Center for Health Economics and Policy
INSTITUTE FOR PUBLIC HEALTH AT WASHINGTON UNIVERSITY

Multidisciplinary Cardio-OB Clinic (MYHEART): Baseline characteristics, health care utilization, and spending

Kathryn J. Lindley, MD, Tierney Lanter, BS, RJ Waken, PhD, Molly Stout, MD, MSCI, Kristine Huang, BA, Nicole El Helou, MPH, and Karen E. Joynt Maddox MD MPH

September 7, 2022

INTRODUCTION

The United States has seen an increased rate of pregnancy-related deaths since the 1990s, a trend unlike many other high-income countries. Many of these pregnancy-related events are related to underlying cardiovascular conditions (~13%) and occur in the post-partum period, with the majority (40%) occurring within 42 days of delivery.[1] In Missouri, maternal mortality (33 deaths per 100,000 live births) is much higher than the United States more broadly (17 deaths per 100,000 live births). The Missouri Department of Health and Senior Services (DHSS) and the Pregnancy Associated Mortality Review Board (PAMR) found in their annual report that 82% of pregnancy-related deaths were preventable. Furthermore, DHSS and PAMR found most cardiovascular-related mortality occurred in the post-partum period.[2]

In this context, clinicians at Washington University established the multidisciplinary post-partum MYHEART clinic, aimed at providing enhanced postpartum follow-up care for women with hypertensive diseases of pregnancy. This brief describes baseline characteristics, health care utilization, and spending among enrolled women, and compares them to women who were eligible but did not enroll, and to women who were ineligible for the clinic.

DATA AND METHODS

Data on all people with delivery hospitalizations at Barnes Jewish Hospital between January 2019 and July 2021 were captured using billing data from the BJC Health System. Health care encounters, along with their associated costs from the hospital perspective, were captured from the index delivery hospitalization through 90 days following discharge. Approached and enrolled patients were identified using medical record numbers; all other patients served as potential controls. Data included information on patient age, race, medical comorbidities, and ZIP code of residence.

Our primary predictor was MYHEART enrollment. Enrollment began in January 2020, but was paused due to the COVID-19 pandemic and restarted in late June 2020. Due to COVID-related disruptions, we only included participants enrolled after June 23, 2020. We had two control groups: patients who were eligible for the clinic and approached, but did not agree to enroll; and patients who were not approached. These groups are clearly identifiable in the post-clinic period, but are not identifiable in the pre-clinic period. Further, because of COVID, it is unrealistic to perform a simple pre-post comparison. Therefore, we fit two models: one describing the recruitment in the post-period and one describing participation conditional on recruitment in the post-period. The outputs of these two models then generate the groupings in the pre-period based on probability distributions and random number generators. We then used a difference-in-differences approach to compare the change from the pre-period to the post-period between the three groups, in order to determine whether the MYHEART clinic was associated with reductions in health care utilization or spending. The study was approved by the Washington University Office of Human Research Protection and all data were de-identified once the intervention group was flagged.

KEY FINDINGS

- **There were 110 participants in the first phase of the MYHEART clinic.**
- **Patients enrolled in MYHEART had more comorbidities and pregnancy complications than the broader pool of patients delivering at our center, suggesting we enrolled high-risk patients as planned.**
- **Readmissions were higher in the intervention group than controls, though long-term follow-up is needed to understand whether this represents identification and treatment of disease that could prevent worse long-term outcomes.**

RESEARCH BRIEF

RESULTS

There were 10,906 deliveries in our sample, of which 110 participated in the MYHEART clinic, and 241 were approached but did not participate (Table 1). In the MYHEART cohort, mean age was 30.9, over half of patients were covered by Medicaid, and 52.7% patients were Black. Comorbidities, including mental health disorders (37.0%), substance use disorder (19.4%), chronic hypertension (44.4%), and cardiac disease (10.2%) were common. Mild pre-eclampsia occurred in 28.7% of participants, severe pre-eclampsia in 41.7% of participants, and preterm birth in 31.5% of participants. The majority of comorbidities and adverse pregnancy outcomes were markedly more common in the approached and participant groups than in deliveries overall.

Table 1: Patient Characteristics		All Deliveries (Pre) (N=6877)	Ineligible or not approached (Post) (N=3678)	Approached but not participant (Post) (N=241)	MYHEART Participant (Post) (N=110)
Age	Mean (SD)	28.3 (5.94)	28.5 (6.07)	28.9 (5.84)	30.9 (5.38)
Payer Group	Medicaid	4011 (58.3%)	2179 (59.2%)	127 (52.7%)	56 (50.9%)
	Medicare	96 (1.4%)	51 (1.4%)	≤10 (n/a)	≤10 (n/a)
	Private	2530 (36.8%)	1351 (36.7%)	97 (40.2%)	51 (46.4%)
	Other	240 (3.5%)	97 (2.6%)	≤10 (n/a)	≤10 (n/a)
Race	White	2687 (39.1%)	1645 (44.7%)	97 (40.2%)	51 (46.4%)
	Black	3552 (51.7%)	1850 (50.3%)	139 (57.7%)	58 (52.7%)
	Asian	279 (4.1%)	149 (4.1%)	≤10 (n/a)	≤10 (n/a)
	Other	359 (5.2%)	34 (0.9%)	≤10 (n/a)	≤10 (n/a)
Ethnic Origin	Hispanic	478 (7.0%)	259 (7.0%)	≤10 (n/a)	≤10 (n/a)
	Non-Hispanic	6399 (93.0%)	3419 (93.0%)	238 (98.8%)	109 (99.1%)
Comorbidities	Anemia	1413 (20.5%)	788 (21.4%)	58 (25.1%)	23 (21.3%)
	Mental Health Disorder	1379 (20.0%)	859 (23.4%)	70 (30.3%)	40 (37.0%)
	Prior Caesarean	1250 (18.2%)	651 (17.7%)	50 (21.6%)	24 (22.2%)
	Substance Use Disorder	1181 (17.2%)	671 (18.2%)	43 (18.6%)	21 (19.4%)
	Asthma	1166 (16.9%)	688 (18.7%)	51 (22.1%)	28 (25.9%)
	Maternal Age ≧35	1112 (16.1%)	645 (17.5%)	45 (19.5%)	24 (22.2%)
	GI Diseases	791 (11.5%)	463 (12.6%)	40 (17.3%)	11 (10.2%)
	Chronic Hypertension	639 (9.3%)	357 (9.7%)	92 (39.8%)	48 (44.4%)
	Cardiac Disease	452 (6.6%)	213 (5.8%)	22 (9.5%)	11 (10.2%)
	Neuromuscular Disease	423 (6.1%)	266 (7.2%)	33 (14.3%)	16 (14.8%)
	Gest. Diabetes	421 (6.1%)	259 (7.0%)	30 (13.0%)	≤10 (n/a)
	Bleeding disorder	296 (4.3%)	163 (4.4%)	≤10 (n/a)	≤10 (n/a)
	Diabetes	202 (2.9%)	118 (3.2%)	≤10 (n/a)	≤10 (n/a)
	Bariatric Surgery	42 (0.6%)	25 (0.7%)	≤10 (n/a)	≤10 (n/a)
Obstetric Outcomes	Preterm Birth	1443 (21.0%)	704 (19.1%)	51 (22.1%)	34 (31.5%)
	Prior Caesarean Section	1250 (18.2%)	651 (17.7%)	50 (21.6%)	24 (22.2%)
	Pre-eclampsia, not severe	1247 (18.1%)	824 (22.4%)	100 (43.3%)	31 (28.7%)
	Pre-eclampsia, severe	764 (11.1%)	347 (9.4%)	67 (29.0%)	45 (41.7%)
	Multiple gestation	236 (3.4%)	126 (3.4%)	11 (4.8%)	≤10 (n/a)
	Placental abruption	142 (2.1%)	51 (1.4%)	≤10 (n/a)	≤10 (n/a)
	Placenta previa	51 (0.7%)	28 (0.8%)	≤10 (n/a)	≤10 (n/a)

GI=gastrointestinal; SD=standard deviation

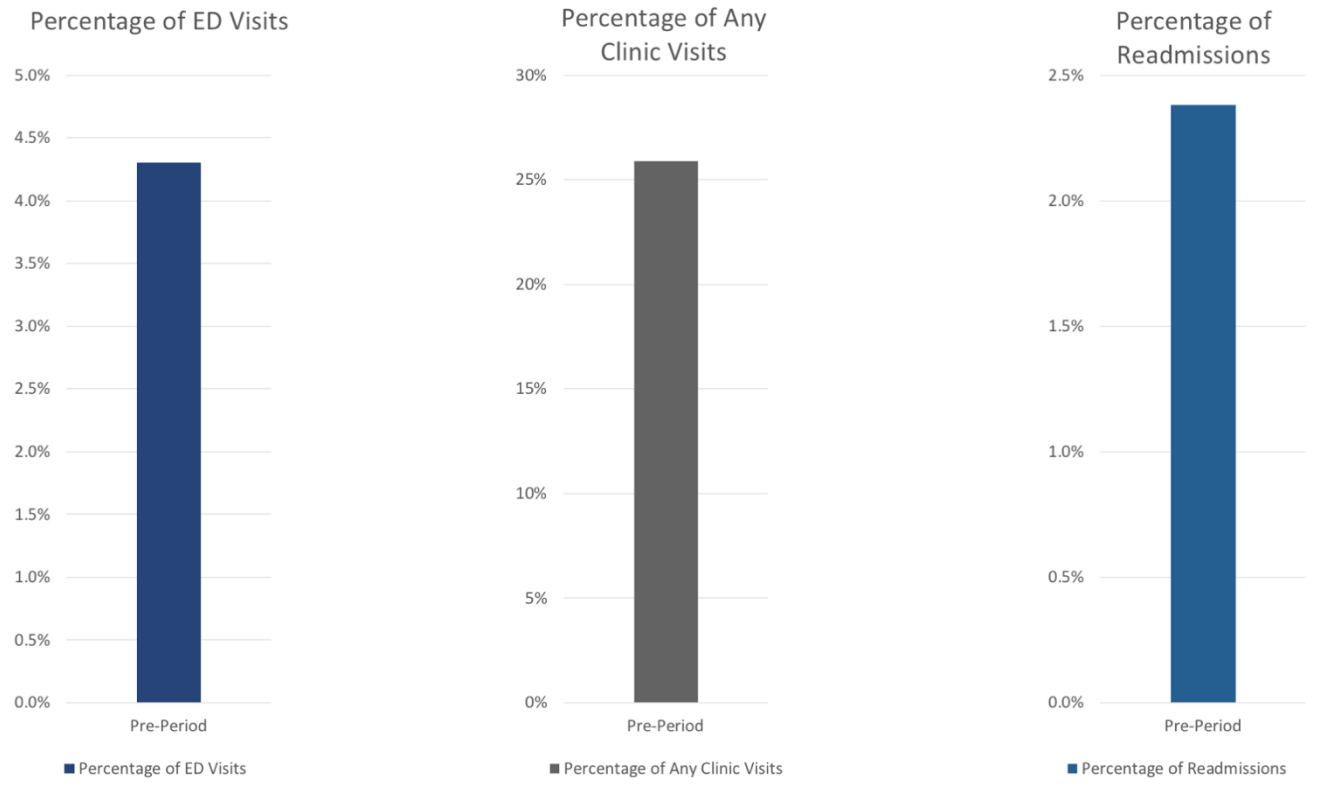
As a check on representativeness of the enrolled patients, we examined the odds of participation among those who were approached. There were no significant differences based on race, insurance status, or ethnicity, albeit with limited sample size, particularly among pregnant people from Asian or other racial backgrounds, or who identified with a Hispanic ethnicity (Table 2).

Table 2: Odds of Participation among approached individuals

		Odds Ratio	Lower 95% confidence interval	Upper 95% confidence interval
Race	White	Ref	Ref	Ref
	Black	0.89	0.49	1.48
	Asian	0.68	0.02	3.53
	Other	1.96	0.00003	15.20
Insurance Status	Private	Ref	Ref	Ref
	Medicaid	0.98	0.53	1.61
	Medicare	0.47	0.04	1.49
	Other	0.36	0.01	1.38
Ethnicity	Non-Hispanic	Ref	Ref	Ref
	Hispanic	0.92	0.02	4.25

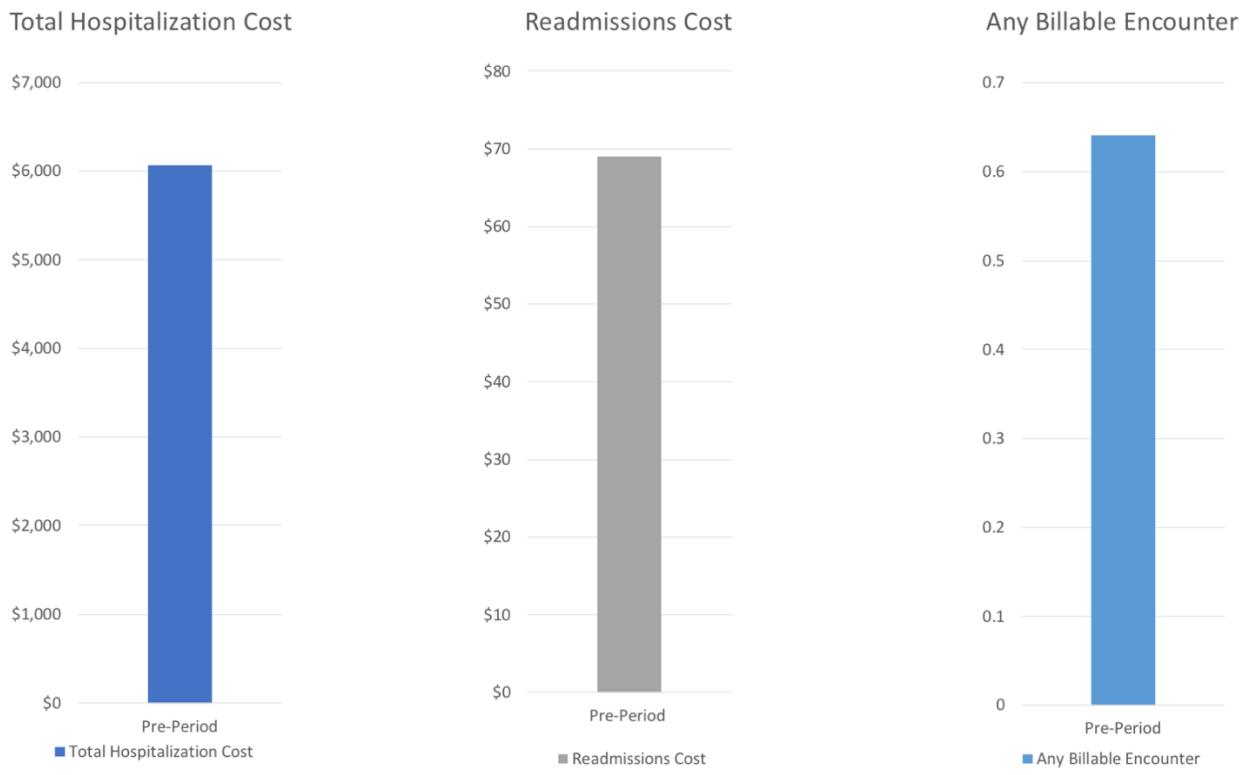
Unadjusted baseline healthcare utilization rates for emergency department visits, outpatient visits, and hospital readmissions are shown in Figure 1. Patients within the pre-period had a 4.3% likelihood of an emergency department visit, 27% likelihood of an outpatient visit, and a 2.4% likelihood of a readmission within 90 days of their index delivery hospitalization.

FIGURE 2: Pre-Period Rates of Healthcare Utilization



During the pre-intervention period, total hospitalization costs averaged $6,070 per person, whereas readmission costs averaged $68 (or $2833 for each patient readmitted, Figure 2). Patients had a mean of 0.64 billable health care encounters in the 90 days following delivery.

FIGURE 2: Pre-Period Means of Healthcare Costs and Any Billable Encounter



When we created control groups using pre-period data for a difference in differences analysis, we found that the changes in utilization from the pre-period to the post-period were generally greater among the MYHEART patients than among those who were approached or those who were ineligible (Table 3). For example, while all groups had a mean of around 0.15 billable encounters in the pre-period, the MYHEART group increased to 0.918 in the post-period, an increase of 0.75 encounters. The approached group increased to 0.473 in the post-period, an increase of 0.33 encounters, for a difference in differences of 0.44 encounters. The ineligible group decreased their overall encounters, likely reflecting deferral of care during COVID. In terms of acute care encounters, while the MYHEART group increased their ED visits to a similar degree as the approached group (a 2.2% increase versus a 1.3% increase), the MYHEART group's readmission rates increased more than the approached group (a 4.3% increase versus a 0.9% increase).

Table 3: Health Care Utilization	**myHeart Group**	**Pre-Period**	**Post-intervention**	**Pre-post difference**	**Diff in Diff (Participant-Other)**
		Mean	**Mean**	**Mean**	**Mean**
Any billable encounter (mean)	Participated	0.164	0.918	0.754	Ref
	Approached	0.148	0.473	0.312	0.441
	Ineligible	0.154	0.308	0.146	0.608
ED visits (%)	Participated	3.3%	5.5%	2.2%	Ref
	Approached	3.3%	4.6%	1.3%	0.1%
	Ineligible	3.6%	5.5%	-0.8%	3.0%
Any clinic visits (%)	Participated	15.3%	18.2%	2.9%	Ref
	Approached	15.4%	29.1%	13.6%	-10.7
	Ineligible	15.3%	14.4%	-1.0%	-3.8
Readmissions (%)	Participated	3.0%	7.3%	4.3%	Ref
	Approached	2.9%	3.7%	0.9%	3.4%
	Ineligible	2.2%	2.3%	0.1%	4.2%

Examining costs of care, the MYHEART group's total hospitalization costs decreased from $11,623 to $9,396, for a difference of $2,227, while the approached group's costs decreased from $10,658 to $9,311, a difference of $1,347 (Table 3). The ineligible group had an increase in costs over the same time period, from $9,988 to $10,379. Readmission costs were much lower, reflecting the relative rarity of this outcome, but increased to a lesser degree in MYHEART participants than the approached group ($23 versus $31, difference in differences -$7). Given the increase in readmission rate among participants compared to controls, this suggests that rehospitalizations were less expensive on a per-unit basis among participants ($1329 versus $2568).

Table 4: Costs of Care	myHeart Group	Pre-Period	Post-intervention	Pre-post difference	Diff in Diff (Participant-Other)
		Mean	Mean	Mean	Mean
Index Hospitalization Cost	Participated	$11,623	$9,396	-$2,227	Ref
	Approached	$10,658	$9,311	-$1,347	$880
	Ineligible	$9,988	$10,379	$391	$2,618
Readmission Cost	Participated	$121	$97	-$23	Ref
	Approached	$126	$95	-$31	-$7
	Ineligible	$75	$98	$23	$46

DISCUSSION

In this preliminary study, we found that patients enrolled in the MYHEART clinic had a higher burden of comorbidities and pregnancy complications than the broader pool of patients delivering at our center. Baseline healthcare utilization was high, with roughly 7% of clinic participants readmitted to the hospital within 90 days of discharge for their index delivery. Overall post-delivery care utilization and readmissions increased in the MYHEART cohort to a greater degree than among comparison populations. Both inpatient and outpatient costs decreased to a greater degree among patients who participated in or were eligible for MYHEART than controls. It is possible in the short term that, as patients return to clinic for close monitoring of postpartum health, acute and chronic health issues were uncovered and patients were appropriately admitted for disease management. However, all findings should be considered exploratory since these reflect only an early look at the data and the selection into groups was non-randomized, requiring statistical modeling to create comparable control groups based on administrative data elements. Additionally, shifts in billing practices as well as changes in care patterns during COVID likely impact these findings.

The early experience of the MYHEART clinic in enrolling high-risk people following deliveries highlights the opportunity to improve care and outcomes for high-risk individuals with hypertensive diseases of pregnancy. A more holistic test of the clinic's efficacy will require longer follow-up, as the preventive care and treatment provided by the clinic would be anticipated to have much of its benefit over time, in improving women's health longitudinally, and preventing complications in future pregnancies.

REFERENCES

1. Pregnancy Mortality Surveillance System | Maternal and Infant Health | CDC. Published June 23, 2022. Accessed July 29, 2022. https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm
2. Pregnancy Associated Mortality Review | Health & Senior Services. Accessed July 29, 2022. https://health.mo.gov/data/pamr/