

Perinatal Quality Collaborative Vermont

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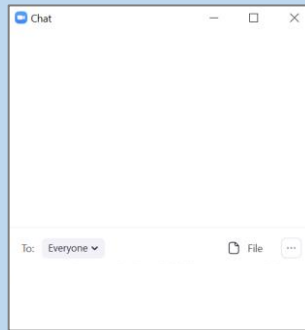
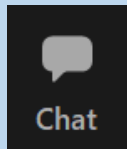
Gestational Diabetes
Management
2/6/2024



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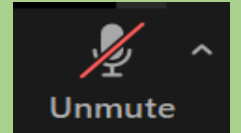
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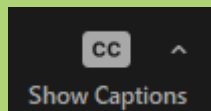
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Disclosures

- None

Intrapartum and Newborn Care for Gestational Diabetes

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Delia Horn MD

University of Vermont

Definition of Gestational Diabetes

- **Gestational diabetes** traditionally referred to any pregnant person in whom abnormal glucose tolerance was first recognized at any time during pregnancy [1997].
- A more contemporary definition, and that used by the American Diabetes Association (ADA), is diabetes diagnosed in the second or third trimester that was not clearly present prior to conception [2023]. This definition excludes patients diagnosed in the first trimester because they likely have previously undiagnosed type 2 diabetes. The term "overt diabetes" is sometimes used to describe the diabetes status of these individuals during pregnancy; a formal diagnosis of type 2 diabetes can be made when the diagnosis is confirmed in the nonpregnant state.
- The American College of Obstetricians and Gynecologists (ACOG) continues to define GDM as "a condition in which carbohydrate intolerance develops during pregnancy" [3].

UVMMC: we look at HgbA1c and if elevated early pregnancy diagnose preexisting DM, if normal GDM

Outline of the issue with intrapartum GDM

Maternal care:

- How should people with a dx of GDM be prepared for admission for labor and delivery
- How should glucose testing be performed intrapartum
- Should people treated with insulin and/or metformin be assessed differently
- How should glucose results be treated/acted upon re: insulin management
- How does intrapartum control impact neonatal hypoglycemia
- What level of Maternal Care is needed

Neonatal care:

- How should neonatal glucoses be assessed and treated
- What factors, including intrapartum, affect neonatal hypoglycemia
- What level of neonatal care is needed for the infant of the person with GDM

Maternal Levels of Care

Capabilities

- Capability and equipment to provide low-risk and appropriate moderate-risk maternal care and a readiness at all times to initiate emergency procedures to meet unexpected needs of women and newborns within the center. This includes
 - ability to begin emergency cesarean delivery within a time interval that best incorporates maternal and fetal risks and benefits.
 - limited obstetric ultrasonography with interpretation readily available at all times.[†]
 - support services readily available at all times[†], including laboratory testing and blood bank.
 - capability to implement patient safety bundles[†] for common causes of preventable maternal morbidity, such as management of maternal venous thromboembolism, obstetric hemorrhage, and maternal severe hypertension in pregnancy.[§]
 - ability at all times[†] to initiate massive transfusion protocol, with process to obtain more blood and component therapy as needed.
- Stabilization and the ability to facilitate transport to a higher-level hospital when necessary. This includes
 - risk identification and determination of conditions necessitating consultation, referral, and transfer.
 - a mechanism and procedure for transfer/transport to a higher-level hospital available at all times.[†]
 - a reliable, accurate, and comprehensive communication system between participating hospitals, hospital personnel, and transport teams.
- Ability, in collaboration with higher-level facility partners, to initiate and sustain education and quality improvement programs to maximize patient safety.

Level I (Basic Care)

Definition

Care of low- to moderate-risk pregnancies with ability to detect, stabilize, and initiate management of unanticipated maternal–fetal or neonatal problems that occur during the antepartum, intrapartum, or postpartum period until the patient can be transferred to a facility at which specialty maternal care is available

ACOG, SMFM 2019

Health Care Providers

- Every birth attended by at least one qualified birthing professional (midwife^{||}, family physician, or ob-gyn) and an appropriately trained and qualified RN with level-appropriate competencies as demonstrated by nursing competency documentation.
- Physician with privileges to perform emergency cesarean delivery readily available at all times.[†]
- Primary maternal care providers, including midwives^{||}, family physicians, or ob-gyns readily available at all times.[†]
- Appropriately trained and qualified RNs with level-appropriate competencies as demonstrated by nursing competency documentation readily available at all times.[†]
- Nursing leadership has level-appropriate formal training and experience in maternal care.
- Anesthesia providers, such as anesthesiologists, nurse anesthetists, or anesthesiologist assistants working with an anesthesiologist,[¶] for labor analgesia and surgical anesthesia readily available at all times.[†]

Neonatal Levels of Care

TABLE 1 Definitions, Capabilities, and Provider Types: Neonatal Levels of Care

Level of Care	Capabilities	Provider Types ^a
Level I Well newborn nursery	• Provide neonatal resuscitation at every delivery • Evaluate and provide postnatal care to stable term newborn infants • Stabilize and provide care for infants born 35–37 wk gestation who remain physiologically stable • Stabilize newborn infants who are ill and those born at <35 wk gestation until transfer to a higher level of care	Pediatricians, family physicians, nurse practitioners, and other advanced practice registered nurses

PEDIATRICS Volume 130, Number 3, September 2012

Treatment of GDM

- Diet
- Metformin
- Insulin±metformin

Assessment of glycemic control in pregnancy (antepartum):

- ACOG: insufficient evidence to recommend specific frequency of assessment; generally FBS and PP values assessed daily
- Diet: FBS (<95), 1 (<140) or 2 hr PP (<120) for 1-2 weeks, can reduce frequency to 3 days a week if stable
- Start medication: between any abnormal glucose values and >50% abnormal (the earlier the less macrosomia)
- Taking medication: FBS and 1 or 2 hr PP every day

Intrapartum Glucose monitoring recommendations

- None specific to GDM
- All reference data from T1 DM re: importance of intrapartum control
- We have no real idea
- ACOG: silent on intrapartum glucose assessment intrapartum for GDM
- Reference to optimize control to reduce neonatal hypoglycemia extrapolated from T1 DM data

RESEARCH ARTICLE

Open Access

Current guidelines on the management of gestational diabetes mellitus: a content analysis and appraisal



Mengxing Zhang¹, Yingfeng Zhou^{1*}, Jie Zhong¹, Kairong Wang¹, Yan Ding² and Li Li²

Zhang *et al. BMC Pregnancy and Childbirth* (2019)

<https://doi.org/10.1186/s12884-019-2343-2>

Intrapartum Care

Timing and mode of birth

Optimal timing and mode of birth in women with GDM

4 evidence-based guidelines (NICE, NZGG, SIGN, FIGO)
1 expert consensus (CMA)

Discuss the timing and mode of birth with pregnant women with diabetes during antenatal appointments, especially during the third trimester.

Glycemic control

Maintaining maternal blood glucose in target range during labor and birth to reduce the incidence of neonatal hypoglycemia and reduce fetal distress.

6 evidence-based guidelines (NICE, SIGN, FIGO, NGC, CDA, API)
1 expert consensus (CMA)

Women should be closely monitored during labor and delivery, and maternal blood glucose levels should be kept between 4.0 and 7.0 mmol/L in order to minimize the risk of neonatal hypoglycemia.

(70-125 mg/dl)

Does intrapartum glucose control matter with GDM?

Maternal implications:

- How often to check glucose
- Does tight intrapartum control matter

Neonatal implications:

- Does tight intrapartum control improve neonatal outcome, specifically hypoglycemia

Intrapartum Glucose Management in Women With Gestational Diabetes Mellitus

A Randomized Controlled Trial

Maureen S. Hamel, MD, Lindsey M. Kanno, BA, Phinnara Has, MS, Michael J. Beninati, MD, Dwight J. Rouse, MD, MSMPH, and Erika F. Werner, MD, MS

(*Obstet Gynecol* 2019;133:1171–7)

DOI: 10.1097/AOG.0000000000003257

Participants were randomly allocated in a 1:1 ratio to one of two intrapartum glucose management protocols: tight or liberalized control.

2/3 of each group GDM A2 on antenatal insulin

Tight glucose control group:

- Glucose level was checked every 1 hour, goal blood glucose was 70–100 mg/dl
- Treatment was initiated for a single maternal blood glucose level greater than 100 mg/dL or lower than 60 mg/dL.

Liberalized control group:

- Glucose level was checked every 4 hours (in the absence of symptoms), goal blood glucose was 70–120 mg/dL
- Treatment was initiated for a single maternal blood glucose level greater than 120 mg/dL or lower than 60 mg/dL.

TIGHT: Q1 HR TESTING; IF 2 VALUES >100 CONSIDER INSULIN

For elevated glucose: 2-8 units short acting insulin (aspart, SQ):

- 101-120 2 u
- 121-150 4u
- 151-200 6u
- >200 8u consider IV infusion

LIBERAL: Q4 HR TESTING; IF 2 VALUES >200 CONSIDER INSULIN

For elevated glucose: 2-8 units short acting insulin (aspart, SQ):

- 101-150 2 u
- 151-200 4u
- >200 8u consider IV infusion

Tight control vs liberal:

- More FS testing
- Similar average glucose values
- More people treated with insulin intrapartum (32% vs 3%) and more insulin administered (but little insulin given overall)
- More maternal hypoglycemia (16% vs 8%)

Table 2. Intrapartum and Postpartum Maternal Characteristics

Variable	Tight Control (n=38)	Liberalized Control (n=38)	<i>P</i>
No. of intrapartum maternal glucose measurements	8±6	3±2	.01
Maternal glucose values (mg/dL)	85 (80–94)	87 (78–93)	.84
Any glucose value exceeding upper protocol threshold	17 (45)	3 (8)	.01
Insulin for maternal hyperglycemia	12 (32)	1 (3)	.01
Insulin units administered	5 (2–7)	3 (—)	.80
Maternal hypoglycemia	6 (16)	3 (8)	.31
Spontaneous vaginal delivery	31 (82)	29 (76)	.91
Time from admission to delivery (h)	18±10	22±23	.79
OGTT postpartum	18 (47)	19 (50)	.88

OGTT, oral glucose tolerance test.

Data are mean±SD, median (interquartile range), or n (%) unless otherwise specified.

Neonatal outcomes:

No difference initial glucose 2 hr

Tight control vs liberal control:

- Lower mean glucose in first 24 hrs of life
- 45% tight control vs 32% liberal control had interventions for hypoglycemia
- higher IV intervention and all NICU admits for hypoglycemia were in the tight control group

Table 4. Primary and Secondary Outcomes

Variable	Tight Control (n=38)	Liberalized Control (n=38)	P
Primary outcome			
1st neonatal glucose measurement (mg/dL)	53±16	58±21	.60
Secondary outcomes			
Mean glucose level in first 24 h of life (mg/dL)	54±8	58±8	.049
Proportion with glucose levels lower than 40 mg/dL within 2 h of birth	9 (24)	9 (24)	.99
Proportion with glucose levels lower than 50 mg/dL within 2 h of birth	17 (45)	15 (40)	.80
Received any intervention for hypoglycemia (oral, IV, or both)*	17 (45)	12 (32)	.35
Received IV intervention for hypoglycemia	4 (11)	0 (0)	.12
NICU admission	5 (13)	1 (3)	.20
NICU admission for hypoglycemia	5 (100)	0 (—)	.17
Neonatal hyperbilirubinemia	13 (34)	11 (29)	.81

IV, intravenous, NICU, neonatal intensive care unit.

Data are mean±SD or n (%) unless otherwise specified.

* Threshold for intervention was neonatal blood glucose level lower than 40 mg/dL at any time within the first 24 hours of life.

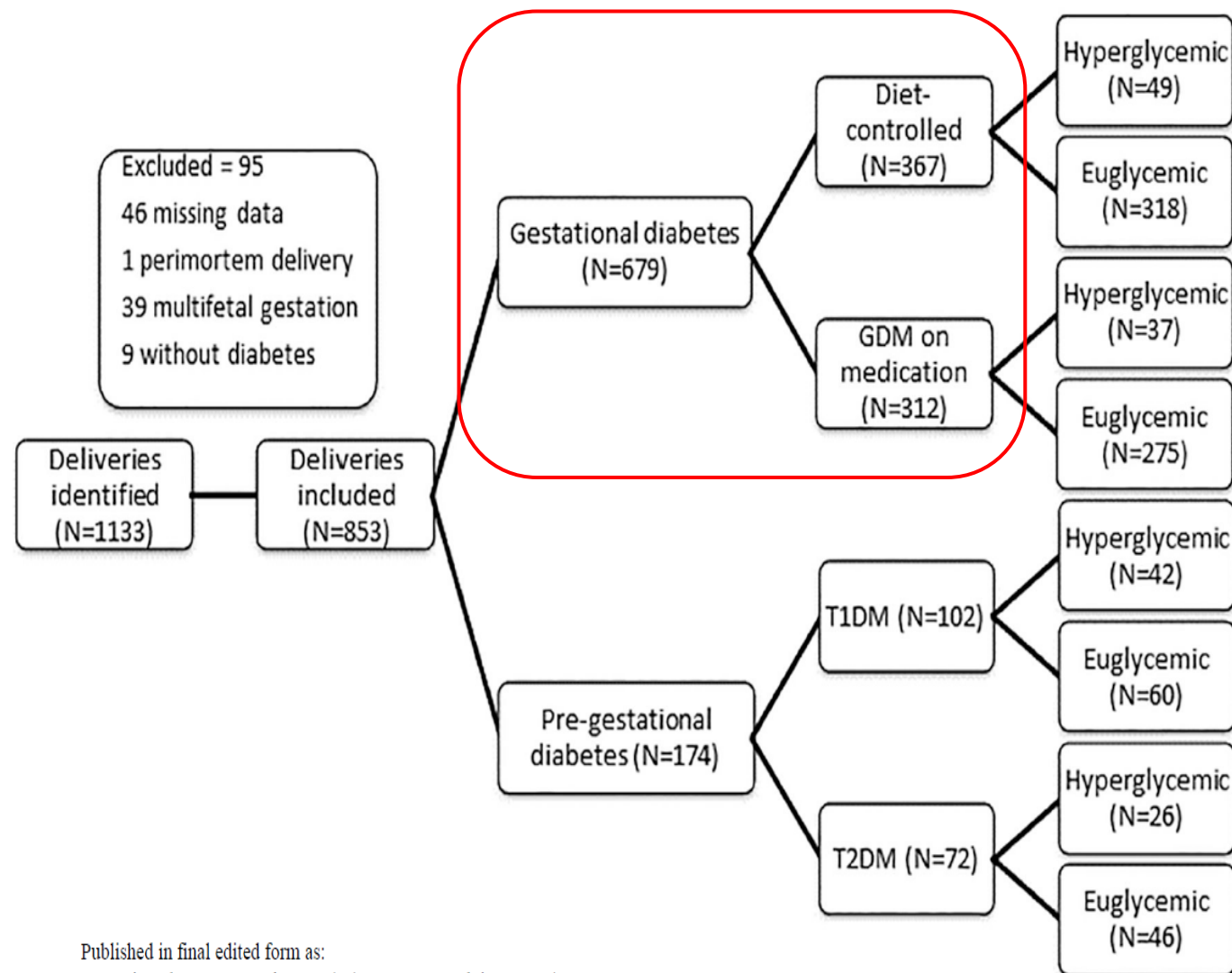
In summary, for women with GDM, our study found no benefit to tight control of glucose levels in labor and instead supports glucose assessment every 4 hours, with intervention only if the maternal glucose level is lower than 60 mg/dL or greater than 120 mg/dL

Reexamining intrapartum glucose control in patients with diabetes and risk of neonatal hypoglycemia

Tooba Z. ANWER, MD^{1,2}, Ricardo AGUAYO, BS¹, Anna M. MODEST, PhD, MPH^{1,2}, Ai-ris Y. COLLIER, MD^{1,2}

We hypothesize that strict intrapartum glycemic control may not be the key driver in preventing neonatal hypoglycemia.

- The primary objective of this study was to evaluate the incidences of neonatal hypoglycemia and NICU admission in patients with immediate pre-delivery maternal hyperglycemia compared with patients with normal capillary glucose
- Determine whether this relationship differed by maternal diabetes type (MM note: it matters a lot)



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Figure 1. Participant Allocation

GDM= gestational diabetes, T1DM= Type 1 diabetes mellitus; T2DM= Type 2 diabetes mellitus. Maternal euglycemia was defined as capillary glucose ≤ 110 mg/dL and hyperglycemia was defined as glucose > 110 mg/dL.

We hypothesize that strict intrapartum glycemic control may not be the key driver in preventing neonatal hypoglycemia.

Interventions and definitions:

- **GDM on medications** capillary glucose monitoring **every 2 to 4 hours in early labor and every 1 to 2 hours in active labor** with a goal of maintaining glucose between 80–110 mg/dL.
- **Diet-controlled GDM** capillary glucose is monitored **every 4 hours** until delivery for, and **more frequently if elevated.**
- **IV insulin** was initiated when the maternal capillary glucose **was >110 mg/dL over at least 2 consecutive occasions.**

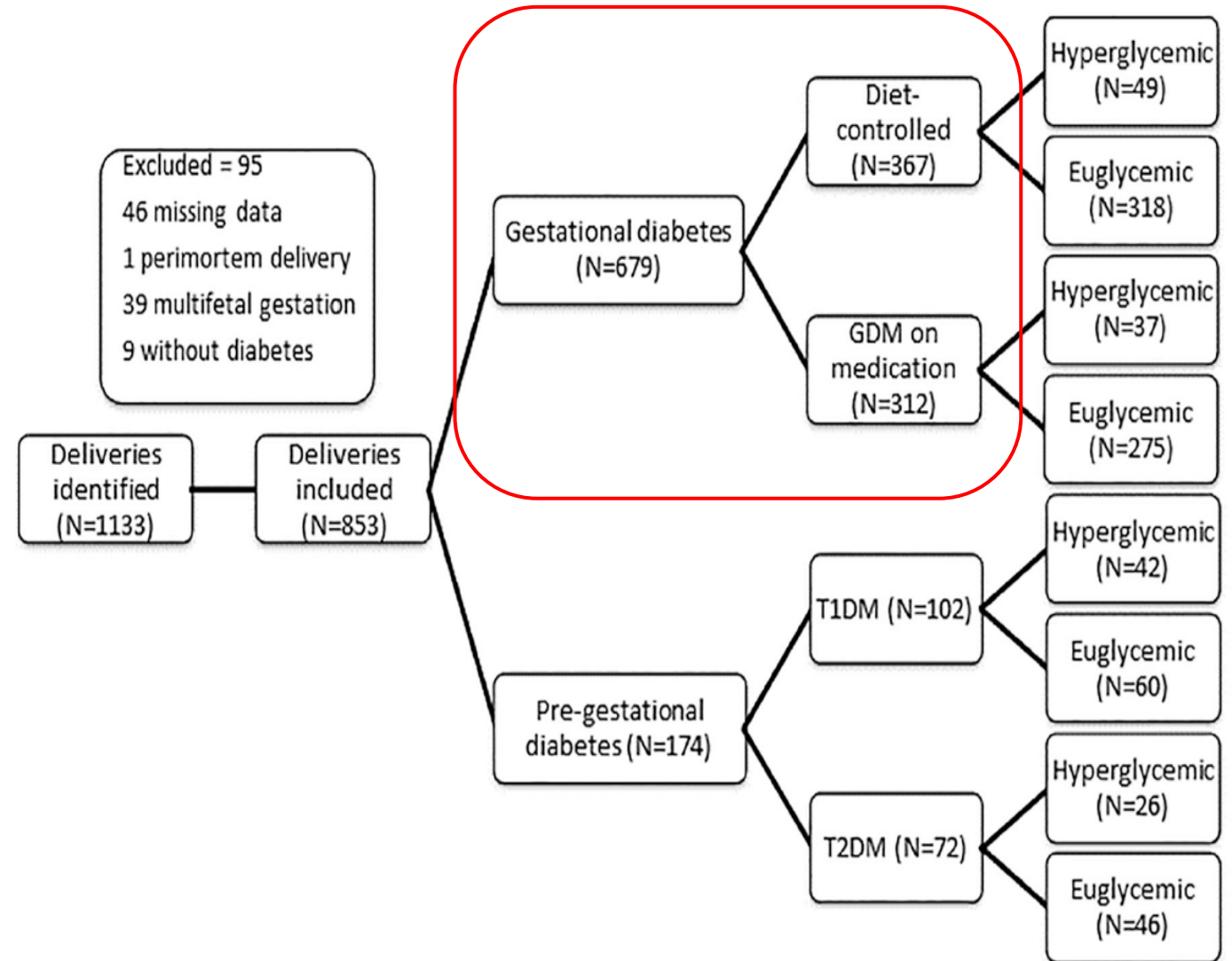


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We hypothesize that strict intrapartum glycemic control may not be the key driver in preventing neonatal hypoglycemia.

Neonatal:

- Primary outcome was neonatal hypoglycemia, defined as capillary glucose <45 mg/dL within the first hour of life.
- Secondary outcomes included neonatal hypoglycemia 2 to 24 hours after birth and NICU admission, irrespective of indication for NICU admission.
- At our hospital, all neonates born to women with diabetes undergo a glucose check within one hour after birth.

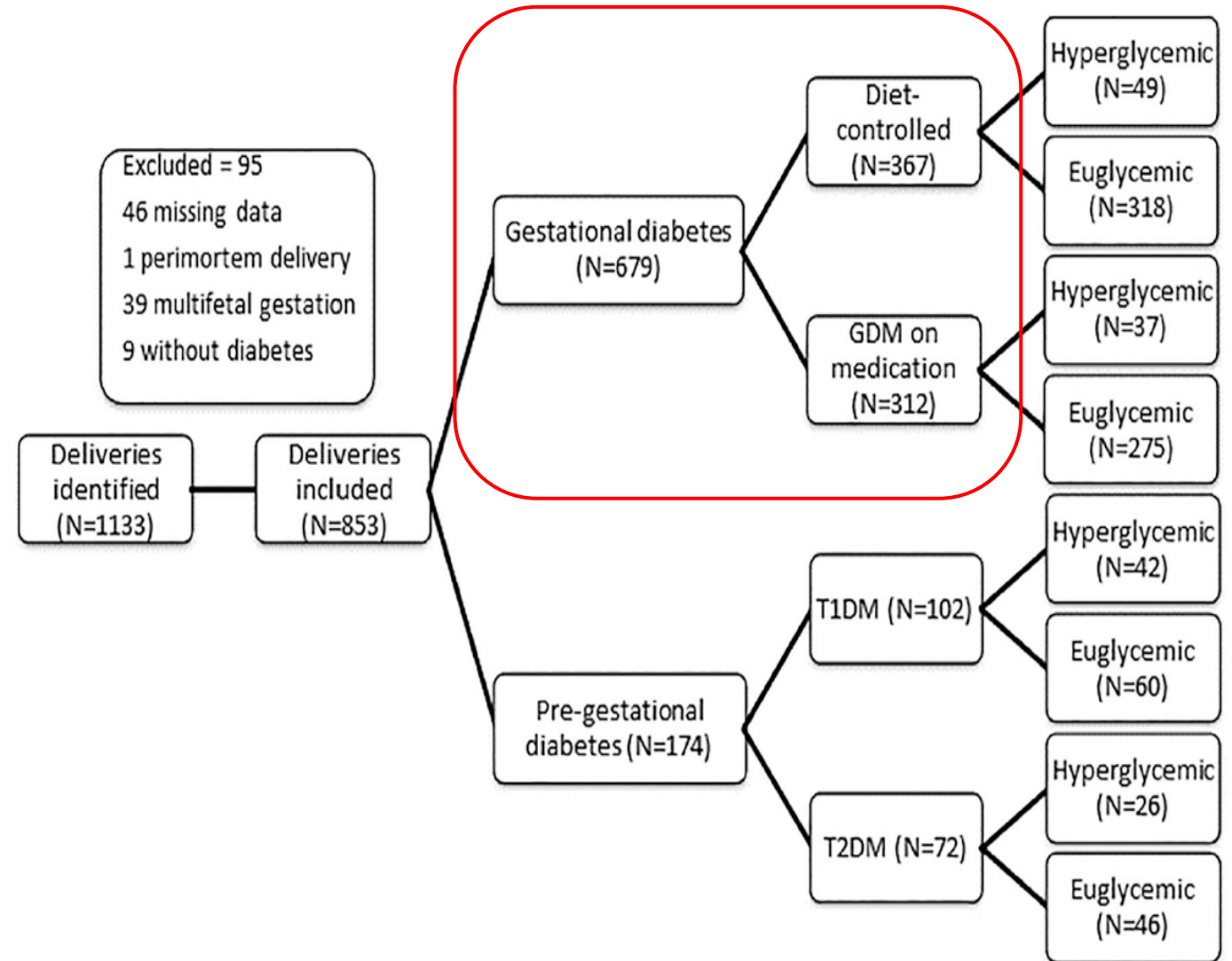


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- **IV insulin** was initiated when the maternal capillary glucose was >110 mg/dL over at least 2 consecutive occasions.

Notable findings:

- **GDM-diet:**
 - **Hyperglycemia 49/367 (13%)**
- **GDM-medication**
 - **Hyperglycemia 37/312 (12%)**

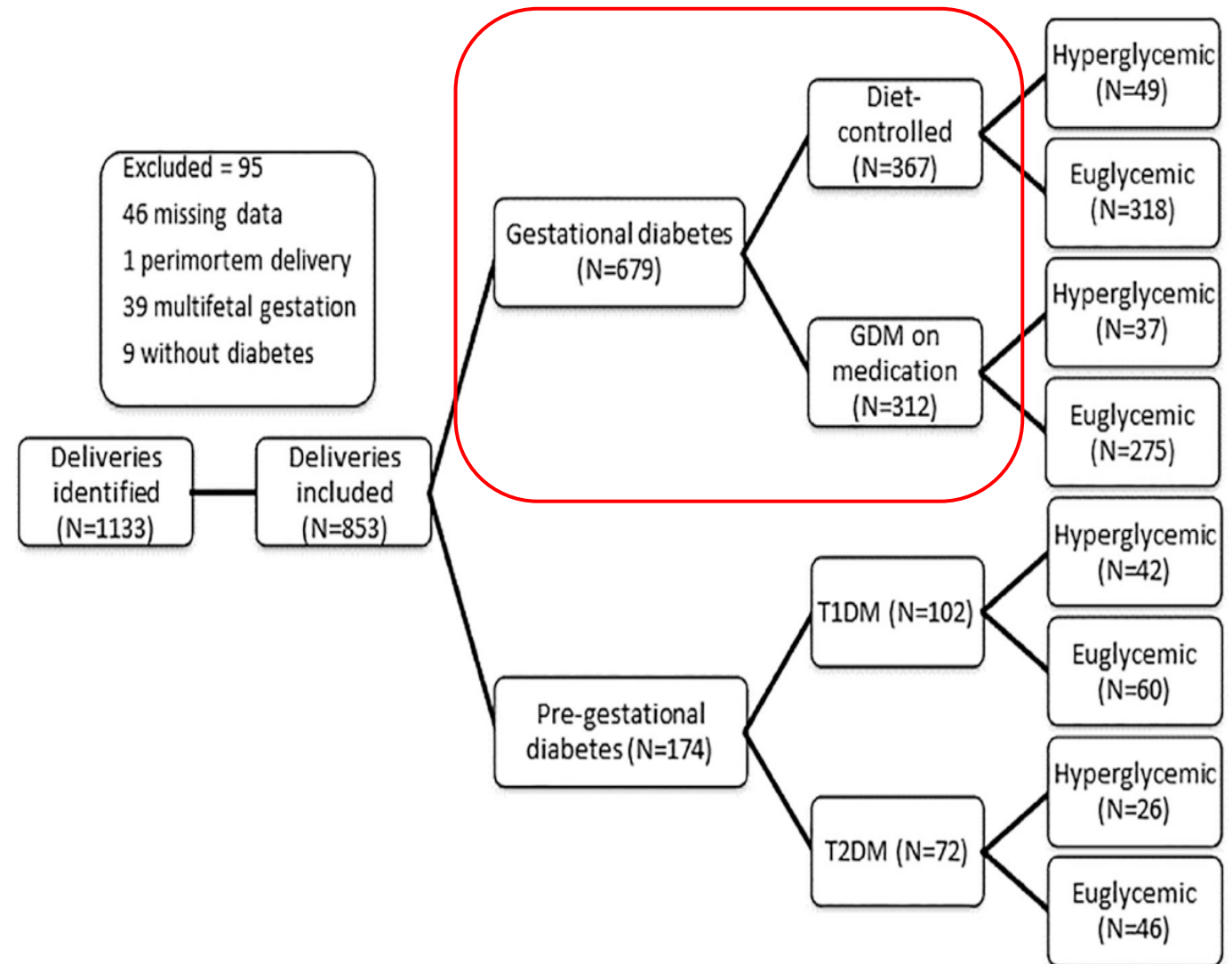


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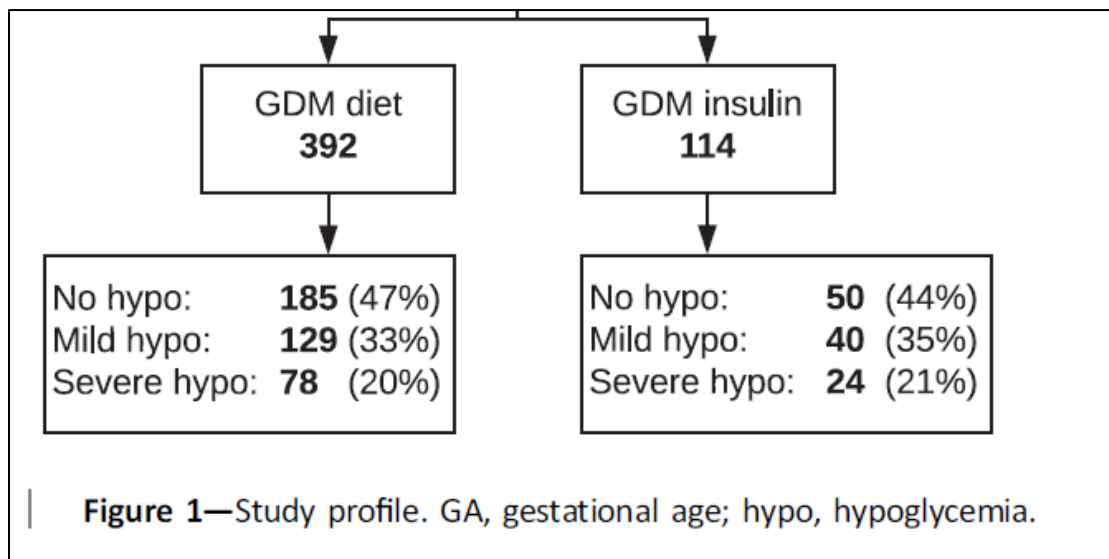
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- Hyperglycemia prior to delivery is uncommon in GDM
- GDM: 10% received insulin in labor (hyperglycemia group glucose range 118 (114 – 126) mg/dl
- The newborn hypoglycemia in the GDM-medication group was resolved without NICU admission
- ***Strategies other than strict intrapartum glucose control to reduce adverse neonatal outcomes are necessary to reduce neonatal hypoglycemia (MM note: optimal antenatal control)***

GDM-diet		Maternal Hyperglycemia (>110)	Maternal Euglycemia	Adj RR (age, race, BMI, IV insulin, insurance)
		N=49/367 (13%)	N=318/367	
	Neonatal hypoglycemia 1 hr	7 (14%)	75 (24%)	0.50 (0.23 – 1.1)
	Neonatal hypoglycemia 2-24 hrs	13 (27%)	121 (38%)	0.73 (0.44 – 1.2)
	NICU admit	12 (25%) (no mention re: indication)	43 (14%)	2.0 (1.1 – 3.4)
GDM-medication		N=37/312 (12%)	N=275/312	
	Neonatal hypoglycemia 1 hr	15 (40%)	71 (26%)	1.8 (1.1 – 2.7)
	Neonatal hypoglycemia 2-24 hrs	15 (40%)	118 (43%)	0.97 (0.64 – 1.5)
	NICU admit	6 (16%)	38 (14%)	1.2 (0.54 – 2.5)

Neonatal Hypoglycemia Following Diet-Controlled and Insulin-Treated Gestational Diabetes Mellitus

Diabetes Care 2018;41:1385–1390 | <https://doi.org/10.2337/dc18-0048>



- No difference in neonatal hypoglycemia GDM diet vs insulin
- Major factor: LGA
- NICU admit: indication other than hypoglycemia 2.6%; mild 1%; severe 0%

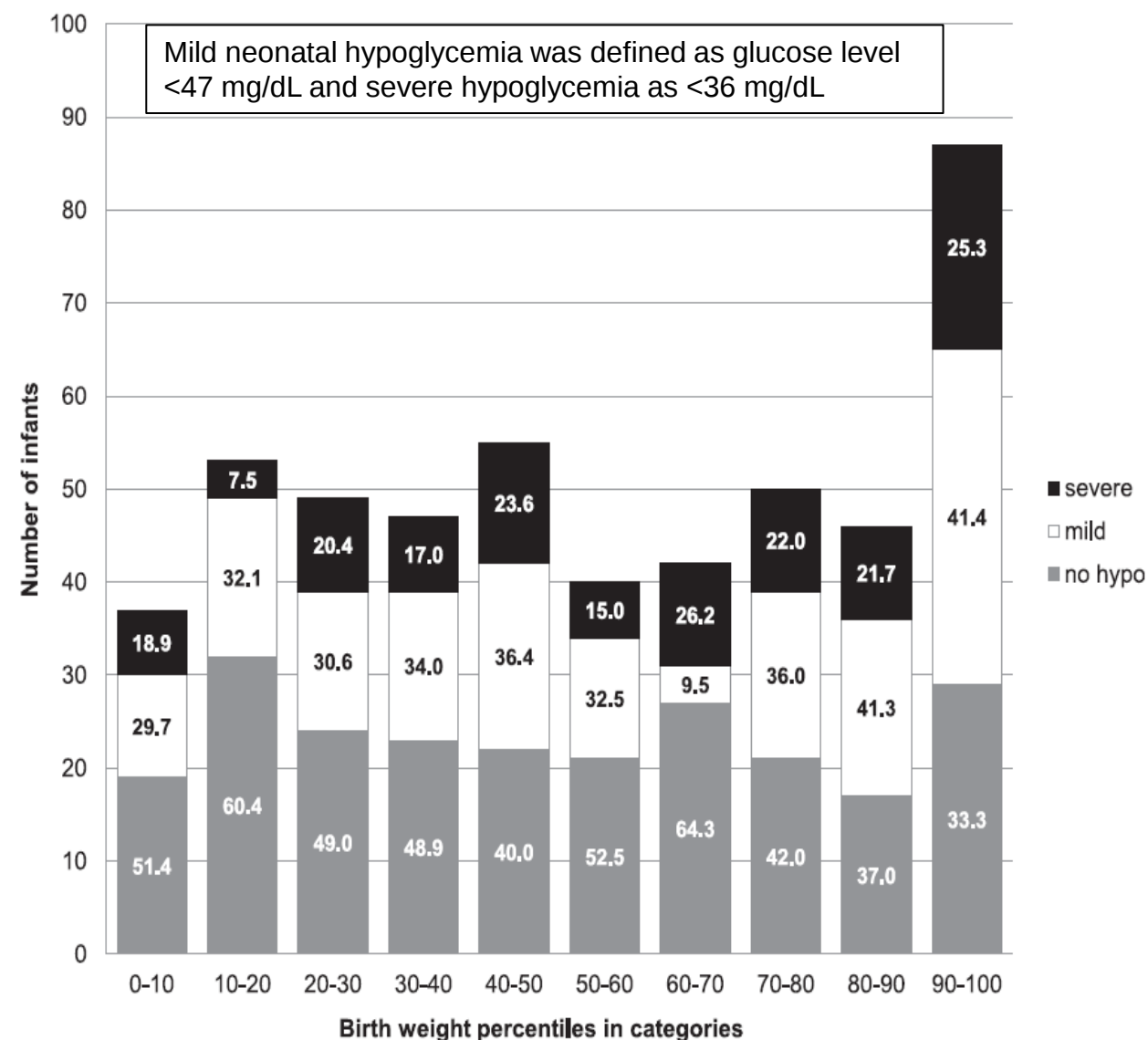


Figure 2—Infants with no, mild, or severe hypoglycemia (hypo) per birth weight percentile (numbers in bars indicate the percentage within the birth weight decile).

To reduce risk for GDM:

- Optimal antenatal control
- Avoid LGA by avoid excessive weight gain

Note:

- **Less than recommended weight gain** after the dx of GDM is association with **reduced risk** for LGA/macrosomia
- **Excessive weigh gain** after dx of GDM is associated with **increased risk** of LGA/macrosomia and cesarean delivery

Table 4 GWG after OGTT in women with GDM classified by IOM criteria and risk of adverse pregnancy outcomes (aOR (95% CI))

	PIH and preeclampsia	LGA	SGA	Macrosomia	LBW	Preterm	Cesarean section
Insufficient GWG before OGTT							
Lower than IOM criteria after OGTT, n = 196	1.95 (0.92–4.14)	0.52 (0.32–0.82)	1.35 (0.44–4.18)	0.85 (0.42–1.73)	1.49 (0.56–3.98)	1.21 (0.48–3.07)	1.43 (0.94–2.17)
Within the IOM criteria after OGTT, n = 131	1.47 (0.58–3.75)	0.37 (0.20–0.68)	2.93 (0.99–8.72)	0.18 (0.04–0.80)	1.78 (0.58–5.43)	1.71 (0.60–4.86)	1.13 (0.68–1.88)
Higher than IOM criteria after OGTT, n = 182	1.79 (0.84–3.81)	0.74 (0.46–1.18)	1.18 (0.32–4.44)	0.77 (0.37–1.58)	1.52 (0.52–4.40)	1.44 (0.55–3.77)	1.94 (1.25–3.01)
Adequate GWG before OGTT							
Lower than IOM criteria after OGTT, n = 529	1.62 (0.78–3.37)	0.61 (0.41–0.91)	0.38 (0.11–1.39)	0.43 (0.20–0.89)	0.97 (0.38–2.51)	1.49 (0.65–3.45)	1.10 (0.75–1.61)
Within the IOM criteria after OGTT, n = 303	1	1	1	1	1	1	1
Higher than IOM criteria after OGTT, n = 305	1.87 (0.91–3.85)	0.80 (0.53–1.21)	0.57 (0.14–2.34)	0.99 (0.53–1.88)	0.87 (0.30–2.58)	0.85 (0.32–2.23)	2.38 (1.60–3.55)
Excessive GWG before OGTT							
Lower than IOM criteria after OGTT, n = 690	1.11 (0.52–2.36)	0.95 (0.65–1.39)	0.57 (0.18–1.81)	1.03 (0.56–1.92)	0.37 (0.12–1.18)	0.74 (0.29–1.85)	1.20 (0.82–1.75)
Within the IOM criteria after OGTT, n = 353	2.34 (1.10–4.99)	1.28 (0.84–1.93)	0.36 (0.07–1.82)	1.64 (0.86–3.10)	0.42 (0.11–1.65)	0.55 (0.18–1.74)	1.44 (0.94–2.19)
Higher than IOM criteria after OGTT, n = 546	2.33 (1.18–4.61)	1.63 (1.13–2.34)	0.74 (0.23–2.38)	2.54 (1.45–4.42)	0.72 (0.26–2.00)	0.83 (0.34–2.02)	3.52 (2.42–5.10)

Adjusted for gravidity, parity, PPBMI, height, adverse pregnancy history, blood glucose levels at OGTT and late pregnancy
 GWG gestational weight gain; OGTT oral glucose tolerance test; aOR adjusted odds ratio; CI confidence interval; GDM gestational diabetes mellitus; PIH pregnancy induced pregnancy; LBW low birth weight; LGA large for gestational age; SGA small for gestational age; IOM Institute of Medicine; PPBMI pre-pregnancy body mass index

Take Home Message:

- Gestational diabetes treated with diet or insulin have low rates of hyperglycemia requiring insulin during labor
- Newborns delivered of patients with gestational diabetes have low rates of NICU admission for hypoglycemia

- There is no clear difference in outcomes re: neonatal hypoglycemia with GDM-diet vs insulin
- Tight intrapartum glucose control does not reduce the risk of neonatal hypoglycemia
- Few people even on medication for GDM need insulin in labor (about 10%)
- Excessive weight gain is associated with macrosomia which is associated with neonatal hypoglycemia

GDM Diet Controlled

(note: it is not clear any patient with GDM with documented diet control needs glucose assessment)

POCT glucose q4 hours in labor and second stage (or none)

Glucose 121-149 mg/dl:

Recheck in 1 hr
120-149: 2 units short acting insulin (Aspart, Lispro) SQ

Glucose 150-200 mg/dl:

4 units short acting insulin (Aspart, Lispro) SQ
Recheck q 1 hr x4 hrs

After insulin recheck POCT glucose q 1 hr x4 hrs (do not retreat until 4 hours)

Postpartum:

- No glucose assessment
- GTT immediately PP, 6 weeks later, or HgbA1C at 3 months

GDM Medication Controlled

(MFM recommendations will note how to continue metformin or insulin)

POCT in labor q2-4 hours; can increase to 1-2 hours depending on results

Glucose 121-149 mg/dl:

Recheck in 1 hr
120-149: 2 units short acting insulin (Aspart, Lispro) SQ

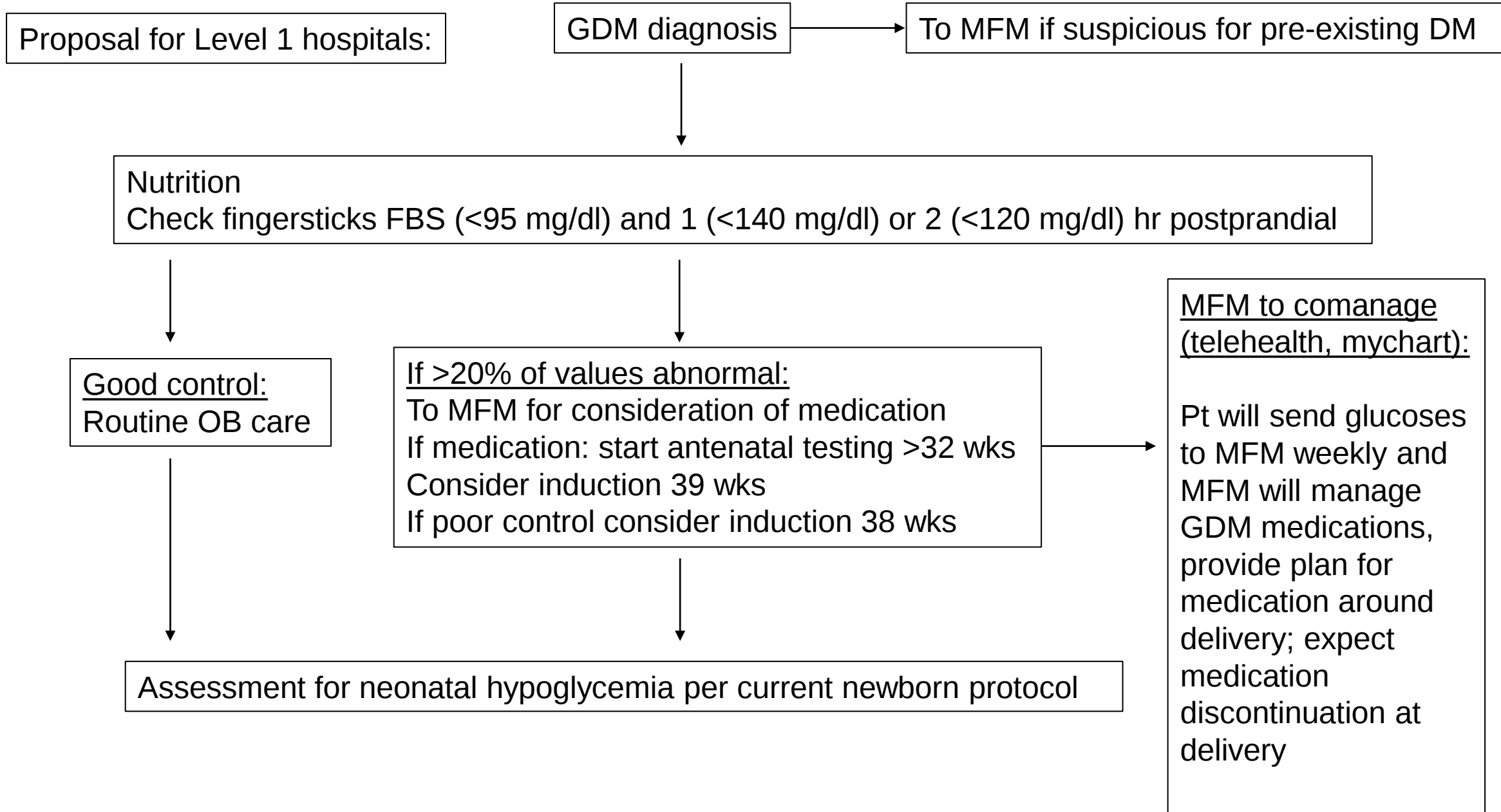
Glucose 150-200 mg/dl:

4 units short acting insulin (Aspart, Lispro) SQ
Recheck q 1 hr x4 hrs

After insulin recheck POCT glucose q 1 hr x4 hrs (do not retreat until 4 hours)

Postpartum (no suspicion for pre-existing DM):

- Check FBS on PPD 1
- If normal can consider GTT immediately
- If elevated wait for GTT 6 wks or HgbA1C at 3 months



Infant of (Gestational) Diabetic Mother

Delia Horn, MD, FAAP

2/6/2024



Table 1. The frequency of adverse pregnancy outcomes.

Adverse Outcome	Increased in Pregestational Diabetes	Increased in GDM	No Difference
Caesarean section	[15,17,20,21,24,27,43,46,48,50,51,52]	[22,47]	[25,44]
Preterm birth	[17,21,22,24,43,44,45,46,48,50,51,52]	[20,27]	
Congenital anomalies	[14,16,17,22,24,25,27,47]	[20]	[15,21,43,45]
Pre-eclampsia	[17,24,43,45,46,50]	[22,27]	[15,44]
Neonatal hypoglycaemia	[27,43,46,47,52]		[14,22,44]
Macrosomia	[15,20,22,24,44,50]	[17]	[14,21,43,48]
NICU admission	[14,20,43,45,46,52]		
Stillbirth	[17,24,44,46,47,49]		[20,45]
Apgar score	[20,21,24,48]		[43,44,46]
Large for gestational age	[46,48,52]	[25,27]	[21]
Induction of labour	[24,43,51]	[17]	[46]
Respiratory distress syndrome	[14,27,43]	[20]	
Miscarriage	[15,17]		

Malaza, N et al. A Systematic Review to Compare Adverse Pregnancy Outcomes in Women with Pregestational Diabetes and Gestational Diabetes. *Int. J. Environ. Res. Public Health* **2022**, *19*, 10846. <https://doi.org/10.3390/ijerph19171084>

Infant of (Gestational) Diabetic Mother

- Maternal hyperglycemia before delivery was associated with 1.8-fold greater risk of neonatal hypoglycemia (glucose <45 mg/dL) in patients with GDM on medication (adjusted risk ratio (aRR): 1.8; 95% CI: 1.1–2.7) – at 1 hour, **not seen at hours 2 or 4**
- This association was not seen in diet-controlled GDM (0.5; 0.23–1.1)
- Pregestational diabetes, compared to GDM, regardless of intrapartum maternal glucose control, was associated with neonatal hypoglycemia and NICU admission.
- Patients with pregestational diabetes were more likely to have a large for gestational age infant compared to patients with GDM (25.3% versus 10.3%)

Tooba et al. Reexamining intrapartum glucose control in patients with diabetes and risk of neonatal hypoglycemia. J Perinatol. 2021 December; 41(12): 2754–2760. doi:10.1038/s41372-021-01292-3

Hypoglycemia

- Advance fast, wean slow
- Oral glucose gel, formula supplemented feeds, fortified feeds (24 kcal/oz)
- IV fluids:
 - D10 bolus as needed (2 mL/kg)
 - D10 fluids at 60-80 mL/kg/d (monitor electrolytes daily)
 - With electrolytes if >24 hours old
 - Increase as needed to attain euglycemia

Hypoglycemia

- D10 IV fluid Weaning Plan:
 - By 0.5-1 milligram/kilogram/minute (mkm; Glucose Infusion Rate or GIR) for every 2 qAc blood sugars >55 mg/dL, or 1 qAc blood sugar >70 mg/dL
- Calculating GIR:
 - [Glucose Infusion Rate \(cornell.edu\)](http://cornell.edu)

$$\text{GIR} = \frac{\text{IV Rate (mL/hr)} * \text{Dextrose Conc (g/dL)} * 1000 \text{ (mg/g)}}{\text{Weight (kg)} * 60 \text{ (min/hr)} * 100 \text{ (mL/dL)}}$$

Case Example

- 3.8 kg male infant receiving 100 mL/kg/d of D10 with electrolytes
 - Fluid rate = $(100 \times 3.8) / 24 = 15.8$ mL/hr
 - GIR = 6.9 mg/kg/min

Calculate the total glucose infusion rate from up to three concentrations of dextrose.

Input Weight	3.8	☒ kg ☐ lb
D5 Rate		mL/hr
D10 Rate	15.8	mL/hr
D	Rate	mL/hr

Total GIR = mg/kg/min

Case Example

- Drop rate to 14.7 mL/hr: GIR = 6.4 mg/kg/min (decrease of ~0.5 mkm)

Input Weight	3.8	☒ kg ☐ lb
D5 Rate		mL/hr
D10 Rate	14.7	mL/hr
D Rate		mL/hr

Total GIR = mg/kg/min

- Drop rate to 13.7 mL/hr: GIR = 6 mg/kg/min (decrease of ~1 mkm)

Input Weight	3.8	☒ kg ☐ lb
D5 Rate		mL/hr
D10 Rate	13.7	mL/hr
D Rate		mL/hr

Total GIR = mg/kg/min

Case Example

- Further weans by either:
 - 0.5 GIR: $(15.8 - 14.7 = \sim 1 \text{ mL/hr})$
 - 1.0 GIR: $(15.8 - 13.7 = \sim 2 \text{ mL/hr})$
- Wean by 1 mL/hr to wean GIR by 0.5 mkm
- Wean by 2 mL/hr to wean GIR by 1 mkm

Ways not to Wean

- Halving fluids, then turning off
- Decreasing by 20 MKD until fluids are off
- Any weaning plan that is not GIR - driven

Advance Fast, Wean Slow – Call UVM If You Get Stuck 😊



Questions

Thank you

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