Don’t Sugar Coat It: Best Practices for Diabetes Management in Pregnancy

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UAB MATERNAL-FETAL MEDICINE

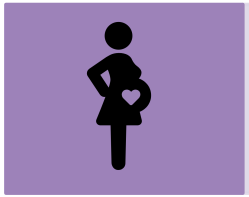
Disclosures

I receive funding from the NIH, CDC, and AHA to support my effort on ongoing clinical trials (K23HD103875, R01HD101476, 17SFRN33620005, BAA 75D301-20-R-67897, R01HL157075).

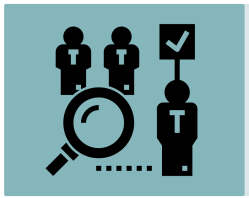
I receive discounted/donated CGM devices for research from Dexcom.

OBJECTIVES

Describe the impact of diabetes in terms of disease prevalence, cost, and maternal & perinatal complications.

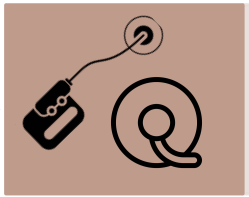


Discuss the current evidence regarding GDM screening, diagnosis and treatment.

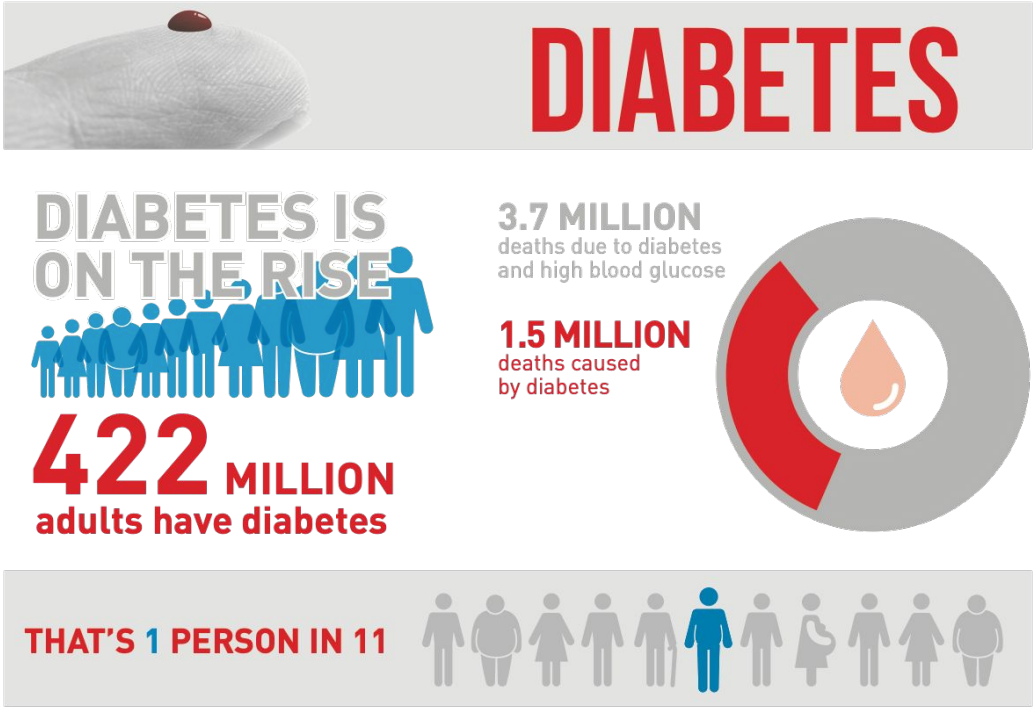


Understand the importance of and barriers to postpartum diabetes screening after GDM.

Identify knowledge gaps surrounding use of oral hypoglycemic agents for pregestational diabetes.



Review new technologies surrounding the treatment of diabetes in pregnancy.



Burden of Disease

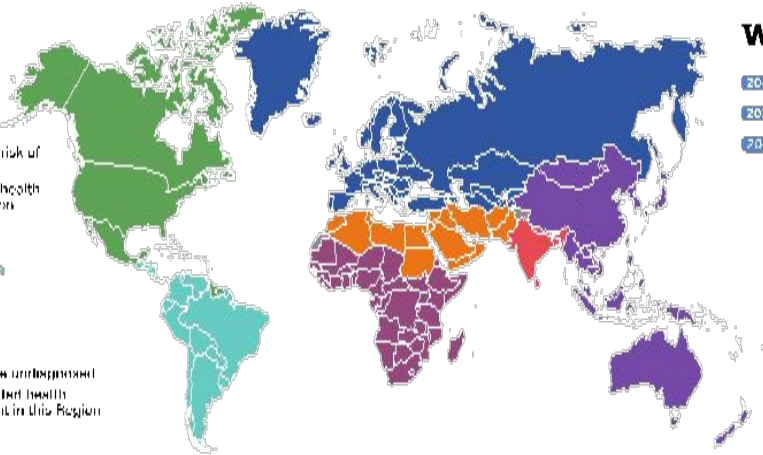
IDF DIABETES ATLAS

9th edition 2019

International Diabetes Federation

GLOBAL Fact sheet

Number of adults (20–79 years) with diabetes worldwide



North America & Caribbean

2045 55 million
2030 50 million
2019 48 million

33% increase

- 1 in 8 adults in this Region is at risk of type 2 diabetes
- 43% of global diabetes related health expenditure occurs in this Region

South & Central America

2045 49 million
2030 40 million
2019 32 million

55% increase

- 2 in 5 people with diabetes were undiagnosed
- Only 8% of global diabetes-related health expenditure for diabetes is spent in this Region

WORLD

2045 700 million
2030 578 million
2019 463 million

51% increase

Europe

2045 68 million
2030 66 million
2019 59 million

15% increase

- 1 in 8 live births are affected by hyperglycaemia in pregnancy
- The Region has the highest number of children and adolescents (0–19 years) with type 1 diabetes - 297,000 in total

Africa

2045 47 million
2030 29 million
2019 19 million

143% increase

- 3 in 5 people with diabetes are undiagnosed
- 3 in 4 deaths due to diabetes were in people under the age of 60

Middle East & North Africa

2045 108 million
2030 76 million
2019 55 million

96% increase

- 1 in 8 people have diabetes
- 1 in 2 deaths due to diabetes were in people under the age of 60

South-East Asia

2045 153 million
2030 115 million
2019 88 million

74% increase

- 1 in 5 adults with diabetes lives in this Region
- 1 in 4 live births are affected by hyperglycaemia in pregnancy

Western Pacific

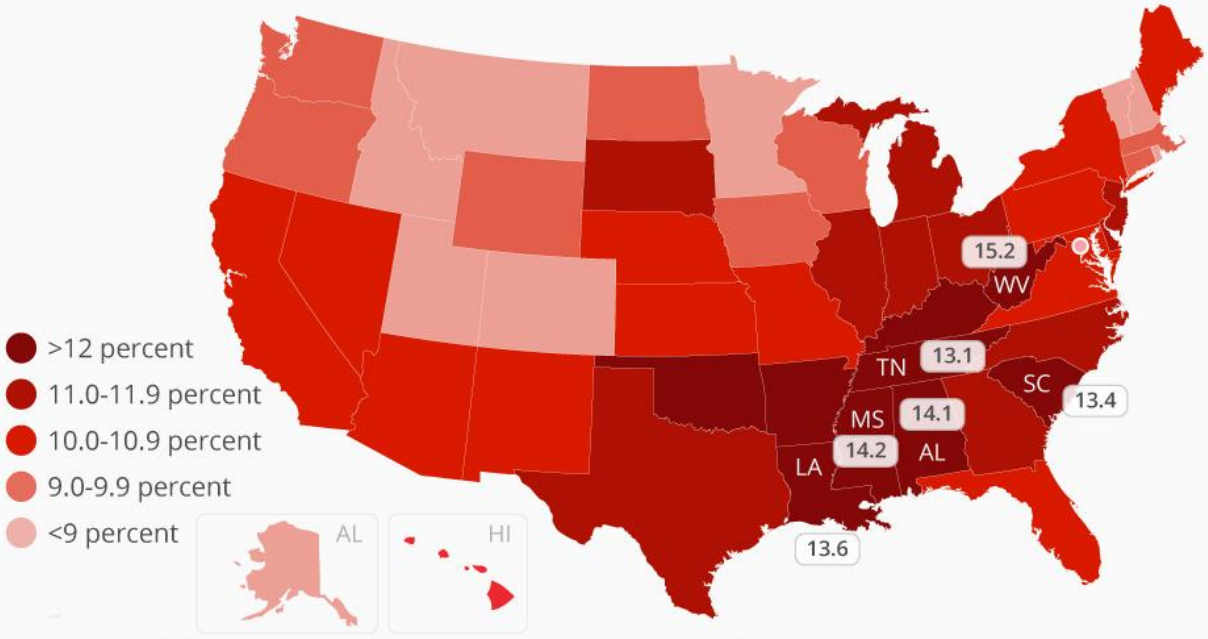
2045 212 million
2030 197 million
2019 163 million

31% increase

- 1 in 3 adults with diabetes lives in this Region
- 1 in 3 deaths due to diabetes occur in this Region

Where Diabetes is Most Prevalent in the U.S.

Percent of adults who have ever been told by a doctor that they have diabetes (2017*)



Includes pregnancy-related diabetes, percentages are weighted to reflect population characteristics (e.g. average age)
* latest on record

Sources: Kaiser Family Foundation, CDC

statista

THE STAGGERING COST OF DIABETES

Today, **4,660** AMERICANS WILL BE DIAGNOSED WITH **DIABETES**

NEARLY **30** MILLION AMERICANS HAVE DIABETES

86 million
Americans have prediabetes
More than the population of the east coast from Connecticut to Georgia

$ **1 in 5 health care dollars** is spent caring for people with diabetes

$ **1 in 3 Medicare dollars** is spent caring for people with diabetes

$ People with diagnosed diabetes have health care costs **2.3 times higher** than if they didn't have the disease

American Diabetes Association.

Learn how to combat this costly disease at **diabetes.org/congress**

STOP DIABETES.

Hyperglycemia is one of the **most common medical conditions women encounter during pregnancy**

1 in 6 live births occur to women with some form of hyperglycemia

84% *of which are due to GDM*

HYPERGLYCEMIA/GDM IS ASSOCIATED WITH:

- Leading causes of **maternal mortality**
- Higher incidence of **maternal morbidity**
- Higher incidence of **perinatal and neonatal morbidity**
- **Later long term consequences** for both mother and child

Low and middle income countries account for:

85% of the annual **global deliveries**

80% of the **global diabetes** burden

90% of all cases of **maternal and perinatal deaths** and **poor pregnancy outcomes**

PREGNANCY OFFERS A WINDOW OF OPPORTUNITY TO:

- **Establish** services
- **Improve** health
- **Prevent** intergenerational transmission of non-communicable diseases

Complications of Diabetes

MATRNAL:

- Hypertension or preeclampsia
- Worsening comorbid conditions (retinopathy)
- Preterm birth
- Cesarean delivery
- **Future risk** for T2DM

NEONATAL:

- Congenital malformations
- Stillbirth
- LGA or SGA
- Shoulder dystocia & birth injury
- Respiratory problems
- NICU admission
- **Future risk** of chronic disease

GDM SCREENING, DIAGNOSIS, AND TREATMENT

Historical Context

- In 1960s, screening for GDM was aimed at identifying women who would develop T2DM later in life
- In 2000s, demonstrated that the increased maternal and fetal risks associated with GDM could be mitigated with treatment during pregnancy

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 16, 2005 VOL. 352 NO. 24

Effect of Treatment of Gestational Diabetes Mellitus on Pregnancy Outcomes

Caroline A. Crowther, F.R.A.N.Z.C.O.G., Janet E. Hiller, Ph.D., John R. Moss, F.C.H.S.E., Andrew J. McPhee, F.R.A.C.P., William S. Jeffries, F.R.A.C.P., and Jeffrey S. Robinson, F.R.A.N.Z.C.O.G., for the Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS) Trial Group*

- Randomized clinical trial to determine whether treatment of women with GDM reduced the risk of perinatal complications
- N=1000 women
  - Intervention (nutrition consult, self-glucose monitoring 4x/day, insulin)
  - Routine care

Table 2. Primary Clinical Outcomes among the Infants and Their Mothers.*

Outcome	Intervention Group	Routine-Care Group	Unadjusted Relative Risk (95% CI)	Unadjusted P Value	Adjusted Relative Risk (95% CI)†	Adjusted P Value†	Step-Down Sidak P Value
	no. (%)						
Infants							
Total no.	506	524					
Any serious perinatal complication‡	7 (1)	23 (4)	0.32 (0.14–0.73)	0.004	0.33 (0.14–0.75)	0.01	0.04
Death	0	5 (1)		0.06		0.07	
Stillbirth	0	3 (1)§		0.25		0.26	
Neonatal death	0	2 (<1)		0.50		0.50	
Shoulder dystocia¶	7 (1)	16 (3)	0.45 (0.19–1.09)	0.07	0.46 (0.19–1.10)	0.08	
Bone fracture	0	1 (<1)		1.00		0.38	
Nerve palsy	0	3 (1)‖		0.25		0.11	

TREATMENT OF GDM DECREASES THE RISK OF SERIOUS PERINATAL COMPLICATION BY 70% (NNT = 34)

Recommend Universal Screening for GDM at 24-28 weeks' Gestation

- Universal screening in US: up to 80% of women have at least one risk factor and **20% have no risk factors** (USPTF 2014)
  - Meta-analysis of 29 studies (n>211,000 women) concluded that risk factors were **poor predictors** of women who had an abnormal GTT
- Universal (versus selective) screening shown to be **cost-effective** in numerous countries
  - Danilenko-Dixon Dr *AM J Obstet Gynecol* 1999;181:798
  - Farrar D *PLoS One* 2017;12:e0175288

One versus Two-step Screening

1hr, 50g

If >130-140

3hr, 100g

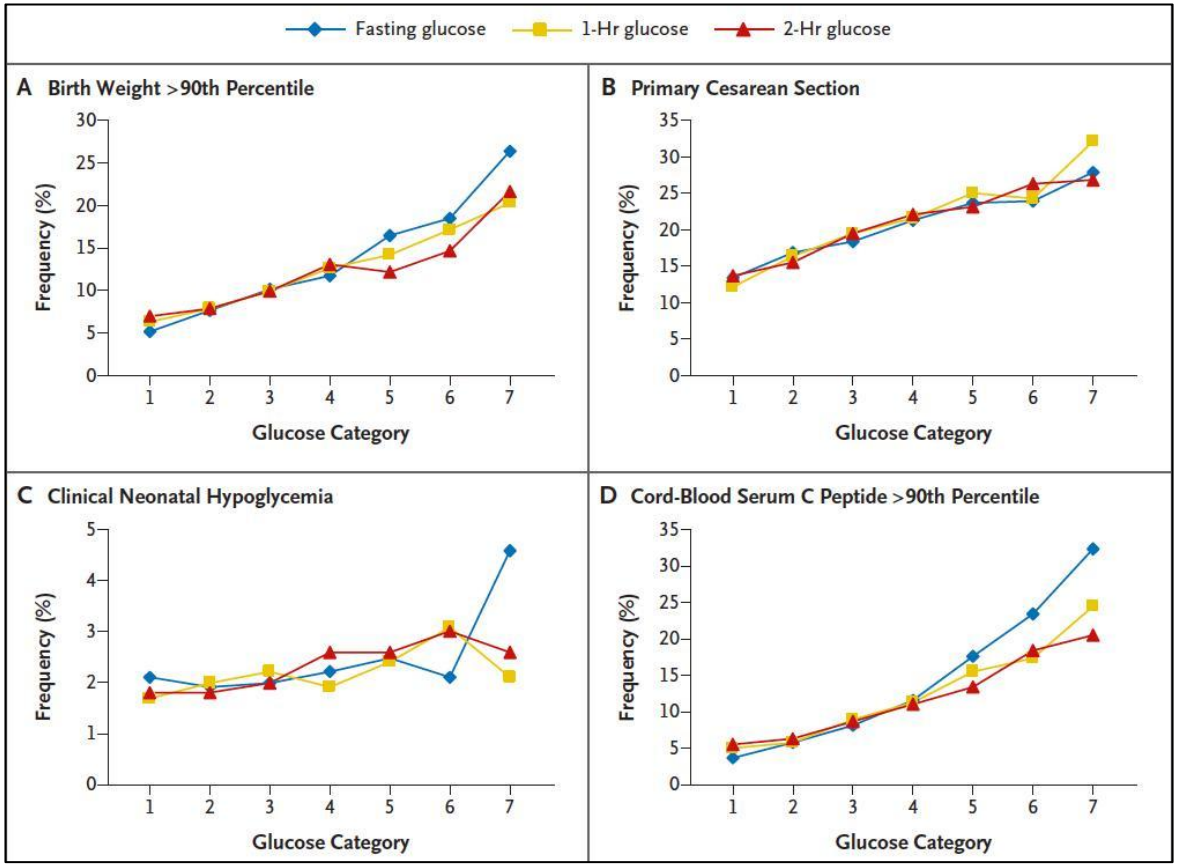
F ≥95
1hr ≥180
2hr ≥155
3hr ≥140

2hr, 75g

F ≥92
1hr ≥180
2hr ≥153

Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) Study

- 25,505 pregnant people
- 15 centers in 9 countries
- 2hr, 75g GTT at 24-32wk
- Objective = identify outcomes-based cutoffs for GDM diagnosis



One versus Two-step Screening

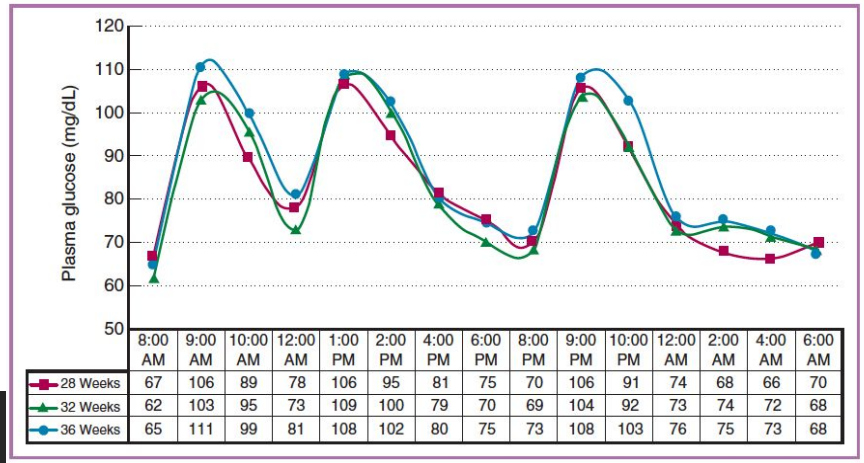
- One-step identifies more GDM (~18% vs ~6%)
- Patients identified as GDM on one-step who have normal two-step screening have “milder” disease, but may still be at risk for adverse pregnancy outcomes
- One-step screening may increase healthcare costs and patient anxiety without clear benefit in pregnancy
- Implications are unknown when long-term impact is considered

Treatment of GDM

- Nutrition Assessment and Education
- Exercise/Activity Counseling
- Diabetes Education
- Pharmacotherapy as needed
  - Insulin
  - Oral hypoglycemic agents

Goals for Treatment

Blood Glucose	ACOG	ADA
Fasting	<95	60-99
1 hr postprandial	<140	<140
2 hr postprandial	<120	<120



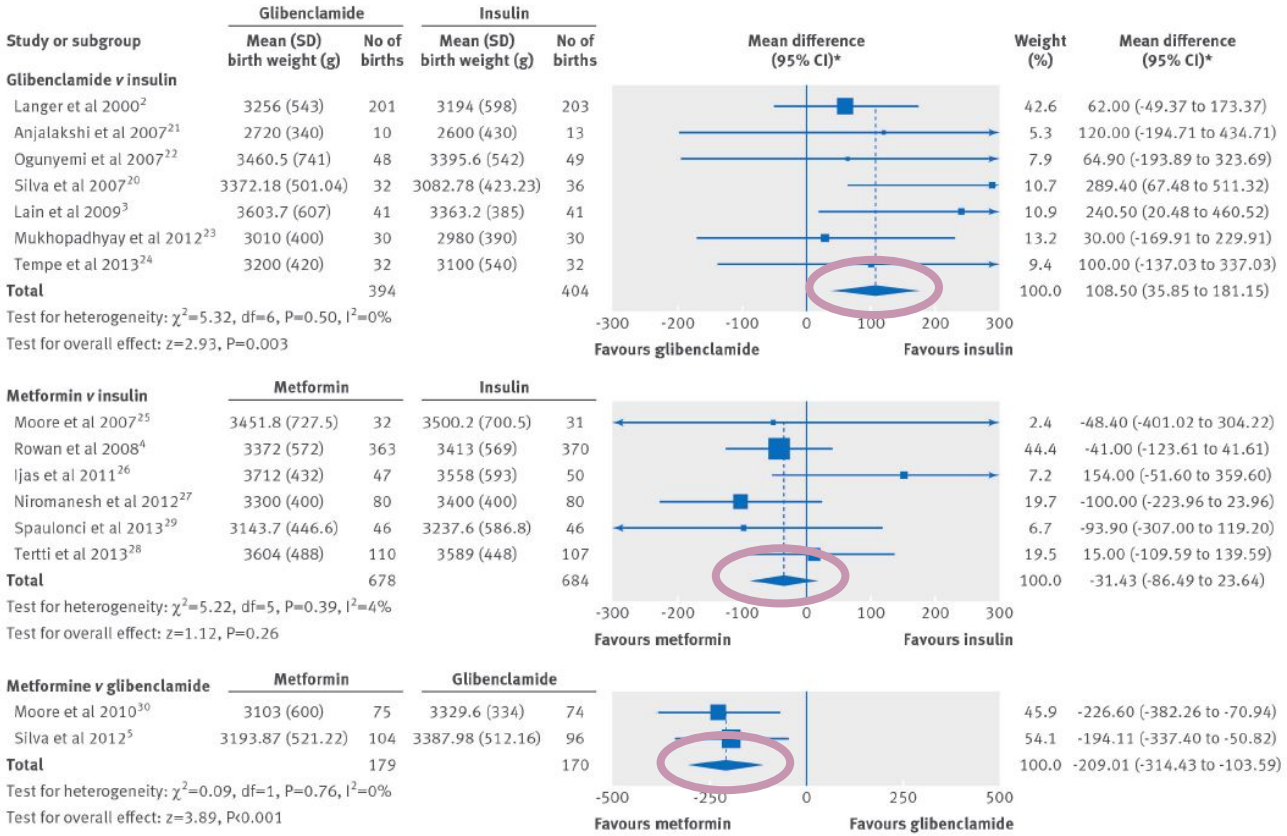
	8:00 AM	9:00 AM	10:00 AM	12:00 AM	1:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM	9:00 PM	10:00 PM	12:00 AM	2:00 AM	4:00 AM	6:00 AM
28 Weeks	67	106	89	78	106	95	81	75	70	106	91	74	68	66	70
32 Weeks	62	103	95	73	109	100	79	70	69	104	92	73	74	72	68
36 Weeks	65	111	99	81	108	102	80	75	73	108	103	76	75	73	68

Pharmacologic Treatment Options

1. Insulin
2. Metformin* – “first-line alternative to insulin”
3. Glyburide* – inferior to both insulin and metformin

*Cross placenta with uncertain long-term effects

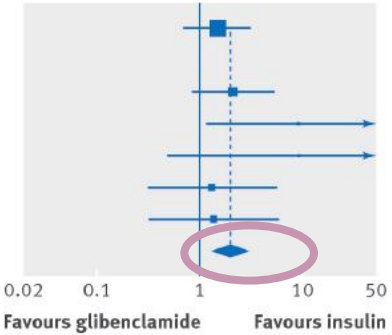
GDM Treatment and Birthweight



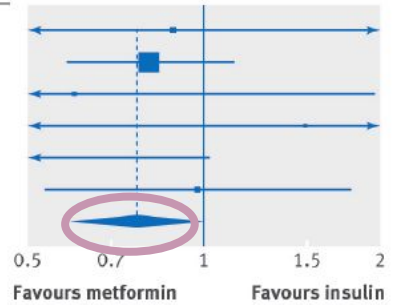
Study or subgroup	Glibenclamide Mean (SD) birth weight (g)	Glibenclamide No of births	Insulin Mean (SD) birth weight (g)	Insulin No of births	Mean difference (95% CI)*	Weight (%)	Mean difference (95% CI)*
Glibenclamide *v* insulin							
Langer et al 2000[2]	3256 (543)	201	3194 (598)	203		42.6	62.00 (-49.37 to 173.37)
Anjalakshi et al 2007[21]	2720 (340)	10	2600 (430)	13		5.3	120.00 (-194.71 to 434.71)
Ogunyemi et al 2007[22]	3460.5 (741)	48	3395.6 (542)	49		7.9	64.90 (-193.89 to 323.69)
Silva et al 2007[20]	3372.18 (501.04)	32	3082.78 (423.23)	36		10.7	289.40 (67.48 to 511.32)
Lain et al 2009[3]	3603.7 (607)	41	3363.2 (385)	41		10.9	240.50 (20.48 to 460.52)
Mukhopadhyay et al 2012[23]	3010 (400)	30	2980 (390)	30		13.2	30.00 (-169.91 to 229.91)
Tempe et al 2013[24]	3200 (420)	32	3100 (540)	32		9.4	100.00 (-137.03 to 337.03)
Total		394		404		100.0	108.50 (35.85 to 181.15)
Test for heterogeneity: χ^2=5.32, df=6, P=0.50, I^2=0%							
Test for overall effect: z=2.93, P=0.003							
					-300 -200 -100 0 100 200 300		
					Favours glibenclamide Favours insulin		
Metformin *v* insulin	**Metformin**		**Insulin**				
Moore et al 2007[25]	3451.8 (727.5)	32	3500.2 (700.5)	31		2.4	-48.40 (-401.02 to 304.22)
Rowan et al 2008[4]	3372 (572)	363	3413 (569)	370		44.4	-41.00 (-123.61 to 41.61)
Ijas et al 2011[26]	3712 (432)	47	3558 (593)	50		7.2	154.00 (-51.60 to 359.60)
Niromanesh et al 2012[27]	3300 (400)	80	3400 (400)	80		19.7	-100.00 (-223.96 to 23.96)
Spaulonci et al 2013[29]	3143.7 (446.6)	46	3237.6 (586.8)	46		6.7	-93.90 (-307.00 to 119.20)
Tertti et al 2013[28]	3604 (488)	110	3589 (448)	107		19.5	15.00 (-109.59 to 139.59)
Total		678		684		100.0	-31.43 (-86.49 to 23.64)
Test for heterogeneity: χ^2=5.22, df=5, P=0.39, I^2=4%							
Test for overall effect: z=1.12, P=0.26							
					-300 -200 -100 0 100 200 300		
					Favours metformin Favours insulin		
Metformine *v* glibenclamide	**Metformin**		**Glibenclamide**				
Moore et al 2010[30]	3103 (600)	75	3329.6 (334)	74		45.9	-226.60 (-382.26 to -70.94)
Silva et al 2012[5]	3193.87 (521.22)	104	3387.98 (512.16)	96		54.1	-194.11 (-337.40 to -50.82)
Total		179		170		100.0	-209.01 (-314.43 to -103.59)
Test for heterogeneity: χ^2=0.09, df=1, P=0.76, I^2=0%							
Test for overall effect: z=3.89, P<0.001							
					-500 -250 0 250 500		
					Favours metformin Favours glibenclamide		

GDM Treatment and Neonatal Hypoglycemia

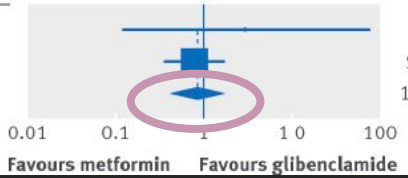
Study or subgroup	Glibenclamide No of events	Glibenclamide No of births	Insulin No of events	Insulin No of births	Risk ratio (95% CI)*	Weight (%)	Risk ratio (95% CI)*
Glibenclamide *v* insulin							
Langer et al 2000[2]	18	201	12	203		47.4	1.51 (0.75 to 3.06)
Anjalakshi et al 2007[21]	0	9	0	13		—	—
Ogunyemi et al 2007[22]	12	43	6	45		23.3	2.09 (0.86 to 5.08)
Silva et al 2007[20]	8	32	1	36		3.7	9.00 (1.19 to 68.09)
Lain et al 2009[3]	4	40	0	41		2.0	9.22 (0.51 to 165.87)
Mukhopadhyay et al 2012[23]	4	30	3	30		11.9	1.33 (0.33 to 5.45)
Tempe et al 2013[24]	4	31	3	32		11.7	1.38 (0.33 to 5.66)
Total	50	386	25	400		100.0	2.04 (1.30 to 3.20)
Test for heterogeneity: χ^2=4.45, df=5, P=0.49, I^2=0%							
Test for overall effect: z=3.11, P=0.002							



Metformin *v* insulin	Metformin		Insulin				
Moore et al 2007[25]	0	31	2	31		2.3	0.20 (0.01 to 4.00)
Rowan et al 2008[4]	55	363	69	370		63.4	0.81 (0.59 to 1.12)
Ijas et al 2011[26]	4	47	7	50		6.3	0.61 (0.19 to 1.94)
Niromanesh et al 2012[27]	3	80	2	80		1.9	1.50 (0.26 to 8.74)
Spaulonci et al 2013[29]	3	46	10	46		9.3	0.30 (0.09 to 1.02)
Tertti et al 2013[28]	18	109	18	107		16.9	0.98 (0.54 to 1.78)
Total	83	676	108	684		100.0	0.78 (0.60 to 1.01)
Test for heterogeneity: χ^2=4.51, df=5, P=0.48, I^2=0%							
Test for overall effect: z=1.87, P=0.06							



Metformine *v* glibenclamide	Metformin		Glibenclamide				
Moore et al 2010[30]	1	75	0	74		3.6	2.96 (0.12 to 71.52)
Silva et al 2012[5]	11	103	13	95		96.4	0.78 (0.37 to 1.66)
Total	12	178	13	169		100.0	0.86 (0.42 to 1.77)
Test for heterogeneity: χ^2=0.64, df=1, P=0.42, I^2=0%							
Test for overall effect: z=0.41, P=0.68							



Balsells meta analysis – *BMJ* 2015

Early GDM Screening?

- Risk-factor based
- Uncertain gestational age range
- Optimal screening test unknown
- Vague guidelines not based on high-quality evidence

Box 1. Screening Strategy for Detecting Pregestational Diabetes or Early Gestational Diabetes Mellitus ⇦

Consider testing in all women who are overweight or obese (ie, have a body mass index greater than 25 or greater than 23 in Asian Americans) and have one or more of the following additional risk factors:

- Physical inactivity
- First-degree relative with diabetes
- High-risk race or ethnicity (eg, African American, Latino, Native American, Asian American, Pacific Islander)
- Have previously given birth to an infant weighing 4,000g (approximately 9 lb) or more
- Previous gestational diabetes mellitus
- Hypertension (140/90 mm Hg or on therapy for hypertension)
- High-density lipoprotein cholesterol level less than 35 mg/dL (0.90 mmol/L), a triglyceride level greater than 250 mg/dL (2.82 mmol/L)
- Women with polycystic ovarian syndrome
- A_{1C} greater than or equal to 5.7%, impaired glucose tolerance, or impaired fasting glucose on previous testing
- Other clinical conditions associated with insulin resistance (eg, prepregnancy body mass index greater than 40 kg/m^2, acanthosis nigricans)
- History of cardiovascular disease

ACOG Practice Bulletin 190 (2018)

EGGO Trial

Harper et al. AJOG 2020

N=962 pregnant women with BMI ≥30 kg/m^2
Singleton gestation, <20w0d

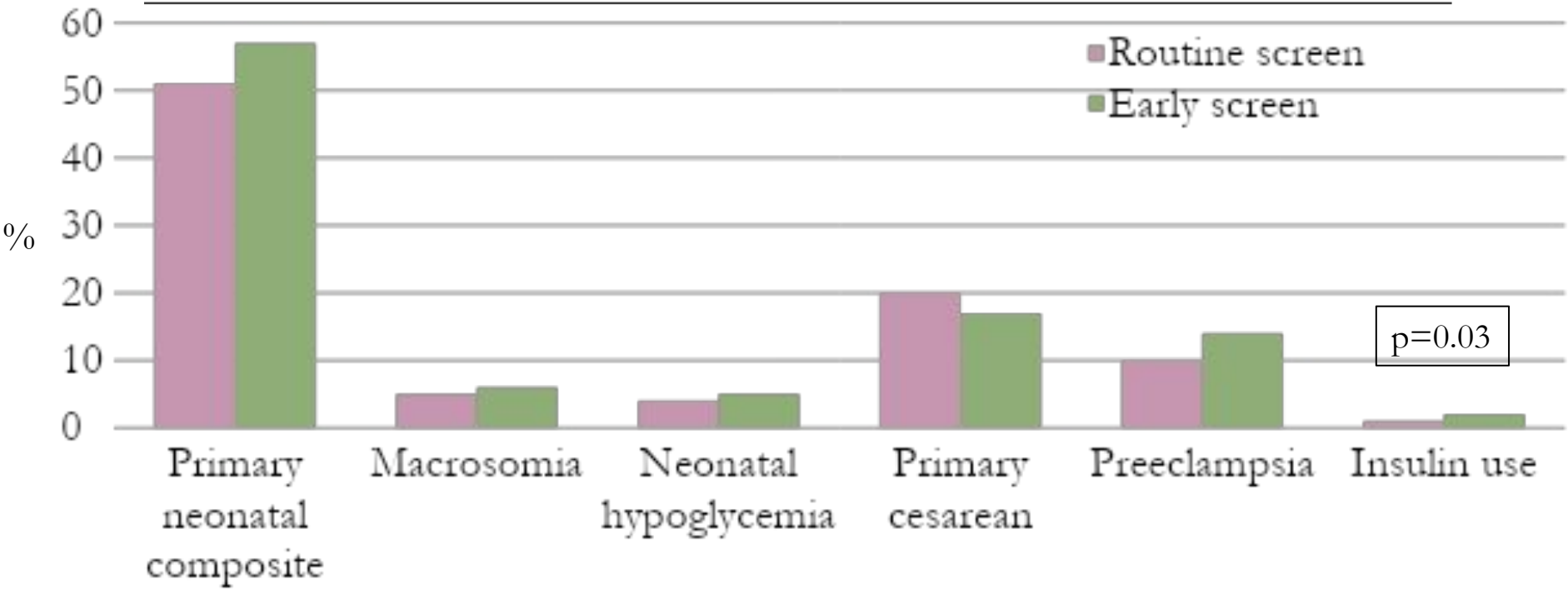
Early GDM screening (14-20wk)

Routine GDM screening (24-28wk)

Routine GDM screening (24-28wk)

Primary outcome = macrosomia, primary cesarean, hypertensive disease of pregnancy, shoulder dystocia, neonatal hyperbilirubinemia and hypoglycemia

Early GDM screening did not improve neonatal outcomes



Unanswered GDM Treatment Questions

- When to initiate pharmacotherapy (1R01HD108194 – Palatnik)
- Ideal glucose targets (1R01HD101476 – Scifres)
- Best pharmacologic agent (R01 pending – Landon/Venkatesh)
- Optimal timing of delivery (SPAN TIME)

CARE AFTER GDM

WOMEN AND DIABETES

world diabetes day
14 November

1 IN 2 WOMEN WITH GDM
WILL DEVELOP TYPE 2 DIABETES
WITHIN 5 TO 10 YEARS AFTER DELIVERY

OUR RIGHT TO A HEALTHY FUTURE

Postpartum Care

Nutrition counseling, exercise and lifestyle changes

2hr, 75g OGTT at 4-12wk postpartum*

Lifelong diabetes screening

- Every **3 years** if postpartum OGTT normal
- Every **1 year** if impaired glucose metabolism

Summary of results per 100,000 women

	No screening	2-step screening	1-step screening
GDM diagnosed	0	5,020	17,800
Future T2DM prevented	0	446	1,134
Shoulder dystocia	1,051	995	910
Preeclampsia	5,292	5,074	4,812
Total QALY	5,563,323	5,565,646	5,571,824
Total cost (2011 $)	$831 million	$870 million	$ 996 million
Marginal cost/QALY*	---	**16,689**	**20,336**
If NO long-term benefit (i.e. NO prevention of future T2DM):			
Total QALY	5,563,323	5,563,340	5,563,367
Total cost (2011 $)	$831 million	$840 million	$ 856 million
Marginal cost/QALY*	---	**543,119**	**565,407**

*Each strategy compared to previous strategy (column to the left)

GDM screening is only cost-effective if provides **long-term maternal health benefit**

"Cost-effective" if incremental cost per quality adjusted life year **<$100,000**

Werner et al 2012

Postpartum Glucose Testing

Bennett WL 2013; Blatt AJ 2011; Smirnakis KW 2005; Lawrence JM 2010; Hale NL 2012; Battarbee 2018

Barriers to Postpartum Diabetes Screening

- Work/school
- Childcare
- Transportation
- Insurance
- Health attitude
- Provider attention

GTT before hospital discharge?

Early Postpartum GTT: Feasibility

- 4 pilot studies comparing early (1-4 days post-partum) to routine post-partum GTTs
- All found early GTTs to be **feasible**
  - 1-4 day post-partum GTT adherence rate **>90%**
  - 4-12 week post-partum GTT adherence rate **<50%**

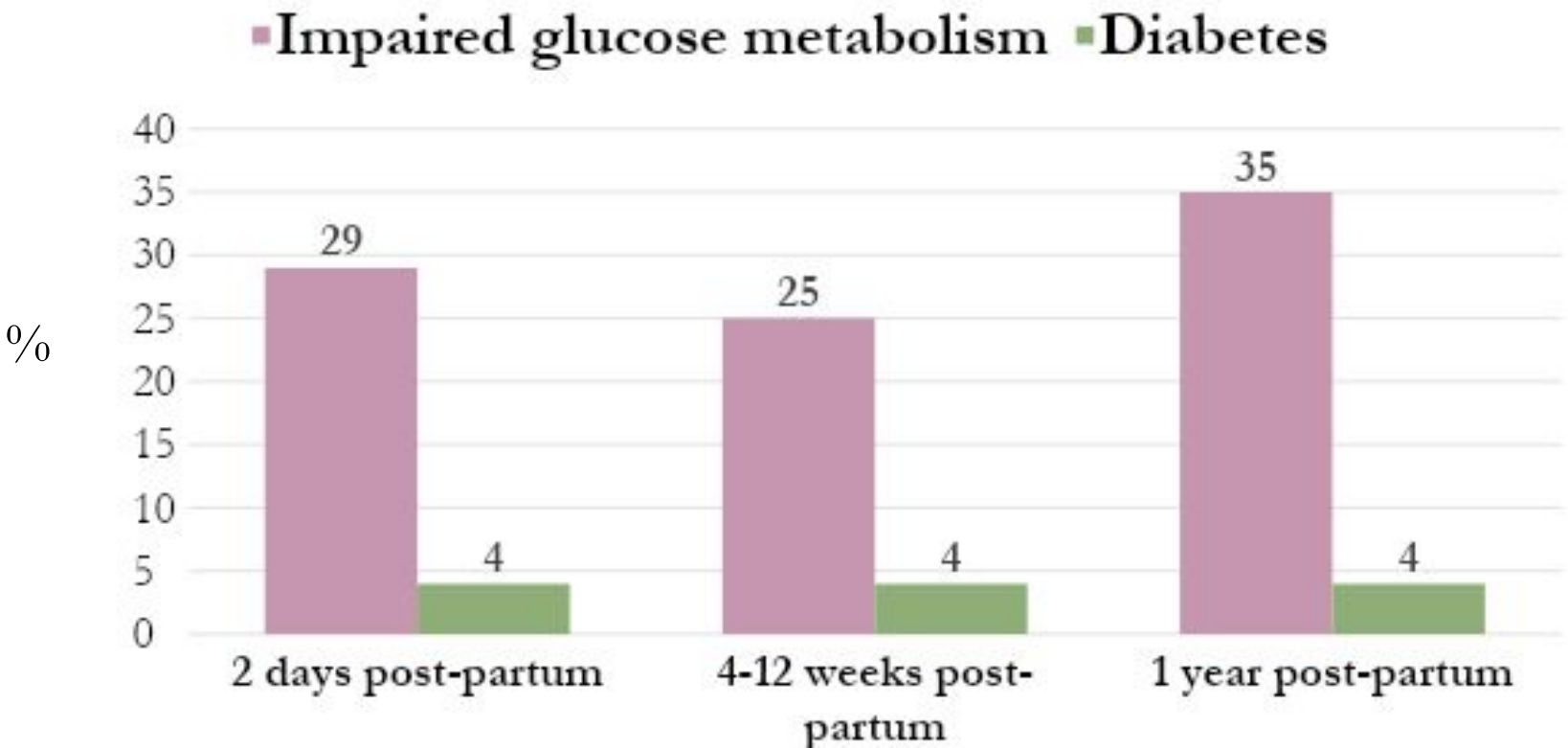
Werner EF er al 2016; Dinglas C et al. 2017; Carter EB et al. 2017; Waters T et al 2019

Early Postpartum GTT: Accuracy

- Prospective cohort study of 300 patients with GDM comparing the diagnostic value of a 2-day postpartum GTT to the 4-12 week GTT in identifying impaired glucose metabolism and overt T2DM at 1 year postpartum.
  - 296 (**99%**) completed 2-hr, 75-g GTT on PPD2
  - 202 (**67%**) completed 2-hr, 75-g GTT at 4-12 weeks
  - 203 (**68%**) completed HbA1c at 1 year

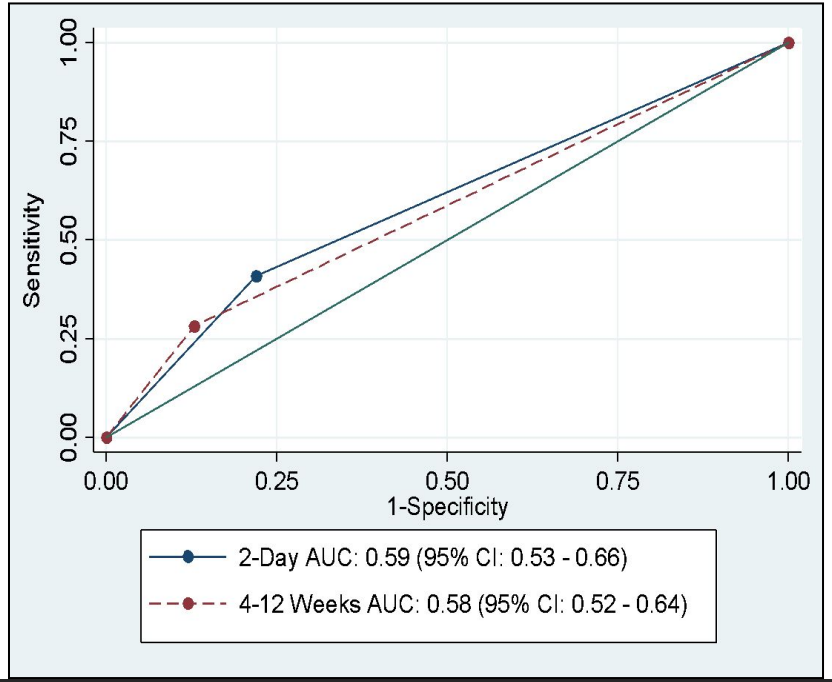
Werner 2020

Glucose Results by Test Time



Identifying Impaired Glucose Metabolism (A1c≥5.7%) at 1 year Postpartum

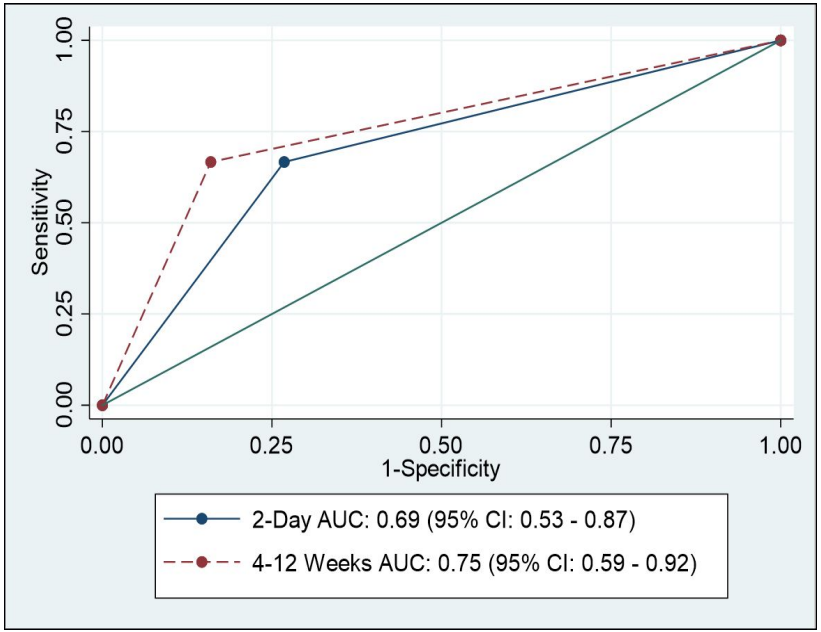
	2 day GTT	4-12 week GTT
Sensitivity	41% (29-53%)	28% (18-40%)
Specificity	78% (70-85%)	87% (80-92%)
Positive Predictive Value	50% (37-63%)	54% (37-70%)
	71% (63-78%)	69% (62-76%)



Werner 2020

Identifying T2DM (A1c ≥6.5%) at 1 year Postpartum

	2 day GTT	4-12 week GTT
Sensitivity	67% (30-92%)	67% (30--92%)
Specificity	73% (66-79%)	84% (78-89%)
Positive Predictive Value	10% (4-21%)	16% (6-32%)
	98% (94-100%)	98% (95-100%)



Werner 2020

Early Postpartum GTT: Accuracy

- 2 day postpartum GTT is associated with 99% adherence
- 2 day postpartum GTT has a similar diagnostic value as the 4-12 week GTT in identifying impaired glucose metabolism at 1 year postpartum
- Both the 2 day postpartum GTT and the 4-12 weeks GTT have high NPV for T2DM at 1 year postpartum

PREGESTATIONAL DIABETES IN PREGNANCY

Keys to Management of Pregestational Diabetes in Pregnancy

- Preconception care to optimize diabetes and comorbidities
- Achieve and maintain maternal euglycemia
  - Diet and exercise
  - Pharmacologic therapy
- Surveillance of fetal growth and well-being

Insulin is the Preferred Treatment for T2DM in Pregnancy

"For those women with type 2 diabetes who decline insulin, those who their obstetricians or obstetric care providers believe will be unable to safely administer insulin, or those who cannot afford insulin, **metformin** (and rarely glyburide) is a *reasonable alternative choice* in the context of discussing with the patient the limitations of the safety data and a high rate of treatment failure, which requires insulin supplementation." –ACOG PB 201, December 2018

What about metformin for T2DM in pregnancy?

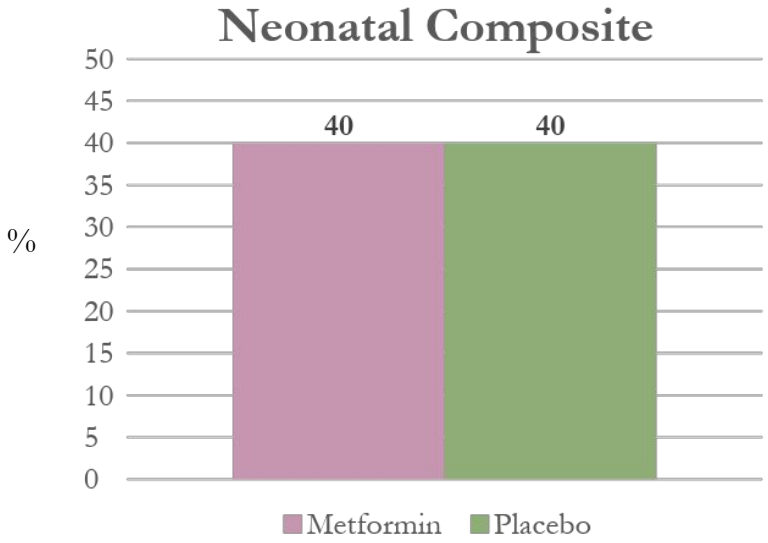
- First-line agent in non-pregnant adults with T2DM
- Reduces glucose production in the liver, glucose absorption in the gut, and increases insulin receptor sensitivity
- 3 RCTs, 241 women – no clear difference between metformin and insulin
- 2 recent/ongoing RCTs
  - MiTy – Metformin in Women with T2DM in Pregnancy Trial (Feig, Canada; N=500)
  - MOMPOD – Medical Optimization of Management of T2DM Complicating Pregnancy (Boggess, U.S.; N=950)

Metformin in Type 2 Diabetes in Pregnancy: MiTy Trial

- Prospective, international, double-masked RCT of metformin versus placebo added to insulin for treatment of T2DM in pregnancy (n=502)
- Primary outcome was composite of:
  - Pregnancy loss (miscarriage, termination, stillbirth, neonatal death)
  - Preterm birth < 37 weeks
  - Birth injury
  - Moderate or severe RDS
  - Neonatal hypoglycemia
  - NICU admission >24hr

Feig 2020

Metformin in Type 2 Diabetes in Pregnancy: MiTy Trial



- Better glycemic control
- Less insulin
- Gained less weight
- Fewer cesarean deliveries
- Smaller neonates at birth
- No difference in hypertensive disorders or neonatal hypoglycemia

NEW DIABETES TECHNOLOGY

Continuous Glucose Monitor

- Easily-administered subcutaneous glucose-sensing device
- Measures interstitial glucose levels every 5-15 minutes (up to 288/day)
- Provide detailed data on glucose level, direction, and rate of change

Available CGM Devices

Dexcom
G4, G5, G6
G4Pro, G6Pro

Real-time or Retrospective
No calibrations
Link to t-slim pump

Medtronic
Guardian, iPro2

Real-time or Retrospective
Calibrations 2x/day
Link to Medronic pump

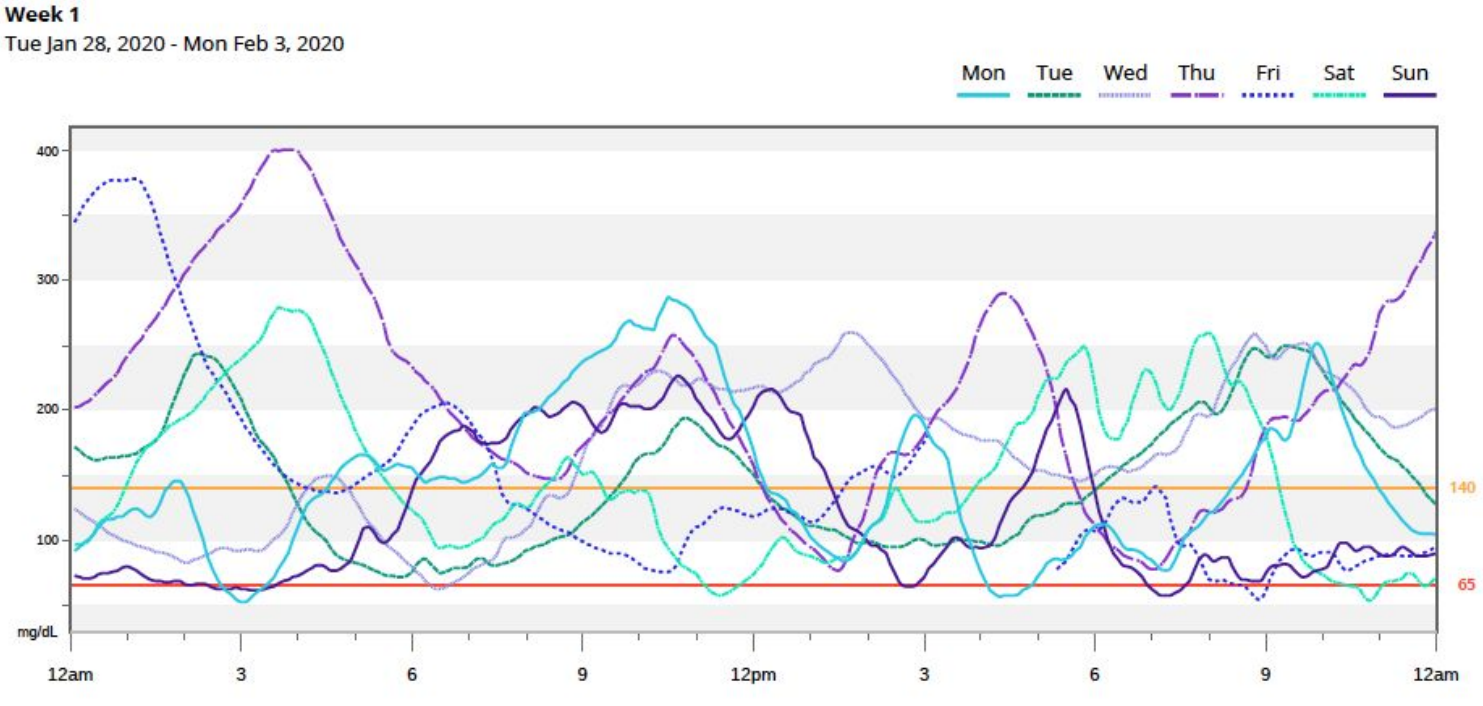
Freestyle
Libre, LibrePro

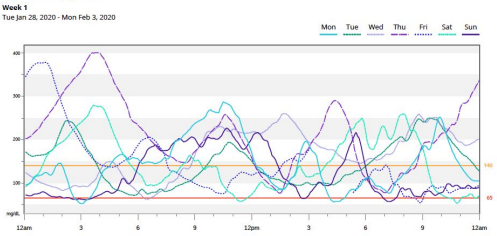
Intermittent or Retrospective
No calibrations
Less expensive, no alarms

Senseonics
Eversense

Real-time
Calibrations 2x/day
Implantable q 3mo

Using CGM


Week 1
Tue Jan 28, 2020 - Mon Feb 3, 2020
Mon
Tue
Wed
Thu
Fri
Sat
Sun
400
300
200
100
mg/dL
140
65
12am
3
6
9
12pm
3
6
9
12am



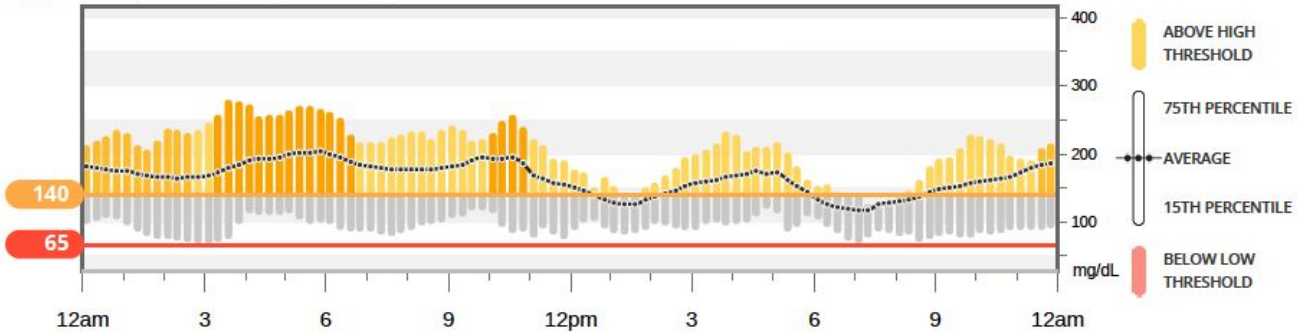
14 days | Tue Jan 28, 2020 - Mon Feb 10, 2020

7.3 %	165	77	HIGH MODERATE LOW **MINIMAL**	55% 43% 2% 0%	Days with CGM data 93% 13 / 14 Avg. calibrations per day 0.0
Glucose Management Indicator	mg/dL Average glucose (CGM)	mg/dL Standard deviation (CGM)	Hypoglycemia risk	Time in range	Sensor usage

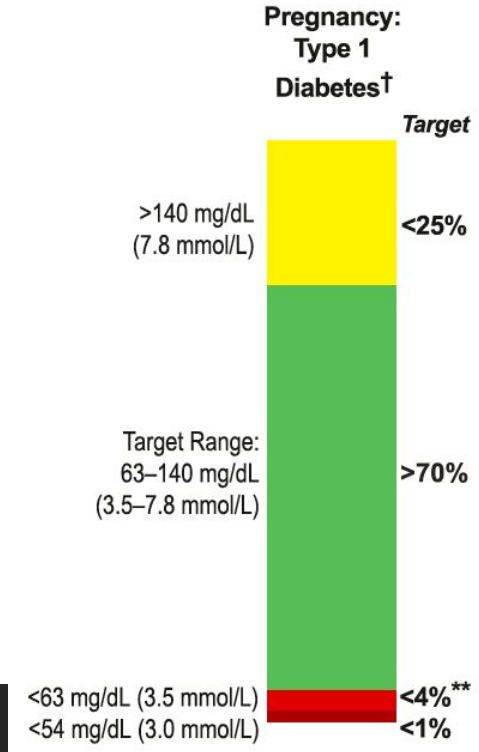
Top Patterns

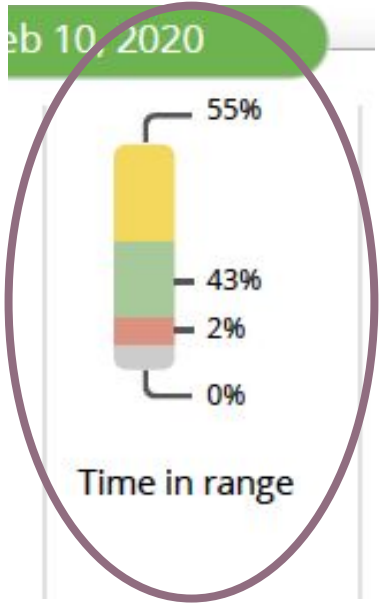
1. **had a pattern of nighttime highs**
   had a pattern of significant highs between 3:20 AM and 6:35 AM.
2. **had a pattern of daytime highs**
   had a pattern of significant highs between 10:05 AM and 10:55 AM.
3. **best glucose day was February 9, 2020**
   glucose data was in the target range about 69% of the day.

This graph shows your data averaged over 14 days



ADA Recommended Clinical Targets





CONCEPT Trial: Pregnancy Arm

Feig et al. Lancet 2017

N=215 pregnant women with T1D
Singleton gestation, <13w6d, A1C 6.5-10%
31 sites in Canada, UK, Spain, Italy, Ireland, US

CGM: N=108
Medtronic CGM + Glucometer

Control: N=107
Glucometer only

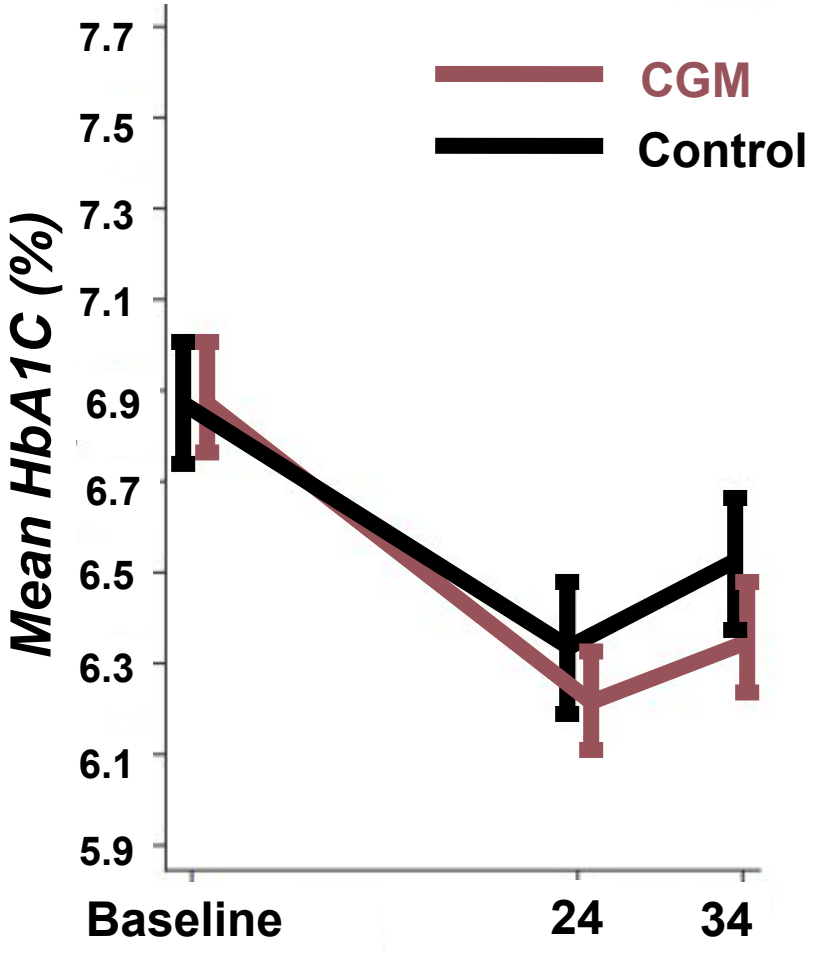
7x daily fingersticks
Target range 63-140 mg/dl
Visits q4 weeks

CONCEPTT Trial

CGM led to more A1C reduction

(primary outcome)

	Baseline	24 wks	34 wks
CGM	6.83%	6.23%	6.35%
Control	6.95%	6.40%	6.53%
P (Δ from baseline)	--	0.037	0.037



Feig et al. Lancet 2017

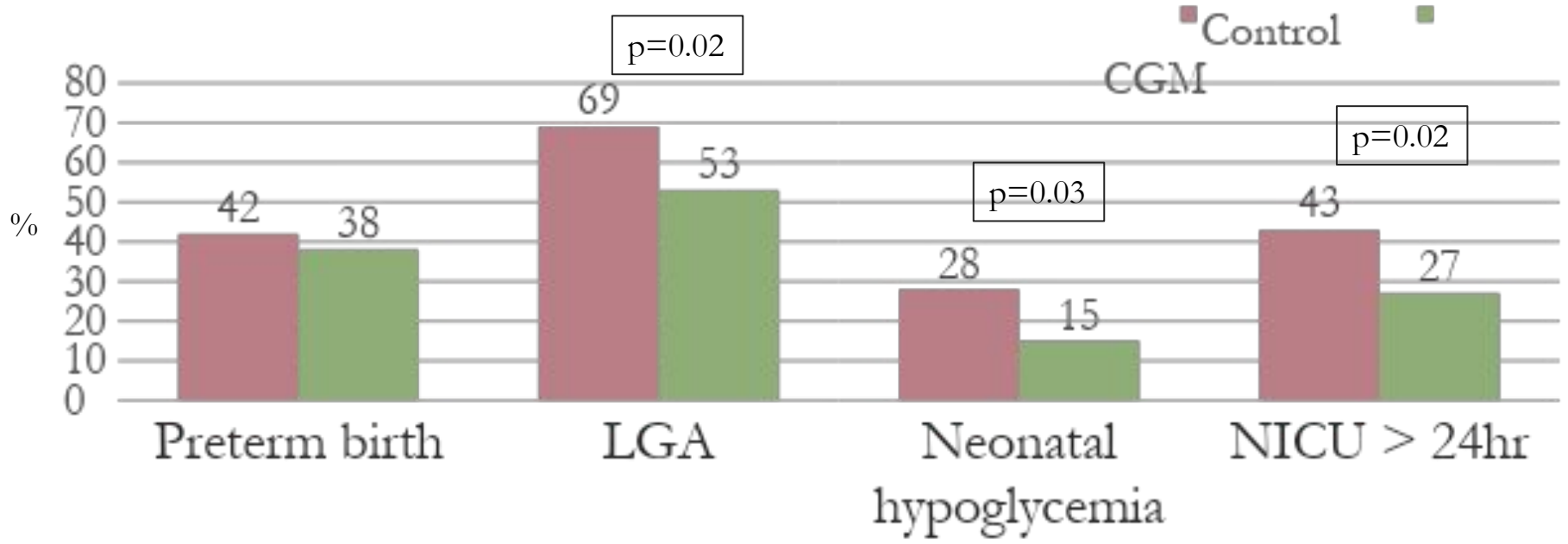
CGM reduced hyperglycemia without increasing hypoglycemia

	CGM (n=159)	Control (n=156)	P-value
Mean glucose	121 +/- 16	126 +/- 20	0.14
% TIR	68 +/- 13	61 +/- 15	0.003
% TAR	27 (19, 37)	32 (25, 39)	0.028
% TBR	3 (1, 6)	4 (2, 8)	0.10

TIR, time in range (63-140 mg/dL); TAR, time above range; TBR, time below range

CGM resulted in 1.7 more hours per day spent in target range

CGM improved neonatal outcomes



Take Home Points

- DM is a growing public health issue.
- Repeat DM testing postpartum after GDM.
- Insulin is first-line treatment.
- CGM shows promise for transforming diabetes care.

Don’t Sugar Coat It: Best Practices for Diabetes Management in Pregnancy

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ASSISTANT PROFESSOR

UAB MATERNAL-FETAL MEDICINE