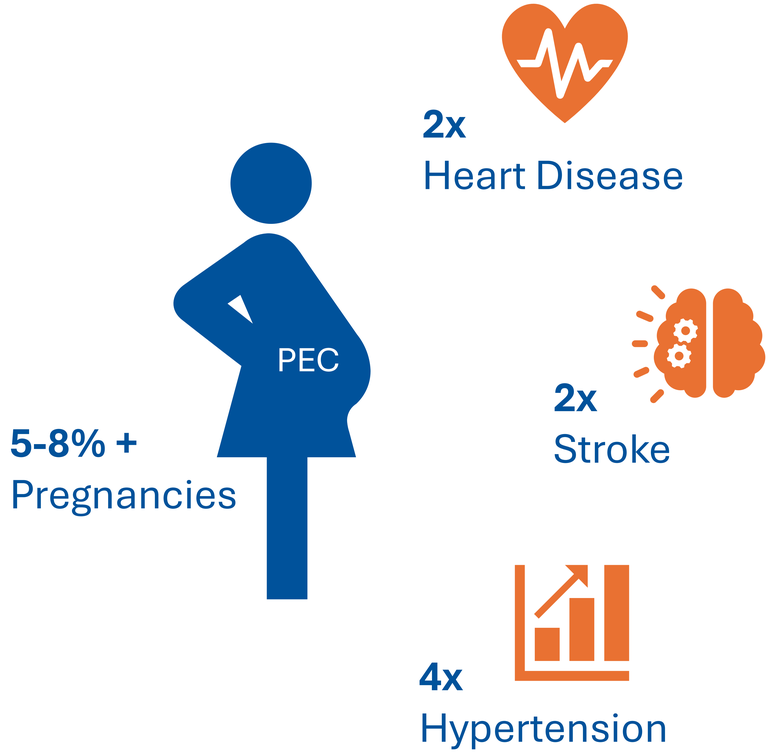
Evaluation of Myocardial Function and Metabolism In Patients with Early Onset Preeclampsia with Severe Features

Adrienne Shami, Maggie Nguyen, Ashraf Habib, Svati Shah, Marie Louise Meng

Background & Hypothesis

- Preeclampsia (PEC) is associated with cardiovascular disease in the peripartum period and later in life (Meng et al 2022)
- PEC-related cardiomyopathy is often not detected until overt systolic dysfunction occurs (Melchiorre et al 2011)
- Knowledge of mechanisms of PEC-related cardiomyopathy, and our ability to characterize and modify risk is lacking

- **Hypothesis**: PEC-related cardiac dysfunction shares similar underlying metabolic mechanisms to chronic heart failure (altered myocardial metabolism)
- **Aims**:
  - Determine the **prevalence of cardiac dysfunction** in <u>early-onset PEC with severe features</u>
  - Determine **if cardiac dysfunction is measurable through metabolic biomarkers** reporting on fuel substrate pathways



Modified from Preeclampsia Foundation

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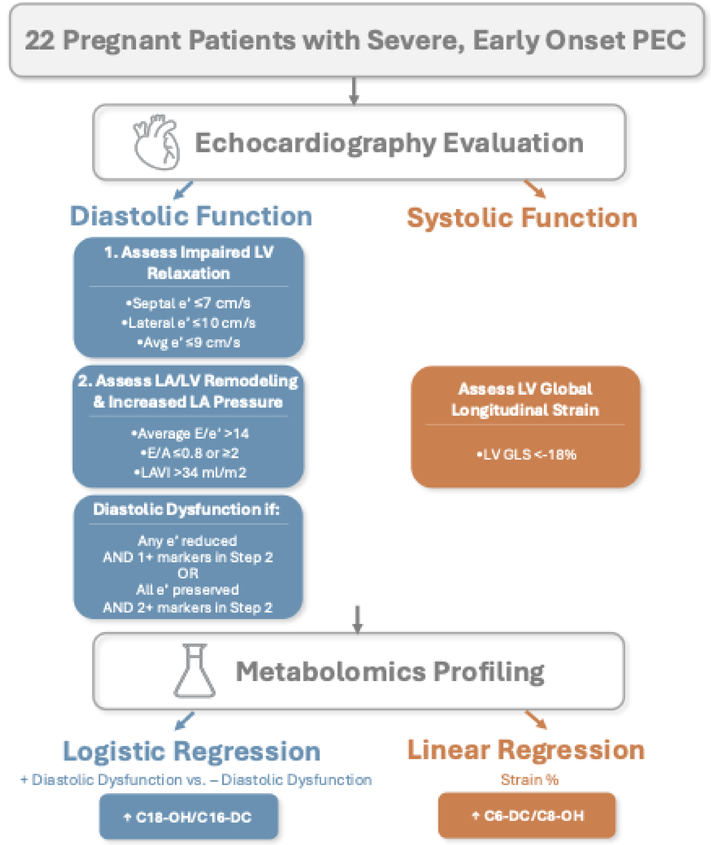
Study Design & Methods

- Enrolled pregnant patients with early onset (<34 weeks) PEC with severe features from 8/2021 to 2/2023 at Duke Birthing Center (total N=22)
  - Exclusion criteria: congenital heart disease, preexisting cardiomyopathy prior to pregnancy, coronary artery disease, alcohol abuse

- Maternal cardiac function assessed by echocardiography and plasma samples for metabolomic profiling collected after PEC diagnosis, but prior to delivery
  - Diastolic function assessed based on 2025 ASE criteria
  - Left ventricular global longitudinal strain defined as >-18%

  - 115 metabolites profiled via targeted tandem-flow mass spectrometry

- Association between individual metabolite levels with cardiac function evaluated in linear (strain %) or logistic (diastolic dysfunction +/-) models
  - Adjusted for age, delivery BMI, chronic hypertension



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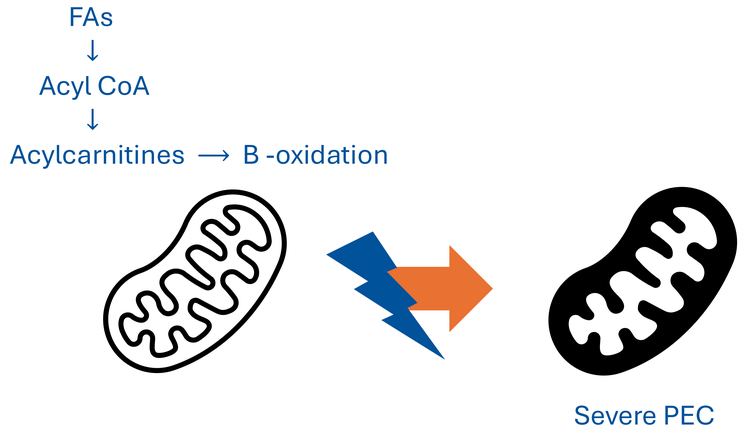
Results

- Diastolic dysfunction in 5/22 (23%) patients
- Impaired GLS in 13/20 (65%) patients
  - One patient mildly reduced LVEF of 49%
  - Three patients overlap diastolic dysfunction and impaired strain

	Count n=22	Percent of Total Cohort
Septal e' <= 7 cm/s (<=6 if age 40-65)	7	0.32
Lateral e' <= 10 cm/s (<=8 if age 40-65)	8	0.36
Average e' <=9 cm/s (<=7 if age 40-65)	8	0.36
E/e' >14	2	0.09
E/A <= 0.8 or >= 2	4	0.18
LAVI >34 ml/m2	8	0.36
LARS <= 18%	NM	NM
Meets 2025 ASE Criteria for Diastolic Dysfunction	5	0.23

- Individual metabolites associated with cardiac function measures included acylcarnitines
  - C18-OH/C16-DC in diastolic dysfunction model (p= 0.047)
  - C6-DC/C8-OH in LV strain model (p= 0.033)



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Conclusion & Discussion

- Early onset PEC with severe features
  - High prevalence of diastolic and systolic function impairment
  - Impairment of metabolic pathways central to healthy myocardial function (fatty acid oxidation)

- Suggest possible mechanisms underlying cardiac dysfunction in PEC
- Metabolic markers may be useful as a proxy for cardiac dysfunction
- Future studies in larger cohorts are needed to further explore this relationship, and whether this persists over time

- Impaired strain and diastolic dysfunction should be considered as possible new severe features of PEC

Thank You!

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