evaluate the frequency of influenza during pregnancy over time and its association with maternal morbidity and mortality.

STUDY DESIGN: A repeated cross-sectional analysis of pregnant women 15-54 years using the National (Nationwide) Inpatient Sample from 2000 to 2015. The primary outcome included 21 indicators of severe maternal morbidity (SMM) during delivery hospitalization excluding transfusion per Centers for Disease Control and Prevention criteria, as well as individual outcomes associated with influenza morbidity: ventilation/tracheostomy, sepsis/shock, and adult respiratory distress syndrome (ARDS). We analyzed the risk of SMM by annual flu seasons, reporting trends as average annual percent change (AAPC). We determined the association between influenza and maternal morbidity using log-linear regression, adjusting for demographic, hospital, and maternal factors.

RESULTS: Among 62.6 million deliveries with a SMM rate of 67 per 10,000, the SMM rate was over 3 times higher with versus without influenza (208 versus 66 per 10,000, $p<0.01$). The risk of SMM increased steadily with an influenza diagnosis compared to those without (AAPC of 5.3% [95% CI: 3.6, 7.1] vs. 2.4% [95% CI: 0.8, 4.0] respectively) [Figure]. Influenza during pregnancy was associated with a two-fold increased risk of SMM (adjusted risk ratio, aRR=2.08, 95% CI: 2.01, 2.15), as well as ventilation/tracheostomy (aRR=6.04, 95% CI: 5.14, 7.09, sepsis/shock (aRR=3.23, 95% CI: 2.80, 3.71), and ARDS (aRR=5.76, 95% CI: 5.37, 6.18) [Table].

CONCLUSION: Pregnant women with influenza are at higher risk of SMM, and this risk has increased over time across the U.S. Continued efforts of increasing universal influenza vaccination in pregnancy and identifying which pregnant women with influenza are at the highest risk of adverse outcomes should be a public health priority to improve maternal health and reduce morbidity and mortality.

Figure: Rate of Severe Maternal Morbidity (SMM) and Influenza in Pregnancy among Delivery Hospitalizations in the US, 2000-2015

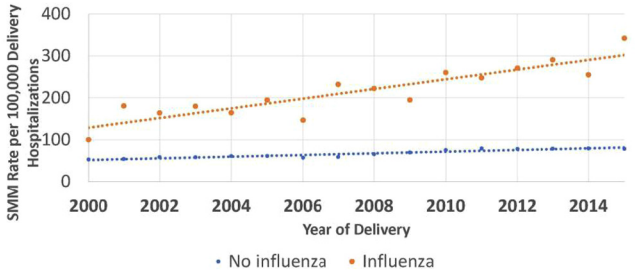

Table: Association between influenza in pregnancy and severe maternal morbidity (SMM) in the US National Inpatient Sample, 2000-2015

Severe Maternal Morbidity	Flu (+)*	Flu (-)*	aRR**	95% CI
SMM (excluding transfusion)	208.5	66.3	2.08	2.01, 2.15
Sepsis/Shock	10.9	2.4	3.23	2.80, 3.71
Ventilator/Tracheostomy	8.5	0.8	6.04	5.14, 7.09
Acute Respiratory Distress Syndrome	44.6	4.4	5.76	5.37, 6.18

*Rate per 10,000 deliveries

**Reference group are non-influenza deliveries; Analysis adjusted for demographic (race, age, payer, income quartile), clinical (mode of delivery, abruption, hypertension, multiple gestation, stillbirth, diabetes, Lupus, asthma, renal disease), and hospital (region, teaching status/location) factors

40 Assessing the association between BMI and blood pressures measured at alternative locations in obstetric patients

Michelle Lende, Paul Feustel, Ruba Alafifr, Tara Lynch
Albany Medical Center, Albany, NY

OBJECTIVE: In patients with obesity the distribution of subcutaneous tissue can make blood pressure (BP) measurements on the upper arm (UA) difficult. In these cases, alternative locations such as the wrist (WR) and forearm (FA) are commonly used. It is unknown if there is a discrepancy between these measurements for pregnant patients at extremes of body mass index (BMI). We hypothesize that BP measurements on the FA and WR will differ from the UA and this difference will be larger at greater BMIs.

STUDY DESIGN: This is a prospective observational study of pregnant patients from July to August 2019. Study subjects had biometric measurements and 3 BP measurements (systolic BP — SBP and diastolic BP - DBP) taken at the UA, FA and WR. Measurements at the FA and WR were considered alternative locations and compared to the UA. Patients were stratified by BMI. Agreement among locations was assessed by Bland Altman analysis. Linear regression was used to assess the blood pressure discrepancy dependence on BMI.

RESULTS: A total of 100 patients were included, 20 from each BMI class. Using Bland Altman plots, it was observed that BP measurements at each site correlated but were discrepant. For the FA, there was an upward bias of 11.5 mmHg (limits of agreement [LOA]: +30.7 to -7.8) for SBP and 11.2 mmHg (LOA:+25.9 to -2.9) for DBP as compared to the UA. For the WR, there was an upward bias of 7.1 mmHg (LOA: +35.1 to -20.9) for SBP and 7.3mmHg (LOA:+26.2 to -11.7) for DBP as compared to the UA. Overall, there was a larger discrepancy in BP measurements with increasing BMI. For the FA compared to the UA, the discrepancy of SBP increased by 0.43 mmHg ($p<0.001$) and of DBP increased by 0.18 mmHg ($p=0.02$) for each unit of BMI over 25. There was no statistically significant change in the discrepancy of SBP or DBP in the UA versus the WR measurements based on BMI.

CONCLUSION: This study highlights that BP measurements are higher when taken at alternative locations, such as the WR and FA, and that FA BP measurements are higher than UA measurements with each BMI unit above 25.

41 *In vitro* human myometrial contractility in pregnancies complicated with obesity

Hiba Mustafa, Weston Upchurch, Rachel Vogel, Paul Iaizoo, Kate Neitzke, Lisa Gill
University of Minnesota, Minneapolis, MN

OBJECTIVE: The onset of parturition in pregnant women with obesity is frequently delayed. Without induction, these women are nearly twice as likely as normal-weight women to have prolonged pregnancies. Obesity has been shown to be an independent risk factor for cesarean birth, even after controlling for birth weight. It has been suggested that myometrial contractility is impaired in women with obesity. In this study we aimed to investigate whether contractility is truly reduced in women with obesity compared to their normal-weight counterparts utilizing an in vitro experiment model.

STUDY DESIGN: Myometrial strips alongside the upper part of the low transverse uterine incisions were obtained at the time of the cesarean birth from 22 healthy, non-laboring, pregnant women, scheduled for elective cesarean birth at term. Strips were transferred to the laboratory and underwent dissection into tissue samples, each approximately 5 mm long, 2 mm wide, and 1 mm thick. In isolated muscle tissue baths, each tissue was attached to a stationary hook and the

other end was attached to a force transducer and mounted for isometric recording under 2 gm of tension. Tissues were prepared under isometric conditions and underwent both spontaneous and oxytocin-induced contractions. Control experiments were performed simultaneously.

RESULTS: Total of 11 participants with obesity and 11 normal-weight participants were enrolled. In both spontaneous and oxytocin-induced contractions, there was a significant reduction in amplitude of contractions between normal-weight and participants with obesity (P= 0.04, and P=0.049 in spontaneous and oxytocin-induced contractions respectively) and a significant reduction in frequency of contractions between groups (P= 0.01, and P=0.02 in spontaneous and oxytocin-induced contractions respectively).

CONCLUSION: Obesity may impair the ability of the uterus to contract in labor which might contribute to the increased cesarean birth rate in women with obesity. This study reiterates the importance of preconception counseling on optimizing weight prior to pregnancy.

Table: Contractions outcomes' comparisons prior to adding adipokines in both spontaneous and oxytocin-induced contraction between groups

	Spontaneous Contractions			Oxytocin-Induced Contractions		
	Normal-Weight (n=10)	Obesity (n=10)		Normal-Weight (n=10)	Obesity (n=10)	
	Median (Range)		P	Median (Range)		P
Amplitude (g)	13.9 (9.3, 34.3)	5.9 (2.8, 7.6)	0.04	21.4 (9.9, 34.0)	9.1 (4.8, 12.2)	0.049
Frequency	6.3 (4.3, 16.2)	2.6 (1.2, 3.2)	0.01	8.3 (3.8, 10.6)	3.3 (1.9, 5.8)	0.02

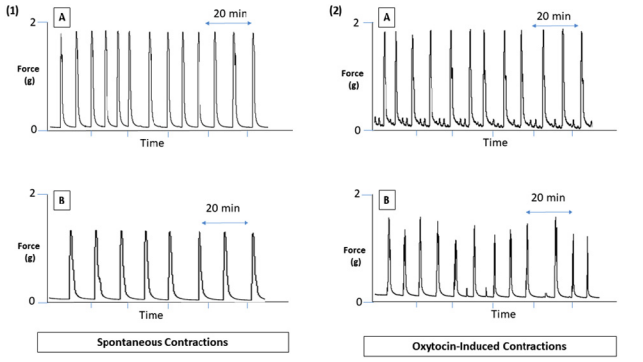

Figure. Representative recording of (1) spontaneous contractions and (2) oxytocin-induced contraction in isolated myometrial samples from A. normal-weight participant, and B. participant with obesity

42 Sleep-disordered breathing in pregnancy and its effect on endothelial and metabolic dysfunction

Mitchell Onslow[1], Jennifer Wolsk[2], Stephen Wisniewski[2], Francesca Facco[1]

[1]Magee-Womens Hospital, Pittsburgh, PA, [2]University of Pittsburgh, Pittsburgh, PA

OBJECTIVE: Prior studies have demonstrated that sleep-disordered breathing (SDB) is a risk factor for preeclampsia and gestational diabetes. The pathophysiology of SDB in pregnancy remains poorly understood. We sought to examine vascular, angiogenic and metabolic markers in obese pregnant participants with and without SDB.

STUDY DESIGN: Participants with a BMI ≥ 30 underwent overnight polysomnography (PSG) at 14-20 weeks (visit 1) and 28-31 weeks gestation (visit 2). An apnea-hypopnea index (AHI) was calculated. Clinical measurements, a fasting blood draw and uterine artery (UA) dopplers were obtained. After visit 1, participants with SDB (AHI ≥ 5) were offered enrollment in an ongoing trial. Participants without SDB (AHI < 5), returned for re-evaluation at visit 2. Three areas of interest were evaluated: the vascular domain using mean arterial blood pressure (MAP) and UA dopplers mean pulsatility index; angiogenic domain using soluble endoglin, soluble FMS-like tyrosine kinase 1 and placental growth factor; and metabolic domain using fasting glucose, insulin values and the homeostatic model assessment for insulin resistance. We used an adjusted linear regression model, controlling for BMI, gestational age and maternal age to examine the relationship between outcomes and AHI (≥ 5 and continuous).

RESULTS: Data was available for 242 and 130 participants at visit 1 and visit 2, respectively. SDB was present in 37% of participants at visit 1, and 31% at visit 2. After adjusting for cofounders at visit 1, MAP and glucose was higher among women with SDB (85.35 mmHg vs 88.71 mmHg, p=0.028 and 86.59 mg/dL vs 92.38 mg/dL, p=0.05, respectively). These measures were positively correlated with AHI as a continuous measure (Table 1). No correlations between outcomes and SDB or AHI were detected at visit 2 (Table 2).

CONCLUSION: In early pregnancy, SDB is associated with elevated MAP and fasting glucose, but not with angiogenic markers or UA dopplers. New-onset SDB in late pregnancy does not appear to impact these domains. Further research into other mechanisms such as oxidative stress and inflammation is still needed.

Visit 1	AHI (categorical)			
	< 5 (n=153)	≥ 5 (n=89)	Unadjusted	Adjusted
	Mean	Mean	P value	P value
MAP (mmHg)	85.35 ± 7.13	88.71 ± 7.28	*<0.001	*0.028
MPI	1.15 ± 0.43	1.04 ± 0.32	*0.041	0.668
sFlt-1 (pg/mL)	9971.4 ± 7490	9080.7 ± 6259.9	0.350	0.560
PlGF (pg/mL)	157.9 ± 117.90	155.2 ± 85	0.850	0.923
sFlt-1/PlGF	88.08 ± 91.34	71.317 ± 49.62	0.115	0.318
Endoglin (ng/mL)	5.65 ± 1.19	5.29 ± 1.05	*0.020	0.072
Glucose (mg/dL)	86.59 ± 11.53	92.38 ± 15.24	*0.001	*0.05
Mean insulin (mU/L)	18.03 ± 18.76	17.86 ± 12.47	0.943	0.814
HOMA-IR	4.14 ± 5.34	4.36 ± 4.18	0.735	0.933

Visit 2	AHI (categorical)			
	< 5 (n=90)	≥ 5 (n=40)	Unadjusted	Adjusted
	Mean	Mean	P value	P value
MAP (mmHg)	84.55 ± 7.78	87.19 ± 7.63	0.076	0.115
MPI	0.79 ± 0.20	0.85 ± 0.19	0.095	0.129
sFlt-1 (pg/mL)	11840.9 ± 9588	10089 ± 6666.70	0.297	0.504
PlGF (pg/mL)	496.8 ± 336.9	512.2 ± 262.10	0.799	0.795
sFlt-1/PlGF	40.07 ± 94.55	22.99 ± 14.61	0.259	0.357
Endoglin (ng/mL)	6.52 ± 1.76	6.63 ± 1.60	0.742	0.698
Glucose (mg/dL)	84.09 ± 10.52	85.29 ± 10.04	0.553	0.603
Mean insulin (mU/L)	16.35 ± 8.86	15.52 ± 7.62	0.920	0.499
HOMA-IR	3.52 ± 2.34	3.50 ± 1.77	0.969	0.671

Table 1: Apnea-Hypopnea Index (AHI) as a categorical variable
Abbreviations: MAP=mean arterial blood pressure, MPI=mean pulsatility index, sFlt-1=soluble FMS-like tyrosine kinase 1, PlGF=placental growth factor, HOMA-IR=homeostatic model assessment for insulin resistance