

Improving Maternal Health & Birth Outcomes: An Evaluation of the Pregnancy Medical Home Developed by CUSOM OB/GYN

Program Background

Women enrolled in Medicaid experience higher rates of preterm birth and low birthweight deliveries than women who are privately insured. To address this, the Centers for Medicare & Medicaid Services (CMS) launched the Maternity Care Home, a model of care that is patient-centered, comprehensive, team-based, coordinated, accessible, and focused on quality and safety¹. In Spring 2020, University of Colorado School of Medicine (CUSOM) OB/GYN faculty launched a project based on the Maternity Care Home model called the Pregnancy Medical Home (PMH).

Program Aims

This project aimed to improve the quality of prenatal and postnatal care, increase high-risk patient access to supporting care, and improve maternal health and infant birth outcomes in the maternal population cared for at Anschutz Medical Campus.

Evaluation

Utilizing data from electronic healthcare records, as well as project team member and patient interviews, this evaluation aimed to demonstrate the impact of the PMH on quality of care, as evidenced by process and pregnancy episode outcomes.

Program Elements

This project began with the hiring of two nurse care managers at the Anschutz Medical Campus OB/GYN clinic to facilitate an improved screening processes for pregnant patients calling to make their first prenatal appointment. During the evaluation period, screening typically occurred during a telehealth visit, though in person appointments were later made available one day per week. The screening was developed by the project team and is a comprehensive review of a patient's medical history, including menstrual, pregnancy, vaccination, socioeconomic, behavioral health, and substance use history, diet and exercise routine, and current medications.

During the evaluation period, the nurse care managers used the screening results and clinical judgment to identify "at-risk" patients and offer them enrollment into the PMH. At-risk was defined as a previous or current issue with pregnancy, nutrition, socioeconomic factors, behavioral health, or substance use. This broad definition of "at-risk" resulted in every Medicaid patient in the clinic being offered enrollment into the PMH between April 2020 and April 2022. In May 2022, the project team implemented refinements to the enrollment process for higher risk patients. As such, this evaluation only focuses on the implementation of the project before those changes went into effect. Further evaluation will be needed to investigate the impact of the enrollment changes.

The PMH nurse care manager makes referrals for at-risk patients based on the screening results to any of the following services: registered dietician, clinical social worker, addiction medicine specialist, and the Perinatal Resource Offering Mood Integrated Services & Evaluation (PROMISE). PROMISE clinic referrals are made through an Epic order, while referrals to addiction medicine, the dietician, and clinical social worker are made through Epic messaging.

Throughout a patient's pregnancy and after delivery, the PMH nurse care managers provide continued support, education, and contact with patients via phone calls and patient messages. Support includes Proof of Pregnancy letters that allow patients to receive government resources, scheduling prenatal appointments, and establishing a primary care provider. Education includes information on symptoms of discomfort associated with pregnancy (e.g. low back pain, feet swelling), recommended testing and vaccinations, how to order a breast pump, how to select a pediatrician, delivery options, and birth control options after delivery. Cadence of contact between the care team and patients is a joint decision made between each provider and individual patient. Post-partum, the nurse care managers and team members schedule a postpartum visit and provide education on breast feeding, postpartum anxiety, and depression. If medically cleared at this visit, a patient is graduated from the PMH.

¹ Tucker, C. M., Berrien, K., Menard, M. K., Herring, A. H., Daniels, J., Rowley, D. L., & Halpern, C. T. (2015). Predicting preterm birth among women screened by North Carolina's Pregnancy Medical Home Program. *Maternal and child health journal*, 19(11), 2438-2452.

QUANTITATIVE ANALYSIS

Methods Overview

The quantitative analysis compares care received and outcomes between PMH and comparison patients, all of whom had a pregnancy episode between April 1, 2020 and April 30, 2022 that resulted in a live birth. PMH patients were defined as having two or more encounters with a PMH nurse care manager during the evaluation period. The comparison group was defined as either patients with one PMH encounter during the evaluation period or patients with Medicaid insurance that met at least one high-risk criteria (history of diabetes, hypertension, prior high-risk pregnancy², or mental health/substance use) with no PMH encounter during the evaluation period.

The following measures were characterized and compared between the two groups:

- *Patient Characteristics* (see Table 1 for all variables)
- *Process Quality Measures*: number of visits with OB/GYN, referrals to PROMISE clinic, visits to supporting care, depression screening, vaccinations, long-acting reversible contraception following delivery
- *Outcome Quality Measures*: birth weight, gestational age at birth, delivery method, postpartum visit engagement

Analysis

Patient characteristics were compared between groups to determine whether they should be used as covariates to control for confounding in regression analysis. History of prior high-risk pregnancy and history of mental health or substance usage issues were found to be largely different between groups and were used as covariates in all models. History of tobacco use was also found to be significantly different between groups and was used as a covariate for infant birth outcomes. Clinical recommendations also led to additional covariate inclusion on some models; maternal age and pregravid BMI were used as covariates in all models, history of prior cesarean was used as a covariate in the model for birth method, and birth method was used as a covariate for modeling postpartum visit engagement.

Univariable models were first fit to assure consistency with the observed data. Chi-square was used to model all process quality measures separately. Logistic regression was used on all outcome quality measures separately, adjusting for associated covariates³. For outcomes, odds ratios with associated p-values and 95% confidence intervals were estimated.

Results

Table 1: Patient characteristics, including health and pregnancy history, between groups

| | PMH N = 487 | | Comparison N = 1619 | | p-value |
|--|----------------|--------|------------------------|--------|---------|
| Standard Demographics | | | | | |
| Race | | | | | <0.001* |
| Caucasian | 131 | 26.9% | 927 | 57.3% | |
| Black/African American | 156 | 32.0% | 260 | 16.1% | |
| Other, multiple, or unknown | 200 | 41.1% | 432 | 26.7% | |
| Hispanic Ethnicity | 221 | 45.4% | 474 | 29.3% | <0.001* |
| Primary Language is non-English | 16 | 3.3% | 126 | 7.8% | <0.001* |
| Urban County Type of Residence | 481 | 98.7% | 1430 | 88.3% | <0.001* |
| Health History Prior to Evaluation Pregnancy Episode | | | | | |
| History of tobacco use | 121 | 24.9% | 549 | 33.9% | <0.001* |
| History of mental health issue or substance use | 129 | 26.5% | 1119 | 69.1% | <0.001* |
| History of hypertension | 20 | 4.1% | 146 | 9.0% | <0.001* |
| History of diabetes | 22 | 4.5% | 100 | 6.2% | 0.17 |
| Pregnancy History Prior to Evaluation Pregnancy Episode | | | | | |
| Prior pregnancy | 378 | 77.6% | 1304 | 80.5% | 0.20 |
| Prior high-risk pregnancy | 110 | 22.6% | 629 | 38.9% | <0.001* |
| Prior cesarean | 38 | 17.19% | 212 | 26.77% | <0.001* |

² Post-analysis, OB/GYN staff shared that this range of ICD-10 codes is not used consistently across pregnancy episodes and therefore may not be the best indication of a high-risk pregnancy. This is noted as a limitation.

³ Limitations of this analysis include modelling choices, as well as potential correlation between confounders. Adjustment for risk factors rather than matching patients on risk factors allows room for error. Additionally, the prior high-risk indicator includes multiple risk factors that may be individually correlated.

| <i>Evaluation Pregnancy Episode Factors</i> | | | | | |
|---|-----|-------|-----|-------|------|
| Maternal age ≥ 35 | 66 | 13.6% | 262 | 16.2% | 0.16 |
| Pregravid BMI ≥30 | 196 | 40.2% | 708 | 43.7% | 0.99 |
| Pregnancy with multiples | 15 | 3.1% | 33 | 2.0% | 0.15 |
| Eclampsia diagnosis | 60 | 12.3% | 242 | 15.0% | 0.15 |
| Gestational diabetes diagnosis | 65 | 13.4% | 230 | 14.2% | 0.63 |
| Gestational hypertension diagnosis | 44 | 9.0% | 108 | 6.7% | 0.07 |

*Indicates a statistically significant difference between groups

For process quality measures related to depression, proportionally more PMH patients were referred to and attended the PROMISE clinic and were screened for depression at a prenatal appointment. Of those women screened, a similar proportion in each group tested positive for depression, but the higher screening rate in the PMH group meant more women with depression were identified (70/487, 14% vs 134/1619, 8%) and received depression care (48/487, 10% attended PROMISE clinic vs 34/1619, 2%). In the postpartum period, depression screening rates were similar between the PMH and comparison groups (34% vs 37%, respectively) but the proportion who screened borderline or positive for depression was lower in the PMH group (9.6% vs 20.3%). No other process quality measures had a statistically significant association with group.

Table 2: Process quality measures - referrals for mental health and identification of depression in prenatal and postpartum periods

| | PMH N = 487 | | Comparison N = 1619 | | p-value |
|--|----------------|-------|------------------------|-------|---------|
| <i>Referrals Placed to and Follow-up Visits to PROMISE Clinic</i> | | | | | |
| PROMISE clinic referral placed | 163 | 33.5% | 159 | 9.8% | <0.001* |
| no visit following referral | 115 | 70.6% | 125 | 78.6% | 0.09 |
| one visit following referral | 32 | 19.6% | 26 | 16.4% | 0.44 |
| more than one visit following referral | 16 | 9.8% | 8 | 5.0% | 0.07 |
| <i>Prenatal EPDS Screenings</i> | | | | | |
| Pregnancies with a prenatal screening | 415 | 85.2% | 554 | 34.2% | <0.001* |
| Borderline ⁺ or positive prenatal screenings (score ≥ 10) | 70 | 16.9% | 134 | 24.2% | 0.006* |
| Positive prenatal screenings (score ≥ 13) | 39 | 9.4% | 79 | 14.3% | 0.02* |
| <i>Postpartum EPDS Screenings</i> | | | | | |
| Pregnancies with a postpartum screening | 166 | 34.1% | 601 | 37.1% | 0.22 |
| Borderline ⁺ or positive postpartum screenings (score ≥ 10) | 16 | 9.6% | 122 | 20.3% | 0.002* |

*Indicates a statistically significant difference between groups; EPDS = Edinburgh Perinatal/Postnatal Depression Scale; + clinics use scores 10 and above as the threshold for needing additional support

No outcome quality measures had a statistically significant association with group after adjusting for the relevant covariates. However, fewer PMH patients had a cesarean than patients in the comparison group. When adjusting for associated covariates (previous history of cesarean birth, history of prior high-risk pregnancy, history of mental health or substance usage issues, pregravid BMI ≥30, maternal age ≥ 35) this association was not statistically significant (OR=0.82, 95% CI 0.61, 1.10). But the point estimate and confidence interval trend towards a greater likelihood of vaginal births over cesarean for PMH patients, which is worth noting and exploring again after the noted changes in program enrollment and structure have been implemented.

Table 3: Outcome quality measure – birth method

| | PMH N = 487 | | Comparison N = 1619 | | p-value | Adjusted Odds Ratio | 95% Confidence Intervals |
|---------------------|----------------|-------|------------------------|-------|---------|---------------------|--------------------------|
| <i>Birth Method</i> | | | | | | | |
| Vaginal | 368 | 75.6% | 1140 | 70.4% | .03 | .82 | .61, 1.10 |
| Cesarean | 119 | 24.4% | 479 | 29.6% | | | |

PREGNANCY MEDICAL HOME (PMH) TEAM MEMBER INTERVIEWS

Project Successes

Overall, PMH team members felt the PMH impacts patients in a meaningful way. The biggest benefiting factor they shared was the centralized network of care. By having the connections and contacts for care built into the model, the “guess work” and extra steps for patients to receive support are removed and the process becomes easier for patients. As one project team member put it “a lot of times if you refer them to someone else...that's another step, another thing... [In this model] I think it's easier for them to just get all their access, what they need done right away.”

“This model allows us to address [patients] as a whole person and address all of their needs in a way that we could not before.”

Team members also shared they felt the small care team acted as patient advocates, which is advantageous for patients. For example, Medicaid patients often have a lot of appointments in general, and it's easy to feel lost within a large hospital system. Having a dedicated team to do outreach on behalf of patients makes care more accessible. One team member shared “We see a lot of high-risk women, and we also see a lot of socioeconomic barriers for these women. Having a medical home set up, where there's an entire team surrounding them, helps set them up for success.”

“I think [the benefit] is the continuity of care... it's the extra support and resources that patients might need that they may not necessarily get from routine OB care.”

Ongoing contact was also seen as a way to reduce care gaps, because increasing the number of contacts improves clinicians' ability to see changes in behavior or situations in their patients and get them needed support faster. One provider shared a notable success story “[One patient] ended up going to the emergency room for domestic violence and I got the notification. I read the report, I contacted her. She had two other children. So, I contacted her to see if she was safe and what her situation was, where her kids were, if she had a place to live. She was living with her sister, but her sister's housing stability was not very great...She agreed to wanting to talk with [supports] ...three days later, she had both social work and behavioral health appointments.”

Team members also cited the ability to provide telehealth appointments as an unexpected success of the project. While the program wasn't originally designed to support telehealth, the COVID-19 pandemic drove a rapid transition to telehealth care. Most team members cited this switch as a way to reach more patients. Per one team member, “I think [telehealth] is way more efficient, being able to get more people, especially these high-risk ones that have thousands of appointments; it's so much easier.”

Project Challenges

Providers were also able to identify barriers and had suggestions for improvement. One commonly shared barrier was the timing of implementation. The project received approval to hire at the beginning of 2020, coinciding with the beginning of the COVID-19 pandemic. While the unexpected shift to remote operations allowed for increased access, it didn't allow for full onboarding and team building, meaning that sometimes communication between team members was a struggle. Team members shared that they weren't always aware of shifts in expectations of the project. However, they also acknowledged communication gaps may improve with the recent implementation of monthly meetings.

Team members also shared that there were limitations due to the patient EHR chart views each had within Epic, meaning some team members had access to patient information that others didn't. One provider shared that with everyone having a different view of patients, they couldn't figure out an efficient, automated way to track patients and run reports. Similarly, there were processes documented that weren't accessible to all project team members, creating issues with understanding. A dashboard that the team had access to run their own reports was one suggestion on how to overcome this barrier.

Capacity was also cited as a barrier. Project team members consistently cited feeling like they had too many patients to see in the time they had available. One team member shared “I was super, super overwhelmed and busy just because trying to fit [patients] in” However, team members did share that they were working to redefine intake criteria so that the number of patients enrolled was lower, therefore reducing the number of patients needing to be seen.

FEEDBACK FROM PATIENT INTERVIEWS

Patient Response Rate

Between July 2022 and December 2022, 53 patients were outreached to participate in a graduation interview. 19 patients answered these calls, with 11 patients agreeing to participate in the phone interview. Dropped calls and corrupted files resulted in 7 completed interviews.

Patient Reported Successes


Overall, patients felt the Pregnancy Medical Home impacts their health in a positive way. Patients were prompted with *Do you believe that the care you received has improved your health or the health of your baby?* and all patients that indicated they engaged in the program stated they did feel their participation had a positive impact. One patient elaborated “Mental [health]-wise, I think they did a great job. And of course, if I’m good mental health-wise, my baby benefits.”

Patients also indicated that they felt the frequent touch points with team members were particularly helpful. Patients shared that having the care managers check-in with them to make sure they were doing okay and had access to resources was greatly appreciated.

Patients also shared that they felt the PMH helped them access the resources and appointments they needed. A patient with a high-risk pregnancy noted they felt they received more frequent ultrasounds thanks to assistance from PMH team members. Multiple patients shared that they enjoyed the connection to care at the PROMISE clinic, as well as the care they received from the PROMISE clinic. One patient shared “My mental health improved through the PROMISE clinic.”

Recommendations for Improvement

Patients were given the opportunity to share what they thought did not work well in the PMH model, but overall patients shared that they felt the model worked well. One patient did share a recommendation that, if it were possible, it would be helpful to have PMH team members handle legal matters, such as FMLA paperwork, so that a patient can see somebody they are familiar with for those issues. But aside from that one recommendation, patients mostly shared that they felt the program should continue as designed. As one patient stated, “They’re doing a great job and thanks...keep doing what they’re doing.”



“I just think [the PMH] was a good support system in general... I feel like they touched all points of my care. So, I really appreciate it.”