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FROM THE FIELD

Caring for Women After Hypertensive Pregnancies and Beyond: Implementation and Integration of a Postpartum Transition Clinic

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Abstract

Purpose We developed a postpartum transition clinic to better support women after hypertensive pregnancy. *Description* Our program goals were (1) early postpartum hypertension medical management, (2) patient and provider education around CVD risk, (3) transition to primary care provider (PCP) and (4) a sustainable clinical model reimbursed by private and public insurances. We focused on women immediately postpartum in this analysis. *Assessment* Over the course of 5 years, a racially and socioeconomically diverse population of 412 immediately postpartum women received care for one, two or more appointments. Referral diagnoses included antepartum preeclampsia (PET) 51% (210/412), postpartum preeclampsia/hypertension (PP-PET) 22.3% (92/412), preeclampsia superimposed on chronic hypertension (siPET) 10.2% (42/412), chronic hypertension (cHTN) 8.8% (37/412), and gestational hypertension (gHTN) 7.8% (31/412). Almost half of women had 2–3 visits 47.3% (195/412) with no difference by diagnosis ($p = 0.18$). No show rates were consistently around 25%. Acquisition of home blood pressure monitors increased from 56.8% (44/94) to 93.8% (61/65) over the 5 years ($p < 0.0001$). Nearly half of patients seen had antihypertensive medication adjustments 48.3% (199/412). Of those patients scheduled, 86.8% (79/91) attended a nutrition consultation. For patients with PCPs within our system, 79.5% (105/132) kept their scheduled follow up PCP appointments. *Conclusion* We report a postpartum transition clinic after hypertensive pregnancy. In this diverse population, patients attended 2–3 visits, incorporated home blood pressure monitoring, adjusted antihypertensive medications and initiated prevention measures such as nutrition referrals and PCP follow-up. An internist salary was sustained through billings and collections from private and public insurance.

Keywords Patient education · Obstetrics · Primary care · Hypertension · Cardiovascular disease · Care transitions

Significance Statement

Hypertensive pregnancies are a risk factor for future cardiovascular disease and there is growing interest in postpartum care models. We initiated a maternal postpartum transition clinic where we manage early postpartum hypertension, educate about cardiovascular disease risk, and transition back to PCP within a model reimbursable by private and public insurances. This standardized approach to patient education with a systematic introduction of interventions and a process for primary care transition can begin in the early weeks of the postpartum period. This novel maternal postpartum program is generalizable to the offices of the primary care obstetrician and internist.

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Purpose

Women with hypertensive disorders of pregnancy are at risk for future cardiovascular disease (CVD) (Bellamy et al. 2007; Brown et al. 2013; Kessous et al. 2015; Ray et al. 2005). Growing evidence is emerging that these women are at greater risk for development of hypertension and hyperlipidemia in the years following a hypertensive pregnancy (Stuart et al. 2018), but limited data exists to assess patient characteristics or interventions to lower CVD risk (Celi et al. 2013). As of 2011, the American Heart Association added preeclampsia and pregnancy-induced hypertension as major risk factors for CVD (Mosca et al. 2011). Since 2018, hypertensive pregnancy was listed as a risk factor for hyperlipidemia treatment (Grundy et al. 2018). The potential impact of risk reduction in such women is unknown, but is anticipated from the lower rates of CVD following a heart healthy lifestyle in childhood/adolescence or when introduced after risk identification (Drawz et al. 2017; Liu et al. 2012; Wilkins et al. 2012; Yusuf et al. 2016).

We previously showed that obstetricians and primary care providers (PCPs) have inadequate clinical knowledge about the association between preeclampsia and future CVD and initiation of health prevention efforts (Wilkins-Haug et al. 2015). In Canada, specialized clinics addressing CVD risk stratification in women following complicated pregnancies are reporting promising results (Cusimano et al. 2014; Sia et al. 2012; Smith et al. 2013). Women are seen 3–6 months postpartum for risk stratification based on blood pressure, anthropomorphic measurements and blood analyses. Care is funded within the Canadian national health insurance system.

We initiated a clinic for postpartum women after hypertensive pregnancies in the United States. Goals were (1) early postpartum hypertension medical management, (2) patient and provider education around CVD risk, (3) transition to PCP and (4) a sustainable clinical model reimbursed by private and public insurances. Here, we review the clinic's first 5 years, highlighting early postpartum needs, interventions achieved, and implementation strategies for obstetric and PCPs, providing a platform for broader use.

Description

Setting

The Cardiometabolic Clinic (CMC) is a postpartum transition program that began seeing patients with an internal medicine clinician in October 2011 in the Division of Maternal Fetal Medicine (MFM), located at an academic tertiary care hospital in a major US city. The hospital delivers more than 6500 babies a year, accepting transfers from 4 local community hospitals and from hospitals across the region. The internal medicine provider sees postpartum patients a half day per week, co-located within the MFM practice. The internist focused on patient driven clinical care including hypertension management and medication titrations, identification of other medical and postpartum concerns, and a solid transition to primary care. We focused on women immediately postpartum in this analysis and did not include in this analysis patients who were preconception, interconception, or more than 4 months postpartum. The women were all referred from our hospital discharges.

Clinic Program

Hypertension management guidelines, patient and provider education, and obstetric transition to primary care are detailed in Online Appendix 1. These focus areas were chosen based on our reported survey of internal medicine and obstetric faculty providers of primary care, which identified specific gaps in knowledge about CVD risk and pregnancy history (Wilkins-Haug et al. 2015). We developed a letter supporting the transitioning care of these patients back to primary obstetric and internal medicine providers (Online Appendix 2), and a nutrition handout for a healthful postpartum eating plan with considerations of hypertension and breastfeeding based on the Dietary Approaches to Stop Hypertension (DASH) diet and published by the Preeclampsia Foundation (Celi et al. 2018). Financial administration was managed by the Primary Care Medicine, and professional billing revenues were collected towards the internist's salary. The internist's salary was guaranteed for the first year as a pilot innovation from the Department of Medicine and thereafter sustained by professional billing collections.

Obstetric providers were encouraged to refer patients within 7–10 days after hospitalization for delivery or postpartum readmission. This timeline is supported by the American College of Obstetrics and Gynecology (ACOG) recommendations and the Center for Medicare Services initiative to shorten time to first primary care visit after hospitalization (American College of Obstetricians and Gynecologists; Task Force on Hypertension in Pregnancy 2013). A policy of direct patient telephone reminders prior to each appointment and follow up calls for "no show" or cancelled appointments was in place to encourage attendance.

Program Evaluation

Clinical, demographic, and administrative information was obtained from the electronic medical record (EMR) by a trained abstractor. The data were collected and managed using Research Electronic Data Capture (REDCap). Physician validation was provided when clarity was needed on 14.9% (62/412) patient charts. Definitions from the ACOG report on hypertension on pregnancy (American College of Obstetricians and Gynecologists; Task Force on Hypertension in Pregnancy 2013) were used to distinguish the subtype of hypertensive disease of pregnancy: PET, PP-PET, siPET, gHTN, or cHTN. On 29.2% (121/412) patient charts where multiple or conflicting diagnoses were present, diagnosis was validated by full chart review by a physician.

Data analysis was completed using SAS Base software version 9.4. For associations between categorical variables, Chi squared tests were used. For associations between categorical and continuous variables, the Wilcoxon and Kruskall–Wallis tests were used. The criterion for statistical significance was set at $p < 0.05$. Where warranted for further pairwise comparisons, the Bonferroni correction was employed (SAS Institute 2002-2012).

This work has been approved by our hospital Institutional Review Board.

Assessment

Population Specifics

From October 2011 until September 2016, 412 immediately postpartum women after hypertensive pregnancies received clinical care during one or more appointments. Demographic, pregnancy and postpartum information is presented in Table 1. The clinic served a racially and socioeconomically diverse population with a high number of preterm births and lower adjusted birth weights compared to hospital norms, as reflected by a Z score of − 0.46 (Cantonwine et al. 2016). Average patient age at delivery was 31.7 (SD 6.9). These patterns stayed consistent over the 5 years of the clinic.

Table 2 describes women's participation in the clinic and the services provided by referring diagnosis. The distribution of the referring diagnoses remained constant over the 5 years ($p = 0.58$). Of those patients with an antepartum diagnosis of PET, in 51.9% (110/210), this diagnosis was preceded by gHTN. Similarly, among the women seen with PP-PET, 48.9% (45/92) had a prior diagnosis of gHTN and 12.0% (11/92) had cHTN. Overall, 21.6% (89/412) of patients were obese, and obesity was associated with cHTN ($p = 0.03$).

The median days to first CMC visit from delivery was 16 days (IQR 11–27), as shown by diagnosis in Fig. 1. Year 1 patients had a longer period before the first visit than other years (Year 1 median = 20, IQR 12–42 days, overall $p = 0.04$). Women with antepartum PET were seen sooner (median 13 days, IQR 10–21) than patients with siPET (median 21 days, IQR 14–30 $p < 0.003$) and patients with PP-PET (median 19 days, IQR 13–25 $p < 0.001$) (Table 2; Fig. 2). Of all patients, 87.1% (359/412) had their initial visits within 6 weeks postpartum. A minority of patients, 12.9% (53/412), initiated care after 6 weeks postpartum, and were more likely to have cHTN ($p = 0.02$). Nearly one-third, 29.4% (121/412), continued their care past 6 weeks postpartum. Continued appointments after 6 weeks postpartum varied by referring diagnosis. Women with siPET were significantly more likely to be seen after 6 weeks compared to patients with antepartum PET, 52.4% (31/92) and 20.5% (43/210) respectively ($p = 0.0002$). Following their first CMC visit, 8.7% (36/412) of women required urgent hospital evaluation and observation or readmission, with this rate consistent across diagnoses ($p = 0.83$) and consistent over the 5 years of the clinic ($p = 0.25$). Most women had 2–3 visits (47.3%, 195/412). Fewer women had a single visit (35.4%, 146/214), or more than 3 visits (17.2%, 71/412). These rates did not differ by the referring diagnosis ($p = 0.18$).

No show and cancellation rates for each clinic session were monitored periodically by administrative database and remained consistently around 25% over the 5 year period. Some patients eventually rescheduled their initial appointments. This rescheduling was closely tracked in the clinic's first 18 months, and we ultimately saw 85% of the patients who were referred. About 60% of nonattendance was for medical reasons (readmission to hospital, neonatal intensive care unit or baby related issue), and the remaining 40% was for personal reasons such as transportation/geography barriers, care for other children, socially complex situations, communication challenges, or household urgencies. Of patients seen for one visit only, most did not medically require a second visit. 38 patients did not follow up for a suggested second clinic visit, resulting in an overall 9.2% (38/412) loss to follow up rate after the first visit.

Hypertension Management and Clinical Interventions

Figure 2 shows aspects of postpartum care for clinic patients over time. Provision of blood pressure monitors increased over the 5 years from 56.8% (44/94) to 93.8% (61/65) ($p < 0.0001$). Distribution of the monitors occurred equally at hospital discharge and through the CMC (33.7%, 139/412 for each). All women participated in home blood pressure monitoring with routine clinic review of home blood pressures tracked on sheets, electronically, and

Table 1 Characteristics of Cardiometabolic Clinic patients

Demographic information (N = 412)	n (%)
Race/ethnicity	
White	133 (32.3%)
African-American	136 (33.0%)
Hispanic	109 (26.5%)
Asian	19 (4.6%)
Other	15 (3.6%)
Insurance type	
Private	189 (45.9%)
Public	219 (53.2%)
Other	4 (1.0%)
Other public assistance[a]	97 (23.5%)
Primary non-English speaker	47 (11.4%)
Comorbidity—obesity	89 (21.6%)
Comorbidity—diabetes	22 (5.3%)
Pregnancy information (N = 412)	**Values (%)**
Primiparous	152 (36.9%)
Gestational age at birth (weeks)	36.1 (3.7)
Gestational age category	
Early preterm < 34 weeks	93 (22.6%)
Late preterm 34 weeks–36 weeks/6 days	101 (24.5%)
Term ≥ 37 weeks	218 (53.0%)
Birth weight (g)[b]	2563 (919)
Birth weight Z-score	− 0.46 (1.10)
Small for gestational age	82 (19.9%)
Large for gestational age	27 (6.6%)
Vaginal	168 (40.8%)
Induced	59 (14.3%)
Not induced	109 (26.5%)
Cesarean section	244 (59.2%)
Repeat/scheduled	76 (18.4%)
Primary/emergent	168 (40.8%)
Failed induction	63 (15.3%)
Other causes	103 (25.0%)
Referral sources (N = 412)	**n (%)**
Faculty obstetric practice	135 (32.8%)
Community practices	128 (31.1%)
Resident obstetric practice	78 (18.9%)
Midwife program	62 (15.0%)

Data are n (%) or mean (standard deviation), as appropriate

[a]Of 97 patients on public assistance, 92 (94.9%) were also public insurance recipients

[b]Mean used for twins and triplets

with the visiting nurse. All patients engaged in clinic discussions about nutrition and heart healthy lifestyles. Electronic and printed materials were provided, and consultation with a dietician was encouraged for all patients either in MFM or with their PCP. Overall, antihypertensive medication adjustments were made for 48.3% (199/412) of patients. This change increased from 28.7% (27/94) to 50.8% (33/65) between the first and fifth clinic years ($p = 0.0002$). Of the 22.1% (91/412) that scheduled appointments with the MFM-affiliated dieticians, 86.8% (79/91) kept these appointments. Lactation support was documented in 9.4% (39/412) of charts overall, increasing from 3.2% (3/94) in the first clinic year to 32.3% (21/65) in the fifth clinic year ($p < 0.0001$).

Obstetric Transition to Primary Care

All patients seen were given a primary care follow up plan to continue their efforts to maintain a heart healthy lifestyle. Overall, 69.4%, (286/412) of the CMC patients had a pre-existing PCP about equally divided between the hospital network and outside medical care sites. This rate did not alter over the 5 years of the clinic. For patients needing to establish with a new PCP, appointments were facilitated by phone call and electronic communication by the internist for 32.3% (21/65) and 98.5% (64/65) of our and other medical network providers, respectively. Of the 132 patients followed by our hospital system, 79.5%, (105/132) kept their scheduled appointments with PCPs.

Insurance/Reimbursement

Professional fees were billed to the patient's medical insurance, qualifying as an outpatient visit beyond antepartum/intrapartum/postpartum care. These charges were generally approved by insurance companies and sustained the internist's salary. During the study period, the declined charges were written off at a rate of 2.35%, compared to 2.94% for general primary care at the hospital.

Conclusions

Summary of Findings

We developed a financially sustainable postpartum transition clinic after hypertensive pregnancy. Our 5-year clinic experience demonstrated that a racially and socioeconomically diverse group of women attended specialized postpartum visits, even 2 to 3 times, and were receptive to engaging in home blood pressure monitoring, medication changes, nutrition consultation, heart healthy lifestyle coaching, and transition to PCP. Further work is needed to address the longer term implications of these CVD prevention interventions in this population.

Table 2 Variables by ACOG diagnosis, with statistically significant pairwise comparisons in notes

	Overall (N = 412)	Antepartum PET (n = 210)	Superimposed PET (n = 42)	Postpartum PET (n = 92)	GHTN (n = 31)	CHTN (n = 37)	*p*
Pre-pregnancy diabetes	22 (5.3%)	9 (4.3%)	5 (11.9%)	4 (4.4%)	1 (3.2%)	3 (8.1%)	0.2815
Obesity[a]	89 (21.6%)	36 (17.1%)	12 (28.6%)	18 (19.6%)	9 (29.0%)	14 (37.8%)	0.0306
Year of initial visit							
1st	94 (22.8%)	45 (21.4%)	7 (16.7%)	22 (23.9%)	11 (35.5%)	9 (24.3%)	0.5855
2nd	82 (19.9%)	42 (20.0%)	10 (23.8%)	13 (14.1%)	5 (16.1%)	12 (32.4%)	
3rd	90 (21.8%)	44 (21.0%)	11 (26.2%)	27 (29.4%)	4 (12.9%)	4 (10.8%)	
4th	81 (19.7%)	43 (20.5%)	8 (19.1%)	14 (15.2%)	9 (29.0)	7 (18.9%)	
5th	65 (15.8%)	36 (17.1%)	6 (14.3%)	16 (17.4%)	2 (6.5%)	5 (13.5%)	
Days to first clinic visit[b]	16 (11–27)	13 (10–21)	21 (14–30)	19 (13–25)	16 (11–27)	18 (11–44)	< 0.0001
First visit > 42 days PP[c]	53 (12.9%)	21 (10.0%)	8 (19.1%)	8 (8.7%)	6 (19.4%)	10 (27.0%)	0.0160
Last visit > 42 days PP[d]	121 (29.4%)	43 (20.5%)	22 (52.4%)	31 (33.7%)	10 (32.3%)	15 (40.5%)	0.0002
Appointments							
1	146 (35.4%)	80 (38.1%)	12 (28.6%)	28 (30.4%)	12 (38.7%)	14 (37.8%)	0.1805
2–3	195 (47.3%)	104 (49.5%)	18 (42.9%)	44 (47.8%)	15 (48.4%)	14 (37.8)	
> 3	71 (17.2%)	26 (12.4%)	12 (28.6%)	20 (21.7%)	4 (12.9%)	9 (24.3%)	
Triage/readmission before CMC visit[e]	96 (23.3%)	32 (15.2%)	7 (16.7%)	43 (46.7%)	7 (22.6%)	7 (18.9%)	< 0.0001
Triage/readmission after CMC visit	36 (8.7%)	17 (8.1%)	4 (9.5%)	9 (9.8%)	4 (12.9%)	2 (5.4%)	0.8342

Data are expressed as n (%) or median (interquartile range)

[a]Antepartum PET vs. CHTN corrected p = 0.0387

[b]Antepartum PET vs. superimposed PET corrected p = 0.0030; antepartum PET vs. post-partum PET corrected p = 0.0010

[c]Antepartum PET vs. CHTN corrected p = 0.0394

[d]Antepartum PET vs. superimposed PET corrected p = 0.0002

[e]Antepartum PET vs. post-partum PET corrected p < 0.0001; superimposed PET vs. post-partum PET corrected p = 0.0084; CHTN vs. post-partum PET corrected p = 0.0335

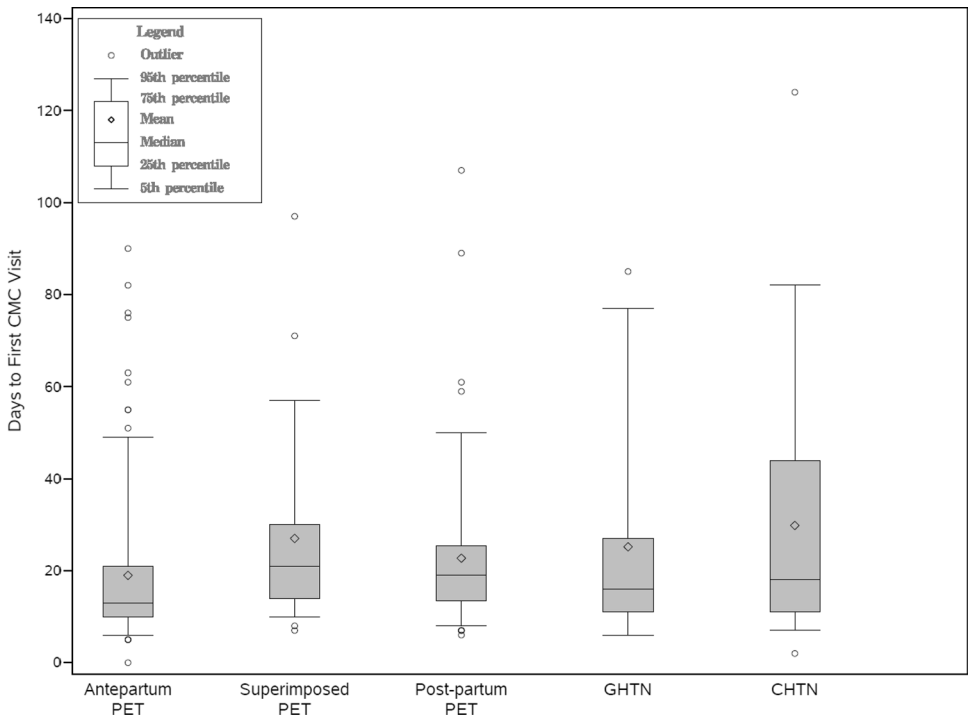

Fig. 1 Postpartum days to Cardiometabolic Clinic appointment by diagnosis

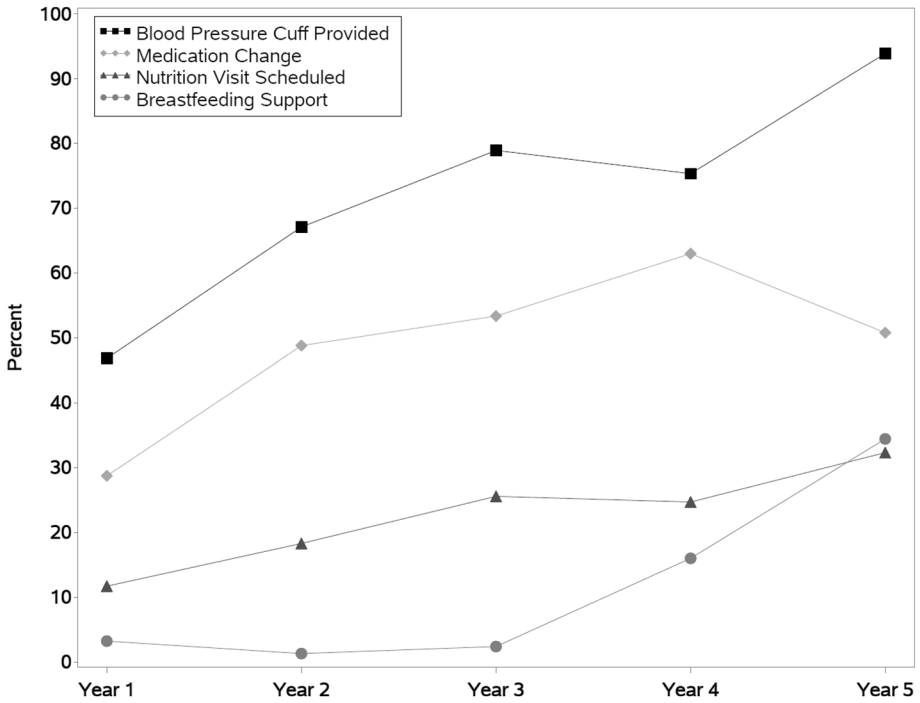

Fig. 2 Provisions of interventions by clinic year

Strengths and Limitations

We developed a research database with rigorous clinical review of diagnoses and validation, an important strength of our data. Our patient population had racial, cultural and socioeconomic diversity and a robust population size allowing for analysis of subcategories of disease. Our early process improvement efforts with appointments revealed the importance of patient education at discharge and a systematic approach to patient phone call reminders stressing the importance of an early in-office visit. These consistent early efforts resulted in good consistent attendance and low loss to follow up. Our patient-centered approach helped identify optimal timing for clinical care and immediate postpartum patient needs and directed process improvement and implementation efforts in the clinic and postpartum floors. The co-location of the clinic within an academic setting enabled initial and ongoing educational efforts for patients, nursing, physician, and midwifery staff to be efficient and centralized as outlined in Online Appendix 1.

Lastly, a further strength lies in the development of patient driven interventions generalizable to PCP and obstetric office (Online Appendices 1 and 2). Interventions include systematic, disease focused discharge planning, hypertensive medication management, home blood pressure monitoring, early postpartum visits, and direct contact for nonattendance and cancellations. Important implications for both the women and the clinical providers are that almost half of patients needed 2–3 visits within the first 6 weeks to achieve stable blood pressure control and almost a third, mostly driven by siPET and cHTN, required visits after 6 weeks. Ongoing consistent self-care patient education about optimal weight, healthy food and lifestyle choices, encourages active engagement as demonstrated by high attendance rates at nutrition appointments. An emphasis on PCP communication and facilitation of scheduling follow up appointments with new or existing PCPs support this care transition.

The analyzed clinic patient population reflects an academic hospital and may bias the studied population. Despite these limitations, we anticipate the approaches of education, structured patient interventions, and closed loop referral to a primary care provider would be transferrable to all obstetrics and primary care offices for postpartum care of women with hypertensive pregnancies. Materials are provided in Online Appendices 1 and 2 with this goal in mind.

Although all patients seen had a primary care follow up plan, we were not able to closely track follow up PCP and nutrition appointments outside of facilities covered by our EMR. This limitation is the focus of ongoing study. An internal administrative database was reviewed for revenues and appointment compliance; this strategy has inherent limitations. Clinical data obtained by chart abstraction had limitations, including clinician documentation and capacity of EMR. A hospital wide EMR transition (June 2015) likely influenced the reduced clinical volume in year 5 as fewer patients were scheduled in the several months following the transition.

Comparisons with Other Studies

Other postpartum CVD risk focused clinics have been reported in Canada. These programs differ from ours as their emphasis is on CVD risk stratification with follow up at 3–6 months postpartum and payment through a national insurance program (Cusimano et al. 2014; Sia et al. 2012; Smith et al. 2013). Optimal timing for postpartum follow up for complicated pregnancies is not yet defined. Our approach of early postpartum timing allows addressing immediate medication adjustments, education on safety of the medications while breastfeeding, and appropriate contraceptive choices (Online Appendix 1), and counseling on earlier initiation of heart healthy lifestyle changes and facilitating a transition to primary care, within a framework sustainable in the United States' public and private insurance providers.

Further Implications

Many areas of future study and attention emerged from this work. Barriers to obtaining blood pressure monitors and patient incomprehension and noncompliance with discharge medications require development of systemic efforts to improve postpartum care for this high risk population. Breastfeeding and the impact of perceived anti-hypertensive medication risks should be assessed in a rigorous fashion. Lastly, interventions not just related to patients' hypertension, but reflecting their complicated pregnancies (social services support, insurance coverage of medications and blood pressure monitors, advocating for maternal and paternal leave) would likely support women's participation in a postpartum care plan and will need further study, attention, and local advocacy.

In summary, we report our postpartum transitions clinic experience caring for women immediately postpartum after hypertensive pregnancy focusing on immediate complex healthcare needs and transition to PCP. Our novel maternal postpartum clinic implements a standardized approach to patient care and education with a systematic introduction of interventions including transition to PCP. This model has implications for broader implementation in the primary obstetrician and internal medicine community.

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