

Cardiovascular risk prevention after preeclampsia: Can we do better?

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Disclosures

I have no conflicts of interest

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Objectives

1. Identify the importance of cardiovascular risk reduction in patients with a history of hypertensive disorders of pregnancy (HDP)
2. Examine systemic and patient-reported barriers to postpartum counselling in this population
3. Illustrate opportunities for novel care delivery models and quality improvement initiatives in patients with a history of HDP

Hypertensive disorders of pregnancy

Chronic HTN

Gestational HTN

+ end organ damage= **preeclampsia**

+ seizure= **eclampsia**



20 weeks

Risk factors for HDP

- Diabetes*
- Chronic hypertension*
- Chronic kidney disease*
- SLE*
- APLA*
- OSA
- Overweight or obese

- Personal history of preeclampsia*
- Maternal age >35
- Nulliparity
- Multifetal gestation
- Family hx of preeclampsia

*major risk factors

Preeclampsia prevention

Aspirin

- >100 mg/day

- Initiated before 16 weeks gestation

- Reduction in pre-term preeclampsia (NNT 38 in ASPRE trial)

- 1 “major” risk factor (hx PET, cHTN, T2D, renal dx etc.)

- OR 2 “moderate” risk factors (obesity, nulliparity, age>35 etc.)

Calcium supplement (if low Ca diet)

Exercise in pregnancy

Table 2. Documented Rate of Aspirin Use for the Prevention of Preeclampsia in Ontario, Canada, From April 1, 2018, to December 31, 2020

	Aspirin use for the prevention of preeclampsia among 371 237 hospital livebirths and stillbirths	
	No./total	% (95% CI)
Did not have diabetes, obesity, or chronic hypertension ^a	9479/293 052	3.2 (3.2-3.3)
Had diabetes only	981/5711	17.2 (16.2-18.2)
Had obesity only ^a	4991/72 120	6.9 (6.7-7.1)
Had chronic hypertension only	1084/3927	27.6 (26.2-29.0)
Had diabetes and obesity ^a	490/2203	22.2 (20.5-24.0)
Had diabetes and chronic hypertension	145/396	36.6 (31.9-41.6)
Had obesity and chronic hypertension ^a	596/1845	32.3 (30.2-34.5)
Had diabetes, obesity, and chronic hypertension ^a	104/268	38.8 (32.9-44.9)

^a Obesity was defined as a prepregnancy body mass index greater than 30.

A history of HDP increases future CV risks

3.6-4x increased risk of heart failure*

2-2.5x increased risk of coronary artery disease*

2x increased risk of stroke*

2x increased risk of diabetes

increased risk of ESKD, vascular dementia

*Included data from women with maternal placental syndromes (HDP, placental abruption or infarction)

*Ray JG, Vermeulen MJ, Schull MJ, Redelmeier DA. Cardiovascular health after maternal placental syndromes (CHAMPS): population-based retrospective cohort study. *Lancet*. 2005;366:1797-1803.

Feig DS, Shah BR, Lipscombe LL, et al. Preeclampsia as a risk factor for diabetes: a population-based cohort study. *PLoS Med*. 2013;10:e1001425.

HDP increases the risk of chronic hypertension

4x increased risk of hypertension

To diagnose one woman with hypertension, **the number needed to screen at age 35 is 1 in 9 for women** with a history of HDP vs. **1 in 38** in women with uncomplicated pregnancies

Mortality from cardiovascular disease (CVD) is declining in the general population

Mortality from CVD is increasing in **women ages 35-54**

Complex sex & gender gaps in CVD management and prevention- prompting “calls to action”

The postpartum “window of opportunity”

1. Primary prevention of CVD: screening and managing risk factors early
2. Implications for future pregnancies: optimization of risk factors + counselling

Brown HL, Warner JJ, Gianos E, et al. Promoting Risk Identification and Reduction of Cardiovascular Disease in Women Through Collaboration With Obstetricians and Gynecologists: A Presidential Advisory From the American Heart Association and the American College of Obstetricians and Gynecologists. *Circulation*. 2018;137(24):e843-e852.

Smith GN, Walker MC, Liu A, et al. A history of preeclampsia identifies women who have underlying cardiovascular risk factors. *Am J Obstet Gynecol*. 2009;200(1):58 e51-58.

Mostello D, Jen Chang J, Allen J, Luehr L, Shyken J and Leet T. Recurrent preeclampsia: the effect of weight change between pregnancies. *Obstet Gynecol*. 2010; 116: 667-72

1 year after preeclampsia:

- 49% of patients were identified as high-risk for cardiovascular disease based on lifetime CV risk scores
- 18% met criteria for metabolic syndrome
- 17.5% were hypertensive based on 24-hour ABPM

Challenges in addressing the “window of opportunity”

- Knowledge gaps in awareness
- Content gaps
- Primary prevention
- System issues

Knowledge gaps in awareness

- 21% of surveyed women knew about the relationship between heart disease and pregnancy complications
- Focus group data in *people with a history of HDP*: most were unaware of the link
- MD survey revealed ~50% of MDs did not know about the link between CVD and HDP

Bailey Merz CN, Andersen H, Sprague E, Burns A, Keida M, Walsh MN, *et al.* Knowledge, Attitudes, and Beliefs Regarding Cardiovascular Disease in Women: The Women's Heart Alliance. *J Am Coll Cardiol.* 2017; **70**: 123-32

Seely EW, Rich-Edwards J, Lui J, Nicklas JM, Saxena A, Tsigas E, *et al.* Risk of future cardiovascular disease in women with prior preeclampsia: a focus group study. *BMC Pregnancy Childbirth.* 2013; **13**: 240.

Young B, Hacker MR, Rana S. Physicians' knowledge of future vascular disease in women with preeclampsia. *Hypertens Pregnancy.* 2012; **31**: 50-8.

Content gaps

Clinical practice guidelines recommend that people with HDP should be **informed** of the increased risk of CVD associated with HDP, and **adopt healthy lifestyle interventions** to mitigate the risk

No long term CVD intervention studies in postpartum women

Primary prevention is a challenge

- 51% lipid screening at 4 years post preeclampsia (vs. 41.5%)
- No RCT data to support BP targets in this population (outside of pregnancy)
- Obesity management and stigmas
- Time and resource constraints

The system is a challenge

Who provides counselling? When?

BOX 2 Checklist of additional considerations for postpartum patients with selected pregnancy complications or medical conditions				
This is a sample checklist only.				
Practices and facilities are encouraged to customize the checklist to fit their unique circumstances.				
Condition	Additional testing or special follow-up	Referral to subspecialty or primary care	Counseling about cardiovascular or metabolic risks	Preconception consultation
Pregnancy complications				
Hypertensive disorders ^a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The system is a challenge

Postpartum vascular clinics are a potential solution (3-12 months)

- Issues with equity and accessibility
- Lower rates of postpartum follow-up have been reported in patients of Black race and Hispanic ethnicity

The system is a challenge

- Maternal Health Clinic in Kingston Ontario: all patients with HDP, Gestational DM, abruption, idiopathic preterm labor, and IUGR were referred for a **6-month follow-up** for CVD-risk screening

50% of women did not attend

- 17% of those that did attend were referred to a Maternal Cardiovascular Risk Reduction Clinic

50% did not attend that 2nd appointment

“The system is not tailored to suit the needs of postpartum women”

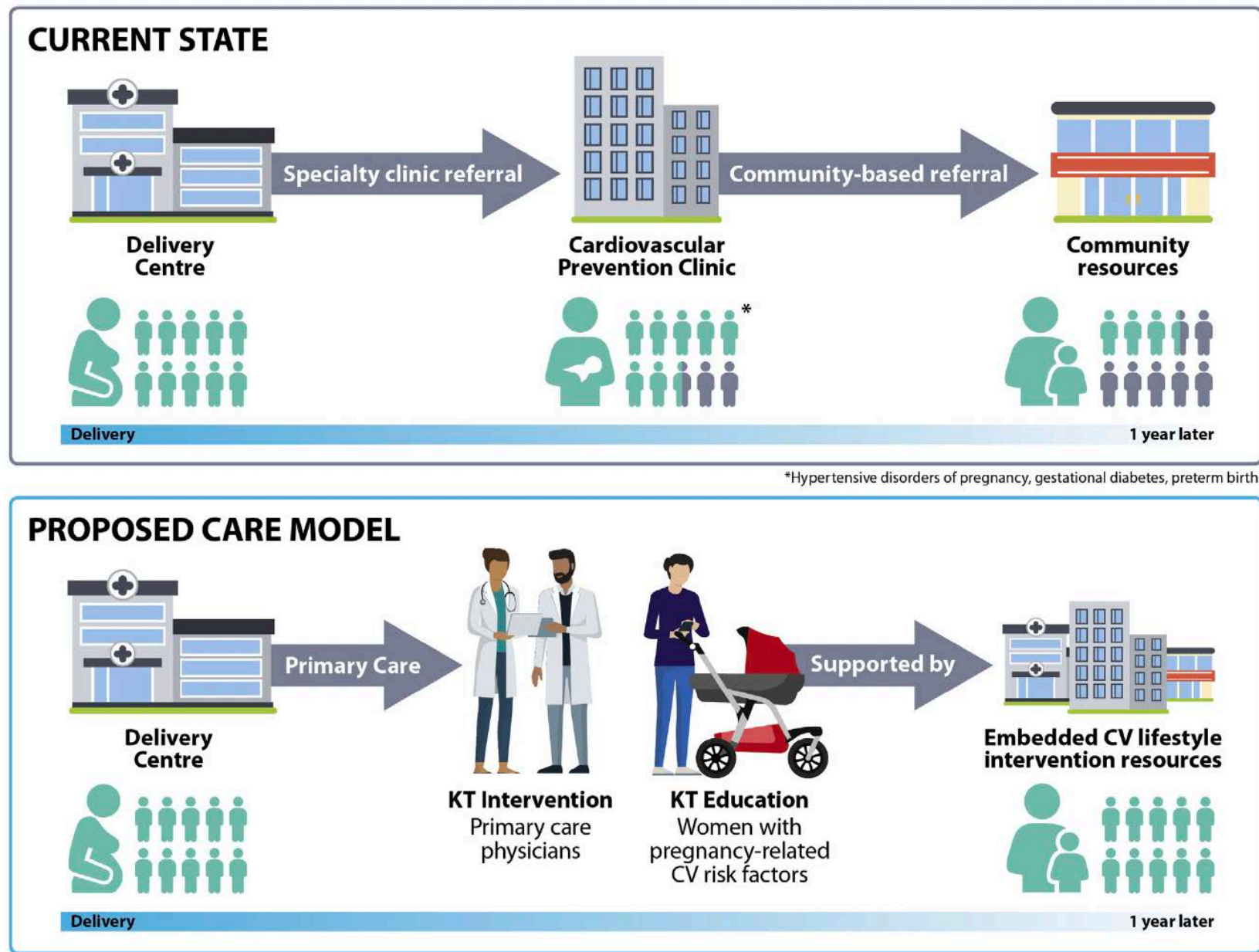


Figure 1. Current and proposed models of postpartum cardiovascular preventive care. CV, cardiovascular; KT, knowledge translation.



Her-HEART: Improve your heart health post pregnancy

Her-HEART pilot project

- Inclusion criteria: age ≥ 18 , English-speaking, living in Ontario, history of HDP in the last 5 years
- Exclusion criteria: history of CKD or history of solid organ transplant
- Recruitment: online advertisements (Preeclampsia Foundation of Canada website, SHSC website), paper-based advertisements at SHSC, physician referrals

1) Educational website for participants

Herheartproject.ca

2) Educational website for healthcare providers

Herheartproject.ca/hcp

3) One time video consultation with participant

4) Letter to PCP on consultation

Qualitative descriptive study: focus groups with participants until thematic saturation reached



Food for Thought



More Food for Thought



Be Active



A Healthy Weight



Blood Pressure



Healthy Habits



Follow-up



Planning Ahead

Virtual consult content

1. Pregnancy and HDP history
2. Medical history with focus on risk factors for CVD and HDP
3. Mental health history and previous interventions
4. Health behaviours including substance use, stress management, diet and physical activity
5. Current and pre-pregnancy weight
6. Most recent out-of-office and/or clinic blood pressure
7. Counselling on future pregnancy risks and contraception (if applicable)
8. Counselling on increased risk of future CVD and CV risk factors
9. Health behaviour and/or pharmacological interventions to reduce CVD risks

Her-HEART results

- 18 of 20 participants participated in a video consultation between November 2020 and March 2021
 - mean (SD) duration 45 (+/- 16) minutes
- All participants reported a history of preeclampsia
 - 1 participant had a history of eclampsia
 - 2 participants experienced a fetal loss related to HDP
- 16 participants participated in 1 of 5 focus groups

	N= 20
Age (years), n (%)	18-25: 0 26-30: 1 (5) 31-35: 6 (30) 36-40: 9 (45) 41+: 4 (20)
Time since index pregnancy, n (%)	< 6 months: 3 (15) 6-12 months: 4 (20) 1-3 years: 7 (35) 3-5 years: 6 (30)
Race/ethnicity, n (%)	White Caucasian: 17 (85) South Asian: 2 (10) African Heritage: 1 (5)
Level of education, n (%)	University/College graduate: 19 (95) High School graduate: 1 (5)
Pre-existing conditions, n (%)	Overweight or obese (BMI ≥ 25): 14 (70) Cardiovascular disease, stroke or heart failure history: 1 (5) Chronic hypertension prior to index pregnancy: 3 (15) Chronic diabetes or gestational Diabetes: 0 Active smoking: 0
Mean (SD) Body Mass Index	27.8 +/- 5.4

I: Patient experience with postpartum counselling prior to Her-HEART

II: Feedback on the Her-HEART project

III: Patient perspective on the ideal follow-up program after HDP

I: Patient experience with postpartum counselling prior to Her-HEART

Consistent with previous research, many pts were **unaware of the long-term CV risks**, or reported lack of knowledge among their HCP

“And I had no idea, three kids later, preeclampsia three times, about what the future risks are for me in relation to heart health.” (C4)

“I was told by the internal medicine people that I would have a higher risk of heart disease and that I should advocate for myself with my family GP. I have been attempting to do that now for many years and still it’s not recognized on my family GP’s radar.” (C1)

I: Patient experience prior to Her-HEART

First question was aimed at looking at the patient experience prior to Her-HEART in relation to CV risk reduction counselling

Participants wanted to focus on the antepartum/postpartum experience in general: concerns not being taken seriously, or signs and symptoms of preeclampsia missed by providers

- Impacts future care

I: Patient experience prior to Her-HEART

*“I had intense swelling as well. And again, I’m flagging this to my health care team and they’re just chalking it up to ‘Well you know, there’s swelling in pregnancy.’ [...] **And so I do feel like the health care system failed me completely.**” (A4)*

*“As a racialized woman I felt like my doctor sort of when I expressed concern, **brushed away**— this was when I was pregnant the first time, brushed away some of the warning signs that I was noticing in terms of my body and how I was feeling. And obviously it turned into preeclampsia early on at like 30 weeks.” (C4)*

I: Patient experience prior to Her-HEART

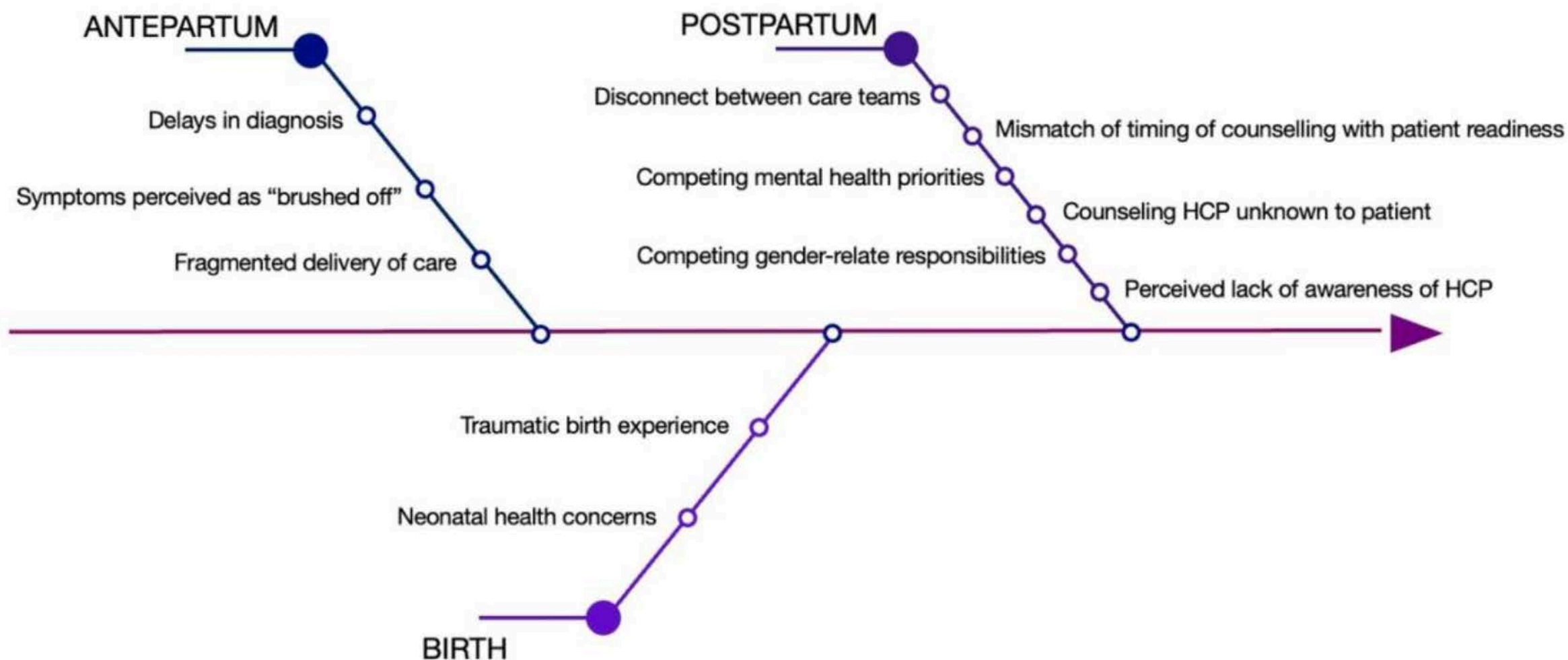
- Traumatic birth experience
- Postpartum mental health issues
- Counselling at inappropriate time
- Competing priorities

I: Patient experience prior to Her-HEART

*“When they told me ‘Don’t have any more kids...like there’s this risk and that risk...’ I didn’t care. I hadn’t even met my son yet. And you know, then there was a long NICU journey, we almost lost him. [...] it was just survival mode to make sure he came home. And I didn’t care about myself at all. Like there was no taking care of me at that point in my time **and those conversations meant nothing.**” (C3)*

*“Receiving a lot of the information that we have received when you’re in that – like still in that traumatic processing time after your birth experience, and not being able to receive that information during that time, I think that happens more often than it should. [...] **We’re not able or ready mentally, physically anything to process any of that information six weeks post what most of us had was a very traumatic experience.**” (C1)*

Patient reported barriers impacting on postpartum counselling



II: Feedback on the Her-HEART project

Website:

- Provided background information for self-advocacy
- Suggestions for improvement:
 - Information for patients from different racial/ethnic backgrounds
 - Timeline, more specific/prescriptive recommendations for follow-up
 - Info on upcoming/ new research

II: Feedback on the Her-HEART project

Virtual consult:

- Virtual is an effective medium to increase awareness, provide education, establish rapport with MD
- More convenient re: flexibility with childcare and travel time versus in-person

II: Feedback on the Her-HEART project

Empowered self advocacy

“I think it did encourage me to do some things like especially if I were to have another pregnancy. Like seeing my doctor for a baby planning visit beforehand was one suggestion that I think I will definitely follow up with that I probably wouldn’t have done otherwise.” (A2)

Positive impact on health behaviors

“So trying to kind of get back to the weight I was before I had kids is kind of a big focus now. And the program definitely pushed me to do that.” (B2)

III: Patient perspective on the ideal follow-up program after HDP

- Desired frequency and timing varied between participants
at least 2 visits, 6-12 months postpartum
- Coordinated care pathways (“warm handoffs”)
- Preference for counselling by a physician with specific knowledge in this area
- Mental health and peer support is critical

Proposed Framework for Postpartum Follow-up after HDP

0-3 months

- Titrate blood pressure medications as needed, avoid re-admissions
- Monitor for resolution of acute end organ dysfunction
- Feeding and baby care support
- Contraception counselling

3-12 months

- Review diagnosis of HDP and counsel on individualized CVD risks
- Introduce pre-conception counselling for future pregnancies (if applicable)
- Health behaviour counselling: dietary and exercise

Beyond 12 months

- Regular blood pressure follow-up
- Routine monitoring for dysglycemia and dyslipidemia
- Health behaviour counselling +/- pharmacological therapy as per best evidence
- Pre-conception counselling

Mental health disorder screening and support: access to mental health professionals and/or peer support

Coordination between specialist/primary care, antepartum/postpartum care teams

CARDIOVASCULAR HEALTH AFTER HDP



HDP occur in 5 - 10 % of all pregnancies in Canada.



2-4x More likely to develop cardiovascular (CV) risk factors and CV diseases.



Early preventative care after HDP may improve future health outcomes.



GENERAL HEALTH RECOMMENDATIONS



HEALTHY NUTRITION

A diet that emphasizes fruits, vegetables, low-fat dairy products, whole grain foods, protein from plant sources, reduced saturated fats and cholesterol and salt <2000mg/day.



STRESS MANAGEMENT

Individualized reductions of current stress levels and use of cognitive-behavioural interventions.



LACTATION SUPPORT

To encourage exclusive breastmilk feeding for 6 months (and up to two years or beyond) within a person's preferences and context.



MAINTENANCE OF A HEALTHY BODY WEIGHT

Target a body mass index of 18.5-24.9 kg/m² and waist circumference <88 cm. (Ethnicity specific cut-offs should be considered.)



PHYSICAL ACTIVITY

Accumulation of 150 minutes/week of moderate to vigorous intensity physical activity (aerobic or resistance activities).



SLEEP

7 - 9 hours of good-quality sleep on regular basis.



CARDIOMETABOLIC RISK FACTOR SCREENING

Regular blood pressure, Dysglycemia, Lipids, BMI, Kidney and Smoking screening. See pages 3-8.



SMOKING CESSATION

See page 9.

CANADIAN POSTPREGNANCY
CLINICAL NETWORK



Healthy Behaviours:

- Supported by other Canadian Guidelines.
- Little direct evidence for people after HDP (impact and sustainability)

Cardiometabolic Screening:

- “Bundling” of testing at 6 months; repeat testing 1 -3 years.
 - Normalization of pregnancy changes.
- Patient Considerations:
 - CV Risk level
 - Convenience / preferences

Slide courtesy of Dr. Kara Nerenberg

HYPERTENSION

PREVENTION

- 1 People with prior HDP should receive individualized counselling on health behaviour modifications to reduce their risks of future hypertension.
 - Emerging evidence demonstrates that **early self-management of postpartum HTN** improves diastolic blood pressure up to 3.6 years after delivery. (Hypertension. 2021;78:469-479.)

SCREENING

FIRST 6 WEEKS AFTER DELIVERY

- 1 Blood pressure should be measured regularly in the first two weeks after delivery in people with HDP to monitor for the development of severe HTN ($\geq 160/110$ mmHg) which requires urgent antihypertensive therapy and up to six weeks after delivery to ensure resolution of hypertension.
- 2 More frequent monitoring of blood pressure after delivery should be individualized for people with HDP with
 - i) Severe HTN; and/or
 - ii) On antihypertensive therapy.

BEYOND 6 MONTHS AFTER DELIVERY

1 People with prior HDP should be screened for chronic hypertension after 6 months with any of the following tests depending on local availability (diagnostic criteria):

- i) 24-hour ambulatory blood pressure monitoring (preferred) (daytime average $\geq 135/185$ mmHg or 24-hour average $\geq 130/80$ mmHg);
- ii) Automated office blood pressure measurements (average $\geq 135/85$ mmHg);
- iii) Non-automated office blood pressure measurements (average $>140/90$ mmHg); or
- iv) Home blood pressure measurement (average $>135/85$ mmHg).

2 Follow-up screening for hypertension should be repeated at all appropriate primary care visits (**at minimum annually**) using any of the above standardized methods of measurement.

3 People with prior HDP who have hypertension beyond 6 months after delivery should be referred for evaluation by a hypertension specialist depending on local availability (e.g., family medicine, internal medicine, endocrinology, nephrology, etc.) for investigations of **secondary causes of hypertension** guided by clinical and/or laboratory findings.



HYPERTENSION

MANAGEMENT OF HYPERTENSION

FIRST 6 WEEKS AFTER DELIVERY

- 1 Antihypertensive medications should be adjusted to target an average blood pressure of $<140/90$ mmHg.
- 2 Severe postpartum hypertension SBP ≥ 160 mmHg or DBP ≥ 110 mmHg requires urgent antihypertensive therapy.
 - Education should be provided on the symptoms of severe hypertension (i.e., headache, visual changes, shortness of breath, chest pain, etc.) and when to seek medical attention.
 - Blood pressure can rise in first 1-2 weeks after delivery.

ANTIHYPERTENSIVE MEDICATIONS IN LACTATION

- 3 Antihypertensives with evidence of safety in lactation (i.e., labetalol, methyldopa, long-acting nifedipine, enalapril or captopril) are preferred for people after HDP who are breastfeeding or pumping breast milk.
 - Other antihypertensive medications can be considered during lactation including: quinapril, hydralazine and amlodipine.
 - Resources for medication safety in lactation include: LactMed and MotherToBaby.

BEYOND 6 MONTHS AFTER DELIVERY

1 For people with prior HDP with no other cardiovascular risk factors or cardiovascular disease, antihypertensive therapy should be initiated in addition to health behaviour modifications for average blood pressure measurements of $\geq 140/90$ mmHg and treated to a blood pressure target of $<140/90$ mmHg.

2 For people with prior HDP and other cardiovascular risk factors or other co-morbidities, antihypertensive therapy initiation, targets and choice of medication should be individualized following current Hypertension Canada Guidelines.

PATIENT-CENTRED CONSIDERATIONS

- 1 **Shared decision making:** to integrate patient preference for all management strategies (pharmacotherapy and health behaviours).
- 2 **Lactation status:** to ensure safety of medications on the infant.

- 3 **Reproductive plans:** for short interpregnancy intervals, consider using antihypertensives with established safety data in pregnancy to minimize risks of first trimester exposures.
- 4 **Patient co-morbidities:** (e.g., diabetes, kidney disease): to individualize antihypertensive medications and BP targets.



DYSLIPIDEMIA

PREVENTION

1 People with prior HDP should receive individualized counselling regarding **health behaviour modifications** to reduce their risks of dyslipidemia including healthy dietary patterns (e.g., the Mediterranean diet, Dietary Approaches to Stop Hypertension [DASH], etc.)

SCREENING

1 People with prior HDP should have a screening lipid panel measured (non-fasting preferred from patient perspective; fasting if triglycerides $>4.5\text{ mmol/L}$) including total cholesterol, LDL, HDL, non-HDL, triglycerides at 6 months (preferred) (range 3-12 months) after delivery regardless of breastfeeding status.

FOLLOW-UP

2 Repeat screening lipid panel (non-fasting preferred; fasting if triglycerides $>4.5\text{ mmol/L}$):

- i) Annually if lipid profile abnormal; or
- ii) Frequency individualized based upon cardiovascular risk and patient preferences (range 1-3 years).

MANAGEMENT OF DYSLIPIDEMIA

1 People with prior HDP with no other traditional cardiovascular risk factors should be considered at increased risk of cardiovascular disease (~2-4 times higher than pregnant people without HDP) and counselled on health behaviour modifications as first-line therapy to reduce LDL if LDL $\geq 3.5\text{ mmol/L}$.

A)

B) For people with LDL $>3.5\text{ mmol/L}$ consider repeating lipid measurement in 6 months prior to initiation of therapy.

B)

2 After 6 months of health behaviour modifications, if LDL remains $\geq 3.5\text{ mmol/L}$, statin therapy should be considered on an individualized basis (incorporating patient preferences and reproductive plans) to **lower LDL $<3.5\text{ mmol/L}$ (preferred)** recognizing that the optimal LDL target remains unknown.

PATIENT-CENTRED CONSIDERATIONS

SCREENING

- Non-fasting lipid measurement is preferred for patient convenience unless TG $>4.5\text{ mmol/L}$.
- Lactation may elevate lipid levels. Consider repeating lipid measurement in 6 months if elevated.
- The optimal interval to repeat screening for dyslipidemias unknown. Best practice considerations should incorporate CV risk, lipid levels and patient preferences.

MANAGEMENT

CV Risk Calculators:

1 Underestimate CV risk due to young age and lack of sex-specific risk factors including HDP.

2 The Lifetime Risk and Cardiovascular Life Expectancy Model scores may be more accurate.

Statin exposure in the first trimester:

1 Lipophilic statins (i.e., pravastatin and rosuvastatin) may be associated with fewer congenital malformation than hydrophilic statins (atorvastatin, lovastatin, simvastatin).

2 Counsel patients to stop statins preconception or at time a pregnancy is confirmed.

3 Consider delaying statin therapy for short planned interpregnancy intervals.



KIDNEY
DISEASE



MENTAL
HEALTH

Take home points

- Patients with a history of HDP are at an increased risk of developing CVD and CV risk factors
- There are important systemic, patient, and provider level barriers to effective counselling and factor modification
- Virtual care may be a feasible way to address some barriers and provide more equitable care

Thank you

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Thank you for your attention!

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