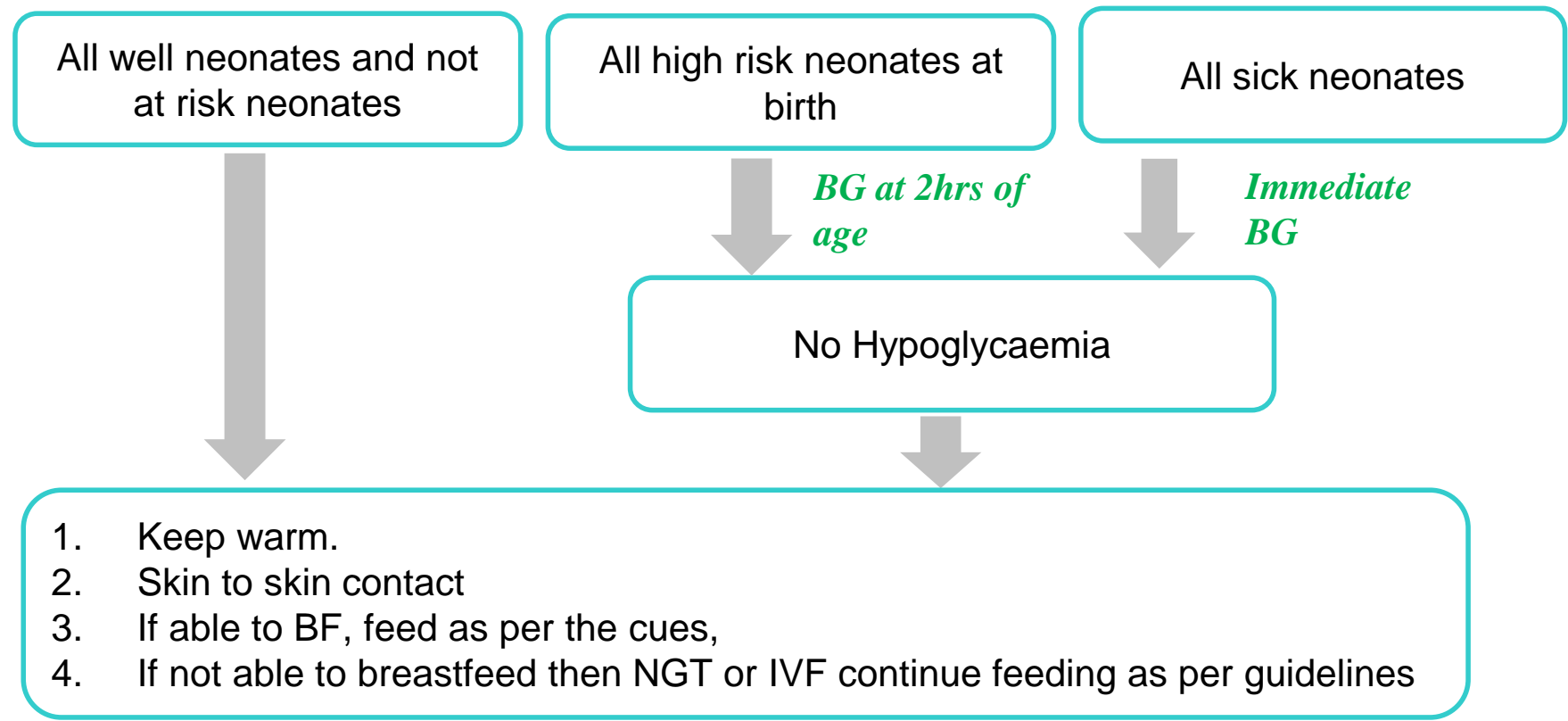
Tick the category of baby after assessment

Alerts : circle readings outside normal range with red pen and action

# Summary

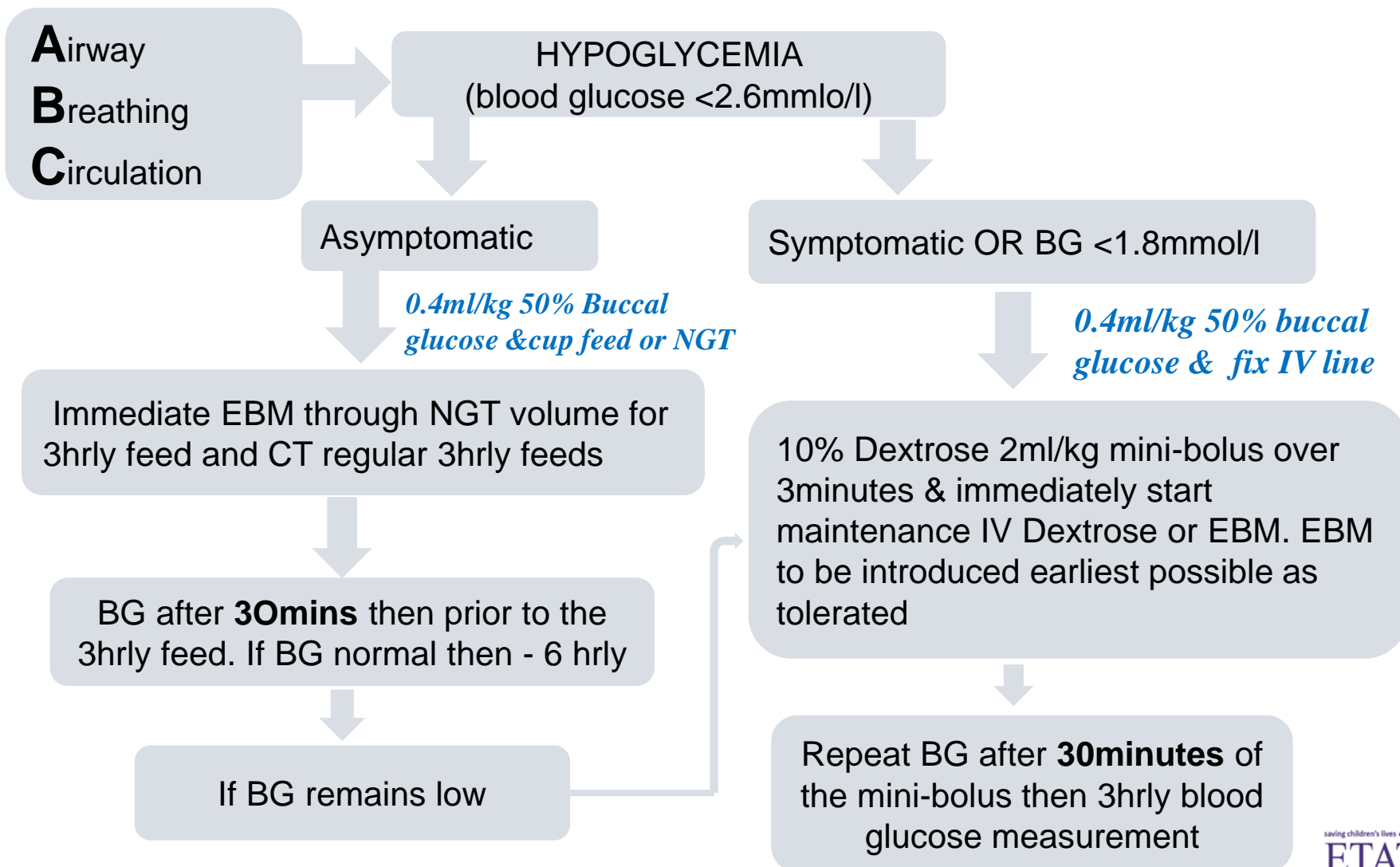
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# Prevention of Hypoglycemia



# Treatment for hypoglycaemia

Do blood glucose for all high risk neonates at 2 hrs after birth . All sick neonates (immediately)



# Available Guidelines

