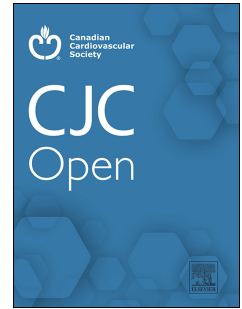


# Journal Pre-proof

Patient perspectives on a pilot virtual follow-up program after hypertensive disorders of pregnancy: a qualitative study

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PII: S2589-790X(23)00057-4

DOI: <https://doi.org/10.1016/j.cjco.2023.03.003>

Reference: CJCO 646

To appear in: *CJC Open*

Received Date: 3 January 2023

Revised Date: 17 February 2023

Accepted Date: 7 March 2023

Please cite this article as: L. Dubrofsky, S. Gundy, L. Boesch, K. Poolman, K.A. Nerenberg, S. Tobe, Patient perspectives on a pilot virtual follow-up program after hypertensive disorders of pregnancy: a qualitative study, *CJC Open* (2023), doi: <https://doi.org/10.1016/j.cjco.2023.03.003>.

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# Patient perspectives on a pilot virtual follow-up program after hypertensive disorders of pregnancy: A qualitative study



## Background

A hypertensive disorder of pregnancy (HDP) increases long-term cardiovascular (CV) risks



## Study Design

Participants with HDP in the previous 5 years

Her-HEART



## *Herheartproject.ca*

Pilot educational website + virtual consult to counsel on CV risk after HDP



## Focus groups (n=16 participants)

- ✓ Feedback on program
- ✓ Barriers and facilitators to counselling on CVD risk after HDP
- ✓ Patient perspective on ideal postpartum program

## Findings



Many affected patients were not aware of link between HDP and heart health



Virtual was an effective medium for counselling



Barriers to counselling:

Inappropriate timing of counselling, traumatic birth experience, competing priorities



Priorities in postpartum care:

Mental health support, coordinated care pathways

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**Patient perspectives on a pilot virtual follow-up program after hypertensive disorders of pregnancy: a qualitative study**

*Running title: Virtual follow-up after HDP*

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Word count: 4377

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36 **Abstract**

37 **Background:** Hypertensive disorders of pregnancy (HDP) are a risk factor for future  
38 cardiovascular disease, therefore follow-up and implementation of early interventions is  
39 recommended. We performed a qualitative study to assess the feasibility and user response to a  
40 mobile-health tool and virtual consult aimed at educating people with HDP on future  
41 cardiovascular risk, and better understand patients' priorities for postpartum care.

42  
43 **Methods:** Participants with a history of HDP in the last five years had access to an online  
44 educational tool and participated in a virtual consult to discuss their cardiovascular risks after  
45 HDP. Participants were invited to a focus group to obtain feedback on their postpartum  
46 experience and on the program.

47  
48 **Results:** 20 female participants were enrolled in the study between January 2020 and February  
49 2021. 16 participants took part in one of five focus groups. Participants reported a lack of  
50 awareness of future cardiovascular disease risks prior to participating in the program, identifying  
51 barriers to counselling including traumatic birth experiences, inappropriate timing and competing  
52 priorities. Participants reported that the virtual Her-HEART program was an effective avenue to  
53 provide counselling on long-term cardiovascular risks. They highlighted the importance of  
54 coordinated care pathways and mental health support in postpartum follow-up programs.

55  
56 **Conclusion:** We have shown the feasibility of an educational website and virtual consult to  
57 facilitate counselling in people affected by hypertensive disorders of pregnancy. Our results shed

58 light on patient-reported priorities related to the content and delivery of postpartum counselling  
59 after HDP.

60 **Keywords:** preeclampsia, postpartum follow up, cardiovascular disease prevention

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**83 Background**

84

85 Hypertensive disorders of pregnancy (HDP) affect approximately 7% of pregnancies, are a  
86 leading cause of maternal morbidity, and encompass a spectrum of diseases including chronic  
87 hypertension, gestational hypertension, pre-eclampsia, eclampsia, and HELLP syndrome  
88 (hemolysis, elevated liver enzymes, and low platelets)<sup>1</sup>. A history of a hypertensive disorder of  
89 pregnancy is a risk factor for future hypertension, diabetes, dyslipidemia, chronic kidney disease,  
90 and premature cardiovascular disease (CVD)<sup>2-5</sup>. HDP is therefore recognized as a female-specific  
91 CVD risk factor requiring counselling, follow-up, and implementation of early interventions  
92 including health behaviour modifications<sup>6,7</sup>.

93

94 There is a documented gender gap in cardiovascular disease management and prevention,  
95 prompting National “Calls to Action” to promote heart health for women<sup>8</sup>. The postpartum  
96 period has been identified as an opportunity to address female-specific cardiovascular risk  
97 factors<sup>9</sup>. However, physicians and patients are often unaware of the link between HDP and future  
98 CVD, and tailored evidence-based preventative interventions are lacking<sup>10-13</sup>. Postpartum  
99 cardiovascular prevention clinics are a proposed solution, but are limited by availability  
100 (particularly in rural areas) and poor attendance rates<sup>14,15</sup>. Identified barriers to attendance  
101 include gender-related responsibilities (e.g., childcare) and clinic accessibility<sup>16</sup>. Novel health  
102 delivery methods, such as community and/or digital health interventions and virtual care delivery  
103 models may address these barriers<sup>14,16</sup>.

104  
105 Telemonitoring of blood pressure in the immediate postpartum period has been shown to be  
106 feasible and highly acceptable by patients, as well as cost-effective<sup>17,18</sup>. Beyond the initial  
107 postpartum period focused on blood pressure monitoring, ongoing postpartum counselling is  
108 important, including identification and education on CVD risk, strategies to lower risk, and  
109 reproductive planning<sup>19</sup>. At present, there is variable data supporting CVD-risk reduction  
110 counselling via digital health interventions<sup>20,21</sup>. As such, we designed the Her-HEART program,  
111 a mobile-health tool and virtual consult aimed at educating people with HDP and their physicians  
112 on future CVD risks and prevention strategies. The program included a qualitative evaluation to  
113 assess the feasibility and user response to the program in Ontario, Canada.

114

## 115 **Methods**

116

117 Inclusion criteria for participation in Her-HEART were: age  $\geq 18$ , English-speaking, currently  
118 living in Ontario, Canada, with a history of any hypertensive disorder of pregnancy in the prior  
119 five years. Patients with a diagnosis of chronic kidney disease and/or solid organ transplant  
120 recipients were excluded. Participant recruitment included self-identification for the study  
121 through online advertisements (Preeclampsia Foundation of Canada Facebook page, Sunnybrook  
122 Health Sciences Centre website), paper advertisements posted at Sunnybrook Health Sciences  
123 Centre, or referral by a physician involved in their prenatal or postnatal care.

124

125 After providing informed consent, participants were given access to an online educational tool  
126 designed for the study (<https://www.herheartproject.ca/>). They were asked to complete a

127 questionnaire to obtain basic demographic and health information. The website content was  
128 designed by the study authors with input from two patient partners (JD and anonymous). Website  
129 content included an explanation of HDP and the associated long-term cardiovascular health risks,  
130 along with general recommendations for cardiovascular risk reduction. All participants were also  
131 offered a one-time virtual (video) consultation over a secure network with a specialist physician  
132 in nephrology/hypertension (LD) to discuss the participant's personal pregnancy and health  
133 history and provide individualized counselling. To take part in the virtual consult, participants  
134 were required to provide the name of their primary care provider (PCP). PCPs were sent a letter  
135 informing them of their patient's involvement in the study, as well as the URL to a portion of the  
136 website dedicated to educating healthcare professionals on the long-term CVD risks associated  
137 with a history of HDP (<https://www.herheartproject.ca/hcp>). PCPs were also given a letter  
138 detailing the virtual consult and including general and specific recommendations for follow-up.  
139 The virtual consult followed a pre-determined outline (Figure 1). Content was derived from  
140 content experts and templates used by pre-existing postpartum clinics. At the virtual session,  
141 participants were counselled on: the increased risk of future CVD; the link between the early and  
142 more frequent development of CVD risk factors (hypertension, diabetes, dyslipidemia and  
143 chronic kidney disease) post -HDP; and on the importance of follow-up with their PCP to  
144 identify and mitigate these risks. Discussions emphasized the importance of medications and  
145 health behaviours to lower the risk of recurrent HDP in subsequent pregnancies if applicable, and  
146 in lowering the risk of CVD and CVD risk factors using non-pharmacological and  
147 pharmacological approaches.

148

## 149 **Qualitative Study Design**



150

151 This qualitative descriptive study sought to elucidate: 1) the postpartum experience of people  
152 affected by HDP; 2) assess feedback on the Her- HEART pilot project; and 3) better understand  
153 patients' priorities for postpartum follow up. Participants were invited to a teleconferenced focus  
154 group to obtain feedback on the program. Each session included 4-6 participants and was  
155 conducted by a qualitative researcher with expertise in this method (LB). Questions centered on  
156 the patient experience prior to and during participation in the Her-HEART program and explored  
157 participants' opinions on the qualities of an ideal postpartum follow-up program for those who  
158 experienced HDP.

159

160 All focus groups were audio recorded and transcribed verbatim. The focus group transcripts were  
161 coded using thematic analysis by two researchers (LB, LD). Focus groups were continued until  
162 thematic saturation occurred. A deductive approach was used to identify participants'  
163 perspectives on the facilitators and barriers to participating in the program and utilizing mobile-  
164 health tools, as well as in implementing health behaviour modifications. Inductive coding was  
165 also integrated to capture additional emerging themes related to patients' perspectives and  
166 experiences. This approach was chosen to address gaps in the existing literature in the  
167 postpartum population and to obtain information that might be used to guide future design of  
168 cardiovascular risk reduction care models in the clinical and research settings. The analysis was  
169 conducted using QSR International NVivo 9 qualitative software. Once preliminary analysis was  
170 complete, draft themes were reviewed and finalized by the study authors.

171

172 The study was approved by the Research Ethics Board at Sunnybrook Health Sciences Centre in  
173 Toronto, Ontario, Canada.

174

## 175 **Results**

176

177 34 people initially expressed interest in Her-HEART. 4 were ineligible due to timing (>5 years  
178 from affected pregnancy), 3 lived outside of the province of Ontario, and 1 person was currently  
179 pregnant therefore opted not to participate. Six of the remaining 26 potential participants did not  
180 follow-up with the research coordinator after the initial conversation. 20 female participants were  
181 therefore enrolled in the study between January 2020 and February 2021, all of whom self-  
182 identified through online or hospital advertisements. Baseline demographic and questionnaire  
183 responses are outlined in Table 1.

184

185 Eighteen of the 20 participants participated in a video consult between November 2020 and  
186 March 2021, the mean (standard deviation [SD]) duration of which was 45 (+/- 16) minutes.  
187 During the video consult, all participants reported a history of pre-eclampsia in the index  
188 pregnancy, one patient experienced eclampsia, and two patients experienced a fetal loss related  
189 to HDP. 16 participants took part in one of five telephone focus groups. Themes were separated  
190 into three categories: (I) Patient experience prior to the program (II) Feedback on the Her-  
191 HEART program and (III) Patient perspective on long-term follow-up after HDP. Representative  
192 quotes are included from unique participants (1 to 5) and study groups (A to E).

193

### 194 **I: Patient experience prior to the Her-HEART program**

195

196 Awareness of future CVD risk after HDP

197

198 Many participants stated that prior to participating in Her-HEART, they were unaware of the  
199 long-term cardiovascular risk associated with HDP and the need for additional postpartum  
200 follow-up care. A common perception among participants was that there was also a general lack  
201 of awareness and knowledge among their healthcare practitioners (HCP) regarding future  
202 cardiovascular risks. Most participants stated that the long-term effects of HDP were either not  
203 discussed with them at all by their HCPs, and if they were, they were generally mentioned or not  
204 followed up on. Participants reported a need to self-advocate to their providers for follow-up  
205 care.

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

208

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

212

213

214 While the initial scripted question was aimed at understanding participants' experience of  
215 cardiovascular risk prevention counselling prior to participating in Her-HEART, a large  
216 proportion of patients discussed their health experiences in general in the antepartum and  
217 postpartum period. Participants frequently mentioned that their concerns prior to giving birth

218 were not taken seriously and were “brushed off” by their providers. Some participants perceived  
219 a significant lack of knowledge among their healthcare providers regarding the signs and  
220 symptoms of HDP.

221

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

225

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

230

231 *I was a third-generation woman to have preeclampsia and no one asked me when I was*  
232 *starting to show signs at 18 weeks, has there been any family history. And I was made to*  
233 *feel like I was just like a wimpy woman who couldn’t handle pregnancy and so I shut-up*  
234 *about my symptoms. Like there were so many signs and risk factors and none of them*  
235 *were asked about. (C3)*

236

237 Patient-identified barriers to postpartum counseling: traumatic birth experience, mental health  
238 state, inappropriate timing, competing priorities

239

240 Many participants spoke about the trauma surrounding their birth experience, as well as the  
241 mental health effects, particularly posttraumatic stress, that they experienced. As a result, many  
242 participants reported an inability to mentally process any information that may have been shared  
243 with them and were not receptive to learning about any future risks or follow-up care in the  
244 immediate postpartum period. Participants stated that postpartum counselling, when it occurred,  
245 was focused on the risk of recurrence of a hypertensive disorder of pregnancy in future  
246 pregnancies. They highlighted the importance of appropriate timing of counselling as being as  
247 integral as the content provided.

248

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

254

255 *I think like as much as the physical health needs to be taken care of, you don't have the*  
256 *headspace. And if your mental health is so bad that you can't even – like I don't*  
257 *remember. [...] Even the first like three to six months, I don't remember it because I was*  
258 *so stressed. (D2)*

259

260 *Receiving a lot of the information that we have received when you're in that – like still in*  
261 *that traumatic processing time after your birth experience, and not being able to receive*  
262 *that information during that time, I think that happens more often than it should. [...]*

263 *We're not able or ready mentally, physically anything to process any of that information*  
264 *six weeks post what most of us had was a very traumatic experience. (C1)*

265

## 266 **II: Feedback on the Her-HEART program**

267

268 Website provided background information to support self-advocacy

269

270 Many participants appreciated the simple and concise language that was used on the Her-  
271 HEART website. Some participants also found the website useful in that it provided them with  
272 essential background information to educate and prepare them for future follow-up care with  
273 their HCPs.

274

275 *I also thought because there was an opportunity to get a little education ahead of time*  
276 *and [...] because I sort of read the website and I thought about things ahead of time, I*  
277 *had actual questions more so than when I go to the doctor and you're kind of not*  
278 *knowing what they're going to tell you ahead of time. (B1)*

279

280 Suggestions for website improvement: increased diversity of information, specific and detailed  
281 information and resources, and access to new and upcoming research

282

283 Although many participants appreciated that the website did not contain an overwhelming  
284 amount of information, some suggested the importance of including more diverse information,  
285 particularly around the impacts and complexities preeclampsia may have on people of various

286 ethnicities and racialized people. Having access to specific information on the website related to  
287 testing and scheduling appointments was another suggestion provided by participants. With  
288 respect to diagnostic testing, participants mentioned that a timeline or schedule could help guide  
289 them as to what specific tests they should be requesting, what these tests are for, when they  
290 should be requesting them, and who they should be contacting (family physician and/or  
291 specialist). As a way to support self-advocacy, some participants suggested providing access to  
292 new and upcoming research related to HDP on the website so that they can stay informed and  
293 updated on the condition they experienced.

294

295 Virtual consult is an effective medium to increase awareness and education

296

297 The majority of participants were appreciative of the virtual consultation in that it increased their  
298 awareness and understanding of future risks, and provided them with helpful, detailed  
299 information. Many participants felt they were able to generate rapport with the practitioner  
300 despite the virtual modality. Although some participants mentioned the importance of seeing a  
301 physician in person, the majority of participants preferred the convenience of virtual  
302 appointments. Participants reported that virtual appointments were more of a relaxing and less  
303 intimidating experience, require less planning, and eliminate the need for travel.

304

305 *I liked the virtual aspect because I feel like your guard is down. I don't know, I don't like*  
306 *the clinical like when you're in a room and you feel like you're on the spot, whereas this*  
307 *is a lot more relaxed. (B2)*

308

309 *Like I think COVID did a great thing and like forcing everyone into virtual care just*  
310 *because [online platform] is amazing. So it's easily done between naps and that sort of*  
311 *thing. But having to check out there, it was a mission because I don't live near*  
312 *[University Hospital] so that was really hard to have to plan that. (A4)*

313

#### 314 Virtual consult empowered self-advocacy

315

316 Participants frequently mentioned that the virtual consultation helped to encourage and empower  
317 them to seek follow-up and improve self-advocacy efforts.

318

319 *I feel like it empowered me to know what follow-up I should ask for in the future. And you*  
320 *know, we talked a little bit about testing blood pressure, and how often that should be*  
321 *done and simple things like that. [...] So little things like that sort of helps with advocacy*  
322 *I guess going forward and knowing what the things are to watch for. I think I've never*  
323 *been very good at – like I've always been a little bit intimidated by doctors and that*  
324 *process. And so I think feeling like I just have a bit better understanding of my own health*  
325 *and things I should watch for going forward I think will make sure that I advocate a little*  
326 *bit better for myself. (B1)*

327

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



332

333 Positive impact on health behaviours

334

335 With an increased awareness and knowledge of cardiovascular risk factors, many participants  
336 revealed that they had made positive changes to their health behaviours including prioritizing  
337 their health, increasing physical activity, and improving nutrition habits.

338

339 *This study has made a difference in just like I said I think prioritizing my health, if I were*  
340 *to summarize that, more in postpartum health which is very easily forgotten I think. I'm a*  
341 *first-time mom so it's all about baby. I'm a mom of a preemie so it was like okay I don't*  
342 *even know how to do this. And there was so much learning for that. I was definitely not*  
343 *thinking about myself. So even though it's scary to hear some of those facts, and what*  
344 *I've learned through this program it's just more of a reason to prioritize myself. (A4)*

345

346 *So trying to kind of get back to the weight I was before I had kids is kind of a big focus*  
347 *now. And the program definitely pushed me to do that. I mean it's always been in the*  
348 *back of my mind, but I would never actually get up and go. But now it's kind of like well I*  
349 *really should because I have kids, I have young kids, I want to make sure that I'm around*  
350 *for them and that I don't have issues later on. So it's definitely pushed me in that*  
351 *direction for sure. (B2)*

352

353 III: Patient perspectives on follow-up programs after a hypertensive disorder of pregnancy

354

355 Frequency and timing of follow-up

356

357 The suggested number of appointments in an “ideal” follow-up program varied from monthly  
358 virtual appointments to being seen annually. Having at least two appointments where the first  
359 provided information to the patient, followed by a second appointment to discuss the information  
360 and formulate a plan was also suggested. Given the birth trauma that many of the participants  
361 experienced, most participants thought that the timing of a follow-up appointment should be, at  
362 the earliest, six to twelve months post-delivery in order to give them time to recover physically  
363 and mentally.

364

365 Coordinated pathways of care

366

367 Most participants stated that they would prefer to follow-up with a physician who had knowledge  
368 of this area and who was ideally involved in their peripartum care. While sharing their stories,  
369 many participants spoke about the disconnect and lack of coordination they felt between the  
370 healthcare providers involved in their postpartum course. Some participants felt that they were  
371 provided with inconsistent advice, and that their primary care providers were inadequately  
372 informed about their experience. Therefore, participants stressed that having continuity of care  
373 and a team-based approach is a vital aspect to follow-up care. A multidisciplinary approach  
374 including a dietitian and mental health support worker was also suggested.

375

376 *I thought there was a huge disconnect between what was happening at [University*  
377 *Hospital] and then what my physician knew in terms of what happened like with this*  
378 *preeclampsia. And then I had to fill her in as best as I could from my recollection. (C4)*

379

380 Mental health and peer support were felt to be integral component to a follow-up program

381

382 When participants were asked their thoughts about future follow-up programs for people after  
383 experiencing HDP, mental health support was commonly mentioned as an essential component  
384 that needs to be incorporated with follow-up care. Participants also spoke about the importance  
385 of having access to support groups with other people who have undergone similar experiences.

386

387 *I think once your mental health gets on track, you can probably start to focus on your*  
388 *physical health after. Plus no one cares about their physical health after having a baby.*  
389 *[...] You're just trying to survive. [chuckles] Yeah so anyway, I 100 percent agree.*

390 *Mental health is the first thing. (D2)*

391

392 *I would just say that this is a really nice experience to just talk to people that have had*  
393 *this one condition with so many different experiences. So it's nice to even just chat on this*  
394 *level because I don't know if there's support groups around here or anything, but it's*  
395 *definitely an important factor to speak about and share experiences like that. (A4)*

396 **Conclusions**

397

398 We have demonstrated the feasibility and patient satisfaction of using the combination of a  
399 website and virtual consultation to educate people with a history of a HDP on their long-term  
400 cardiovascular risks as well as risks of recurrence of HDP in future pregnancies. Consistent with  
401 previous research<sup>12,22</sup>, many participants stated that they were unaware of the long-term  
402 cardiovascular risk factors associated with HDP and the need for additional postpartum follow-  
403 up care prior to participating in Her-HEART. Participants reported increased knowledge,  
404 motivation for self-advocacy, and positive health behaviours after participating in the program.  
405 The majority of participants perceived significant benefits of virtual appointments, including less  
406 travel time and increased comfort level.

407

408 Some participants reported negative interactions with the healthcare system during the pregnancy  
409 and postpartum period. Our participants' perspectives were in line with a recent qualitative study  
410 in which women with HDP reported a need for improved communication (warm-handoffs) of  
411 their diagnosis of HDP and for more detailed postpartum counselling<sup>23</sup>. The patient experience  
412 during the pregnancy, labor and delivery, and immediate postpartum period may significantly  
413 impact a patient's willingness to follow-up in the first year postpartum and therefore impact the  
414 opportunity for long-term CVD prevention (Figure 2).

415

416 Our focus group results reveal important considerations regarding the content and delivery of  
417 postpartum counselling after HDP (Figure 3). Participants varied in their opinions regarding  
418 desired timing and frequency of visits. This may reflect the wide spectrum of HDP presentations  
419 and physical and emotional consequences, highlighting the importance of flexibility and patient-  
420 centeredness when developing postpartum follow-up programs. While short-term follow-up after

421 HDP is imperative to mitigate the increased risks of hypertensive emergencies during the  
422 immediate postpartum period<sup>24</sup>, an individualized approach to timing of CVD risk reduction  
423 counseling may be more appropriate than a “check-list” approach in the early weeks and months  
424 postpartum<sup>25</sup>. Our focus group results suggest that counseling should take place within the first  
425 year postpartum, which is in line with recommendations based on the early development of  
426 vascular risk factors in the first 1-3 years postpartum<sup>26</sup>.

427  
428 Most participants in our study favoured care by a healthcare provider who was knowledgeable in  
429 HDP, however they also highlighted the importance of continuity and collaboration in  
430 specialist/primary care and antepartum/postpartum care for ongoing follow-up. Previous work  
431 has demonstrated challenges in coordinating postpartum care in this population<sup>16</sup>. Novel health  
432 delivery models including the use of virtual care, may enable closer integration of primary and  
433 specialist care that may help overcome these challenges. Education to primary care practitioners  
434 on CVD-risk reduction in HDP survivors is another proposed solution<sup>16</sup>. Coordinated pathways  
435 of virtual care have the potential to meet the needs of women in rural or remote communities as  
436 well. Further research is warranted to determine outcome-based effectiveness of healthcare  
437 provider education in this area.

438  
439 The majority of participants self-reported a history of mood symptoms in the postpartum period.  
440 People with HDP may be at increased risk of developing postpartum anxiety, depression and  
441 PTSD<sup>27</sup>. Participants in our study highlighted the importance of mental health support when  
442 considering the nature and timing of counselling regarding physical health concerns. Perinatal  
443 mental health services transitioned largely to virtual during the COVID-19 pandemic, with

444 emerging data showing high patient satisfaction with virtual care delivery<sup>28,29</sup>. Further research  
445 is warranted on virtual and in-person perinatal mental healthcare in people with HDP, and the  
446 impact this might have on postpartum health behaviour modifications.

447

448 The results of this study must be taken in consideration of limitations in the study design. We did  
449 not objectively assess changes in health behaviours due to the qualitative nature of the study.

450 Previous research has shown mixed results in achieving positive health behaviour change in  
451 similar populations using longer-term interventions than the one used in our study<sup>21,30</sup>. Our study  
452 is limited in generalizability given participants were mainly White and highly educated. This is  
453 particularly important given data showing racial and ethnic disparities in postpartum follow-up  
454 rates<sup>31</sup>. Future work is needed including engagement with local communities to better outline the  
455 patient experience in a diverse population and highlight the important socio-demographic factors  
456 which may impact postpartum follow-up care. Given the timing of the virtual consults in our  
457 study, participants may have already experienced virtual healthcare in the context of the COVID-  
458 19 pandemic, potentially informing their experience in our study. Participants also self-identified  
459 for the study, which may suggest a bias toward a more motivated or resourced subset of this  
460 patient group. There is some data suggesting that this may be a generally motivated population,  
461 for example, very high adherence to a mobile health intervention has been demonstrated in the  
462 antepartum period<sup>32</sup>.

463

464 In summary, we have demonstrated the feasibility and participant satisfaction of the combination  
465 of an educational website and virtual consult to facilitate counselling in people affected by HDP.  
466 This qualitative study highlights important factors to consider in designing postpartum CVD

467 prevention programs, such as mental health support, individualized timing of visits, and  
468 coordinated care pathways. Future work is needed to evaluate the effectiveness of education and  
469 counselling in the postpartum period on the development of cardiovascular risk factors and  
470 cardiovascular disease.

471

## 472 **Acknowledgements**

473

474 The authors would like to thank patient partners Jaymee Davis and Anonymous for their  
475 feedback and contributions to the Her-HEART website.

## 476 **Disclosure of Interests**

477 ST has received unrestricted grant and in-kind support from KMH Cardiology Clinics,  
478 consulting fees from AstraZeneca, and educational program support from Amgen, AstraZeneca,  
479 BMS, Bayer, Boehringer Ingelheim, Janssen, Lilly, Novartis, Novo Nordisk, Pfizer and Sanofi  
480 Genzyme.

481

482 KN funding support from the Canadian Institutes of Health Research and Heart & Stroke for the  
483 Women's Heart and Brain Health Mid-career Research Chair.

484

485 The remaining authors have no disclosures.

486

## 487 **Contribution to Authorship**

488 LD, KN, and ST contributed to the conception and design of the study. LD, KP and ST  
489 contributed to the content of the website. LD, SG, and KN discussed the content of the virtual  
490 consult. LD and ST applied for ethics approval and funding for the project. LD and LB  
491 determined the content of the focus groups. LB conducted the focus groups. LD, LB conducted  
492 analysis of the data with coding subsequently checked by KP and SG. All authors contributed to  
493 the content of this manuscript.

494

## 495 **Details of Ethics Approval**

496 The procedures of this study received ethics approval from the Research Ethics Board at  
497 Sunnybrook Health Sciences Centre in Toronto, Ontario, Canada. Project identification number  
498 403-2019, dated January 23, 2020

#### 499 **Funding**

500 This study was funded by the Preeclampsia Foundation of Canada's 2019 Vision Grant

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#### 504 **References**

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506

- 507 1. Butalia S, Audibert F, Cote AM, Firoz T, Logan AG, Magee LA, et al. Hypertension  
508 Canada's 2018 Guidelines for the Management of Hypertension in Pregnancy. *Can J Cardiol.*  
509 2018;34(5):526-31.
- 510 2. Feig DS, Shah BR, Lipscombe LL, Wu CF, Ray JG, Lowe J, et al. Preeclampsia as a risk  
511 factor for diabetes: a population-based cohort study. *PLoS Med.* 2013;10(4):e1001425.
- 512 3. Ray JG, Vermeulen MJ, Schull MJ, Redelmeier DA. Cardiovascular health after maternal  
513 placental syndromes (CHAMPS): population-based retrospective cohort study. *Lancet.*  
514 2005;366(9499):1797-803.
- 515 4. Groenhof TKJ, Zoet GA, Franx A, Gansevoort RT, Bots ML, Groen H, et al. Trajectory  
516 of Cardiovascular Risk Factors After Hypertensive Disorders of Pregnancy. *Hypertension.*  
517 2019;73(1):171-8.
- 518 5. Kristensen JH, Basit S, Wohlfahrt J, Damholt MB, Boyd HA. Pre-eclampsia and risk of  
519 later kidney disease: nationwide cohort study. *BMJ.* 2019;365:11516.
- 520 6. Hypertension in pregnancy. Report of the American College of Obstetricians and  
521 Gynecologists' Task Force on Hypertension in Pregnancy. *Obstet Gynecol.* 2013;122(5):1122-  
522 31.
- 523 7. Webster K, Fishburn S, Maresh M, Findlay SC, Chappell LC. Diagnosis and  
524 management of hypertension in pregnancy: summary of updated NICE guidance. *BMJ.*  
525 2019;366:l5119.
- 526 8. King A. The heart of a woman: addressing the gender gap in cardiovascular disease.  
527 *Nature Reviews Cardiology.* 2011;8(5):239-40.
- 528 9. Mehta LS, Sharma G, Creanga AA, Hameed AB, Hollier LM, Johnson JC, et al. Call to  
529 Action: Maternal Health and Saving Mothers: A Policy Statement From the American Heart  
530 Association. *Circulation.* 2021;144(15):e251-e69.
- 531 10. Young B, Hacker MR, Rana S. Physicians' knowledge of future vascular disease in  
532 women with preeclampsia. *Hypertens Pregnancy.* 2012;31(1):50-8.



- 533 11. McDonnell LA, Turek M, Coutinho T, Nerenberg K, de Margerie M, Perron S, et al.  
534 Women's Heart Health: Knowledge, Beliefs, and Practices of Canadian Physicians. *J Womens*  
535 *Health (Larchmt)*. 2018;27(1):72-82.
- 536 12. Seely EW, Rich-Edwards J, Lui J, Nicklas JM, Saxena A, Tsigas E, et al. Risk of future  
537 cardiovascular disease in women with prior preeclampsia: a focus group study. *BMC Pregnancy*  
538 *Childbirth*. 2013;13:240.
- 539 13. MacDonald SE, Walker M, Ramshaw H, Godwin M, Chen XK, Smith G. Hypertensive  
540 disorders of pregnancy and long-term risk of hypertension: what do Ontario prenatal care  
541 providers know, and what do they communicate? *J Obstet Gynaecol Can*. 2007;29(9):705-10.
- 542 14. Dayan N, Nerenberg K. Postpartum Cardiovascular Prevention: The Need for a National  
543 Health Systems-Based Strategy. *Can J Cardiol*. 2019;35(6):701-4.
- 544 15. Nerenberg KA, Cooke CL, Smith GN, Davidge ST. Optimising Women's Cardiovascular  
545 Health After Hypertensive Disorders of Pregnancy: A Translational Approach to Cardiovascular  
546 Disease Prevention. *Can J Cardiol*. 2021;37(12):2056-66.
- 547 16. Chan SE, Nowik CM, Pudwell J, Smith GN. Standardized Postpartum Follow-Up for  
548 Women with Pregnancy Complications: Barriers to Access and Perceptions of Maternal  
549 Cardiovascular Risk. *Journal of obstetrics and gynaecology Canada : JOGC = Journal*  
550 *d'obstetrique et gynecologie du Canada : JOGC*. 2021;43(6):746-55.
- 551 17. Hoppe KK, Thomas N, Zernick M, Zella JB, Havighurst T, Kim K, et al. Telehealth with  
552 remote blood pressure monitoring compared with standard care for postpartum hypertension.  
553 *American journal of obstetrics and gynecology*. 2020;223(4):585-8.
- 554 18. Niu B, Mukhtarova N, Alagoz O, Hoppe K. Cost-effectiveness of telehealth with remote  
555 patient monitoring for postpartum hypertension. *The journal of maternal-fetal & neonatal*  
556 *medicine : the official journal of the European Association of Perinatal Medicine, the Federation*  
557 *of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*.  
558 2021:1-7.
- 559 19. McKinney J, Keyser L, Clinton S, Pagliano C. ACOG Committee Opinion No. 736:  
560 Optimizing Postpartum Care. *Obstet Gynecol*. 2018;132(3):784-5.
- 561 20. Hoedjes M, Berks D, Vogel I, Duvekot JJ, Oenema A, Franx A, et al. Preferences for  
562 postpartum lifestyle counseling among women sharing an increased cardiovascular and  
563 metabolic risk: a focus group study. *Hypertens Pregnancy*. 2011;30(1):83-92.
- 564 21. Mukerji G, McTavish S, Glenn A, Delos-Reyes F, Price J, Wu W, et al. An Innovative  
565 Home-Based Cardiovascular Lifestyle Prevention Program for Women With Recent Gestational  
566 Diabetes: A Pilot Feasibility Study. *Can J Diabetes*. 2015;39(6):445-50.
- 567 22. Triebwasser JE, Janssen MK, Sehdev HM. Postpartum counseling in women with  
568 hypertensive disorders of pregnancy. *Am J Obstet Gynecol MFM*. 2021;3(1):100285.
- 569 23. Shree R, Hatfield-Timajchy K, Brewer A, Tsigas E, Vidler M. Information needs and  
570 experiences from pregnancies complicated by hypertensive disorders: a qualitative analysis of  
571 narrative responses. *BMC Pregnancy Childbirth*. 2021;21(1):743.
- 572 24. Harrington CM, Sorour N, Troy S, Botros M, Ciuffo M, Sardella N, et al. Postpartum  
573 Hypertension and the Role of Postpartum Clinics and Digital Health. *Current Treatment Options*  
574 *in Cardiovascular Medicine*. 2021;23(9):59.
- 575 25. Patient S, Quality Committee SfM-FMEasso, Gibson KS, Hameed AB. Society for  
576 Maternal-Fetal Medicine Special Statement: Checklist for postpartum discharge of women with  
577 hypertensive disorders. *Am J Obstet Gynecol*. 2020;223(4):B18-B21.

- 578 26. Smith GN. The Maternal Health Clinic: Improving women's cardiovascular health. *Semin*  
579 *Perinatol.* 2015;39(4):316-9.
- 580 27. Roberts L, Davis GK, Homer CSE. Depression, Anxiety, and Post-traumatic Stress  
581 Disorder Following a Hypertensive Disorder of Pregnancy: A Narrative Literature Review. *Front*  
582 *Cardiovasc Med.* 2019;6:147.
- 583 28. Ackerman M, Greenwald E, Noulas P, Ahn C. Patient Satisfaction with and Use of  
584 Telemental Health Services in the Perinatal Period: a Survey Study. *The Psychiatric quarterly.*  
585 2021;92(3):925-33.
- 586 29. Wassef A, Wassef E. Telemedicine in perinatal mental health: perspectives. *Journal of*  
587 *psychosomatic obstetrics and gynaecology.* 2022:1-4.
- 588 30. Rich-Edwards JW, Stuart JJ, Skurnik G, Roche AT, Tsigas E, Fitzmaurice GM, et al.  
589 Randomized Trial to Reduce Cardiovascular Risk in Women with Recent Preeclampsia. *J*  
590 *Womens Health (Larchmt).* 2019;28(11):1493-504.
- 591 31. Lewey J, Levine LD, Yang L, Triebwasser JE, Groeneveld PW. Patterns of Postpartum  
592 Ambulatory Care Follow-up Care Among Women With Hypertensive Disorders of Pregnancy. *J*  
593 *Am Heart Assoc.* 2020;9(17):e016357.
- 594 32. van den Heuvel JFM, Lely AT, Huisman JJ, Trappenburg JCA, Franx A, Bekker MN.  
595 SAFE@HOME: Digital health platform facilitating a new care path for women at increased risk  
596 of preeclampsia - A case-control study. *Pregnancy hypertension.* 2020;22:30-6.

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618 **Table 1: Baseline information**

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	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 or ethnicity, n (%)	White: 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 $\geq$ 25): 14 (70) Cardiovascular disease, stroke, or heart failure history: 1 (5) Pre-pregnancy hypertension: 3 (15) Pre-pregnancy diabetes or gestational diabetes: 0 Active smoking: 0
Mean (SD) Body Mass Index	27.8 +/- 5.4
Minutes per week of moderate or vigorous physical activity, mean (SD)*	174 +/- 156 minutes
Servings of fruits and vegetables per day, n (%)*	0-2: 7 (35) 3-5: 9 (45) 5-7: 3 (15) 8 or more: 1 (5)

620

621 n= number; BMI = body mass index; SD = standard deviation

622 \*self- reported prior to involvement in the Her-HEART project

623

624 Figure 1: Template for virtual consult

625 HDP= hypertensive disorder of pregnancy, CVD= cardiovascular disease

626

627 Figure 2: Patient reported barriers impacting postpartum counselling

628 HCP= healthcare provider

629

630 Figure 3: Proposed framework for postpartum follow-up after HDP

631 HDP= hypertensive disorder of pregnancy, CVD= cardiovascular disease

**Figure 1: Template for virtual consult**

- 
1. Pregnancy and HDP history

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  2. Medical history with focus on risk factors for CVD and HDP

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  3. Mental health history and previous interventions

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  4. Health behaviours including substance use, stress management, diet and physical activity

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  5. Current and pre-pregnancy weight

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  6. Most recent out-of-office and/or clinic blood pressure

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  7. Counselling on future pregnancy risks and contraception (if applicable)

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  8. Counselling on increased risk of future CVD and CV risk factors

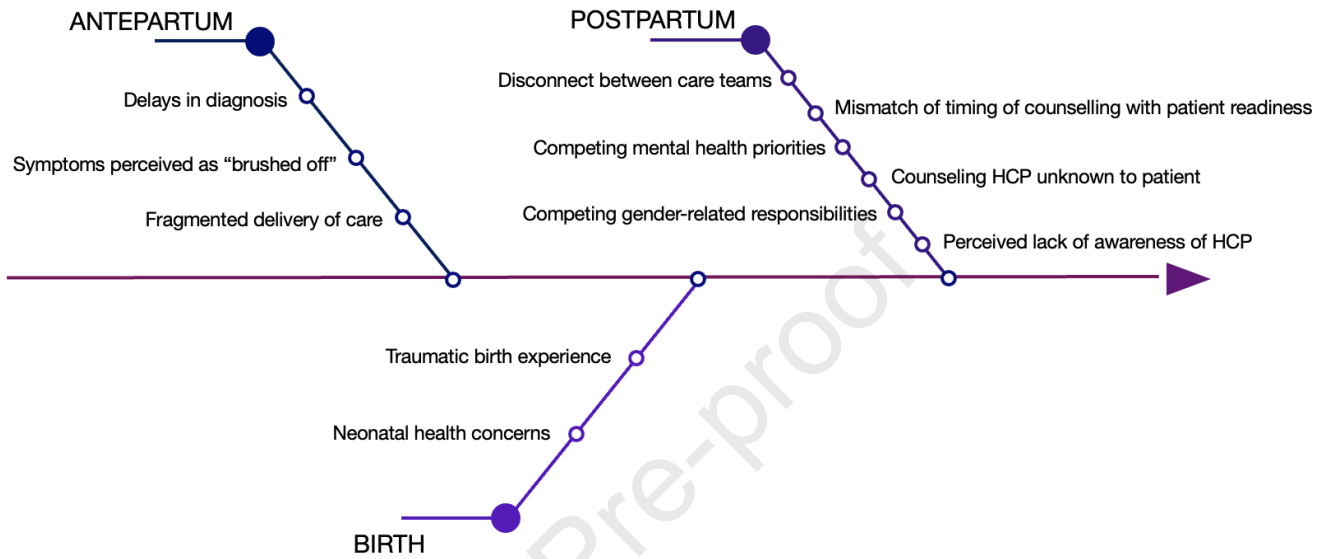
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  9. Health behaviour and/or pharmacological interventions to reduce CVD risks

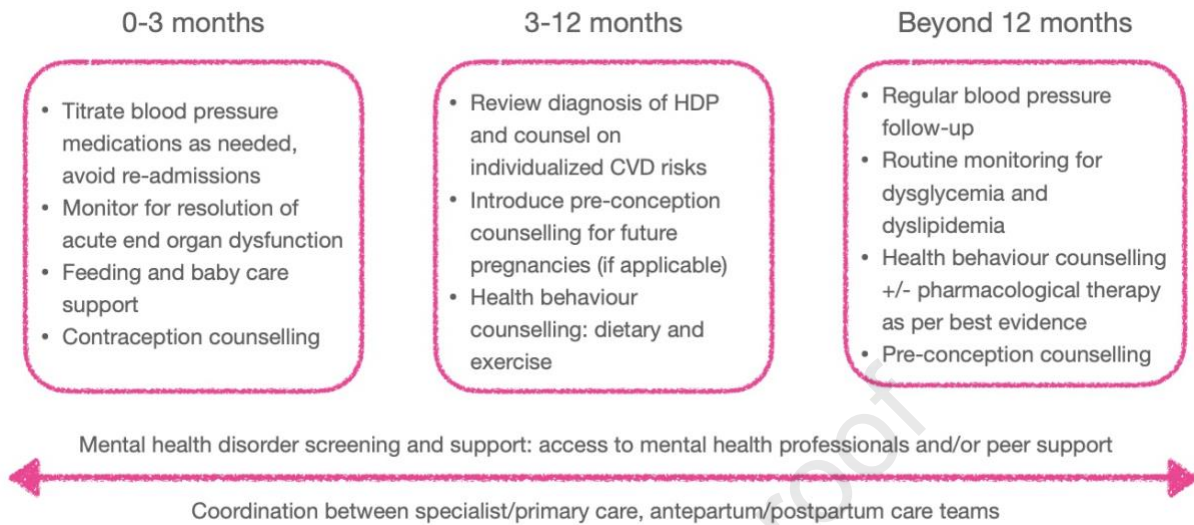
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HDP= hypertensive disorder of pregnancy, CVD= cardiovascular disease

**Figure 2: Patient reported barriers impacting postpartum counselling**



HCP= healthcare practitioner

**Figure 3: Proposed framework for postpartum follow-up after HDP**

HDP= hypertensive disorder of pregnancy, CVD= cardiovascular disease