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Pregnancy-associated cardiovascular risks and postpartum care; an opportunity for interventions aiming at health preservation and disease prevention

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ABSTRACT

Cardiovascular disease (CVD) is the leading cause of premature death and disability for female individuals around the world and the rates are increasing in those aged 35–44 years. Certain pregnancy complications (Pregnancy-associated Cardiovascular Risks (P-CVR))are linked to an increased risk of future CVD making pregnancy and the postpartum period as an ideal time to screen individuals for underlying, often unrecognized, cardiovascular risk factors. Pregnancy complications associated with an increased risk of future CVD including the hypertensive disorders of pregnancy, gestational diabetes, idiopathic preterm birth, delivery of a growth restricted baby and a placental abruption that leads to delivery. A number of guidelines and research groups recommend postpartum CVR screening, counseling and lifestyle intervention for all those who have had one or more of P-CVRs starting within the first six months postpartum. An individualized plan for postpartum screening should be created with the individual and lifestyle interventions discussed.

1. Cardiovascular disease in women

Cardiovascular disease (CVD) is the leading cause of premature death and disability for female individuals around the world [1] and the rates are increasing in those aged 35–44 years [2]. In addition, these individuals also exhibit increasing rates of traditional cardiovascular risk (CVR) factors (e.g. dyslipidemia, hypertension, diabetes, and obesity) which are often present years before the onset of CVD [3]; the presence of CVR factors in younger age females are important contributors to premature CVD before age 60 [4]. Therefore, early-onset CVD will pose a substantial burden on the health care system as these individuals age. In Canada, CVD accounts for $21.2 billion annually in direct healthcare costs and indirect costs from lost future productivity [5]. In the United States, the total direct cost is projected to increase by 200 % in the next 20 years [6].

Female individuals often present with more atypical symptoms of CVD [7], are more likely to be misdiagnosed [8], less likely to receive optimal treatment and are more likely to experience poorer outcomes [9]. Their cardiovascular health suffers because of male-dominated screening, diagnostic tests and treatments [10]. Many of the traditional CVR factors (e.g. smoking, diabetes, hyper-

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tension, hyperlipidemia, obesity) have differing prevalence and disproportionate effects in females compared with men [10]. Modifiable risk factors account for up to 94 % of the population-attributable risks of CVD. Therefore, the incidence of CVD can be reduced with early screening and risk identification, lifestyle modification and therapeutic intervention [11].

2. Pregnancy complications and future cardiovascular disease

In the early 2000's, the association between preeclampsia and future CVD and cardiovascular death was first reported [12,13]. It is now well documented that individuals with preeclampsia have an increased risk of overall CVD (hazard ratio (HR) 1.72, 95 % CI 1.42–2.10) [14], hypertension (relative risk (RR) 2.76, 95 % CI 1.63–4.69) [15], ischemic heart disease (HR 2.21, 95 % CI 1.73:2.84) [14], stroke (RR 1.53, 95 % CI 1.21:1.92) [15], premature cardiovascular death [16], an earlier predicted age at onset of CVD [17] and a significant decrease in cardiometabolic life expectancy [17] compared to those with a normotensive pregnancy [18]. A large number of studies have now identified that preeclampsia without severe features is associated with a small but significant increased risk of CVD and that preeclampsia with severe features, including preterm birth, fetal growth restriction, severe hypertension, and recurrence in subsequent pregnancies further increase the risk [12,18]. CVD, including subtypes of stroke, can be seen as early as the first year postpartum following a hypertensive disorders of pregnancy (HDP) including preeclampsia, eclampsia, HELLP syndrome and gestational hypertension [19]. Independent of preeclampsia, other pregnancy complications (Pregnancy-associated Cardiovascular Risks (P-CVR)) [20] are also linked to an increased risk of future CVD [21]. These P-CVRs include gestational hypertension (odds ratio (OR) 1.67, 95 % CI 1.28:2.19) [22], gestational diabetes (OR 1.68, 95 % CI 1.11:2.52) [22], low birth weight (OR 1.29, 95 % CI 0.91:1.83) [22] and placental abruption (OR 1.82, 95 % CI 1.42:2.33) [22]. Similarly, preterm birth has been associated with a higher risk for CVD mortality (OR 1.93, 95 % CI 1.83–2.03) [22].

Within a year postpartum, females with P-CVRs, compared to those with an uncomplicated pregnancy, are more likely to have underlying CVRs [23,24], putting them at higher risk of future CVD. Many studies have shown an increased incidence of hypertension following a P-CVR [19,25,26]. Within 6–12 months postpartum, more than 50 % of those with P-CVRs have treatable or early stage hypertension [27,28] based on the American Heart Association blood pressure guidelines (BP ≥ 130/80 mmHg) [29]. In addition, 18 % meet the criteria for the Metabolic Syndrome [30], a composite of CVR which increase the risk not just of CVD but also for type II diabetes.

3. Screening for cardiovascular disease after pregnancy complications

For gestational hypertension and preeclampsia, 87 % and 57 % respectively, of the risk for developing CVD can be explained by traditional CVR factors being identified after pregnancy [14]. Pregnancy has been described as a cardiovascular stress-test where the development of P-CVR can identify women at higher risk of CVD [31]. In a Swedish study of coronary computed tomography angiography screening at age 50–65, previous preeclampsia was associated with increased presence of coronary atherosclerosis and stenosis in those who otherwise had a low predicted 10-year risk of CVD [25].

A number of guidelines **(Table 1)** and research groups [21,32] recommend postpartum CVR screening, counseling and lifestyle intervention for all those who have had one or more of P-CVRs [33]. Postpartum CVR screening is a female-specific model that could reduce care inequities leading to health preservation and disease prevention. Though access to postpartum risk screening to date has been limited. There are only a few sites, primarily in North America [34], where postpartum CVR screening has been established and those are primarily based in tertiary care hospitals. And while early findings suggest improved CVR profile and/or future pregnancy outcomes [35,36], these relatively new models of care have not been adequately evaluated. The most effective mode of intervention and magnitude of benefit is uncertain.

4. Postpartum cardiovascular risk scoring

There are no risk calculators that estimate CVD designed to be used in female individuals of reproductive age and none that includes a history of P-CVRs. The creation of such a model is complicated [46]. The 2019 ACC/AHA identifies preeclampsia/eclampsia to be a risk-enhancing factor that should be taken into consideration while using the Atherosclerotic Cardiovascular Disease (ASCVD) Risk Estimator [47]. Those that are considered at "borderline risk" for CVD might therefore have an adjusted risk to advance the initiation of treatment with statins and targeted lifestyle interventions. The Systematic Coronary Risk Evaluation-2 (SCORE-2) [48] and the Framingham risk score [49] are commonly used to estimate sex-specific 10-year risk for CVD. Cardiometabolic risk scoring has also been used [17]. The International Society for the Study of Hypertension in Pregnancy [40] and the Canadian Cardiovascular Society [50] recommend that rather than a 10 year risk score, lifetime risk scores should be used due to the young age of these inidividuals. However, none of these are designed to consider the association of a history of P-CVRs and future CVD and because of their young age, will likely underestimate true risk.

Researchers have stressed the importance of reproductive history in the estimation of CVR in female individuals [46,51]. While all those who've had a P-CVR should be counselled regarding lifestyle modification, the creation of models for CVD risk scoring would be preferable to identify those that should have more targeted intervention and closer follow up.

Table 1
Summary of recommendations for postpartum care after a Hypertensive Disorder of Pregnancy (HDP) by societies.

Societies	Postpartum visit					
	Within 2 weeks	Within 3 months	Within 12 months	At 12 months and beyond	Target blood pressure	General Recommendations
American College of Obstetricians and Gynecologists, ACOG [93].	Blood pressure-check at the primary maternal care provider. Additional BP-evaluations for women with HDP in office or by e.g. remote BP-monitoring.	Individualized postpartum process with comprehensive follow up no later than 12 weeks postpartum.				A plan for postpartum care should be established by the woman and her obstetrician during prenatal care. Women with HDP should be informed about the increased risk for future CVD and undergo risk assessment during postpartum visits.
American Heart Associations, AHA [94].		CVD risk factor's check: e.g., BP, BMI, and lifestyle counseling by OB/Gyn.	CVD risk factor's check at 6 months: e.g., BP, BMI, and lifestyle counseling by the woman's primary healthcare provider.	CVD risk factor's check at 12 months: e.g., BP, BMI, and lifestyle counseling by the woman's primary healthcare provider.	**<130/80 mm Hg**	Advise that HDP is associated with a higher lifetime risk of CVD and recommend CVR assessment. Consider postpartum period as an opportunity to optimize cardiovascular health (diet, exercise, breast feeding, avoid smoking e.g.). Approaches could include mobile coaching apps, telephone education etc.
Danish Society of Obstetrics and Gynecology, DSOG [95].	Monitor blood pressure, phase out antihypertensive therapy slowly when stable under 140/90 mmHg.			All women with HDP are recommended yearly BP-measurement.	**<140/90 mm Hg**	Women should be informed about future CVD-risk, risk for repeated HDP in next pregnancy and healthy lifestyle choices should be advocated.
International Federation of Gynecology and Obstetrics, FIGO [32].	Monitor BP, titrate antihypertensive medication as needed.	BP, BMI and ECG (if available) done by obstetrician/GP. Urine ACR, serum sodium, potassium, creatinine.	BP and BMI by GP at 6-months. Urinalysis, oral glucose tolerance test, lipid profile. Counsel: CVD-risk and future pregnancy.	Postnatal women with HDP should be followed up for BP assessment every 6–12 months and CVD screening at least every 4–6 years.	Follow local recommendations	Interventions during the postpartum period should include breast feeding, lifestyle modifications, dietary, physical activity and pharmacologic interventions if needed.
International Society for the Study of Hypertension in Pregnancy, ISSHP [96].	BP should be monitored at least once. Antihypertensive treatment should be continued, with diastolic BP < 85 mmHg as target. Breast feeding is recommended.	Follow-up for all women to ensure normalization of BP, urinalysis, and laboratory tests.	6 months BP follow-up: BP-measurements >120/80 mmHg should lead to counseling regarding lifestyle interventions.	1 year CVD-screening; BP, risk factors & lifestyle. Also, LDL, triglycerides & total cholesterol, fasting b-glucose, HbA1c, CRP, and urine ACR. Annual medical review the first 5–10 years postpartum.	**<120/80 mm Hg.**	Counseling about the heightened health risks for the mother and the offspring. Calculate lifetime CVR scores (instead of 10-year). Advice about heightened risk of both recurrent HDP and delivery of a small for gestational age infant in future pregnancy.
Norwegian Society for Gynecology and Obstetrics, NGF [97].	Medical review at labor ward or by GP to ensure that BP stabilizes.	Frequency of BP-check and urinalysis depends on severity, blood pressure and co-morbidity. CVD-risk evaluation. Simple lifestyle advice.		1 year CVD-screening and evaluation of need for drug therapy. Regular medical review and blood pressure check. Every 5th year, CVD-risk evaluation, and lifestyle advice.	**130–140/80–90 mm Hg**	Advise about heightened CVR after HDP and how to reduce the risk with a healthy lifestyle. Informe about risk of recurrence of HDP in future pregnancy and how to lower the risk.

(*continued on next page*)

Table 1 (*continued*)

Societies	Postpartum visit					
	Within 2 weeks	Within 3 months	Within 12 months	At 12 months and beyond	Target blood pressure	General Recommendations
National Institute for Health and Care Excellence, NICE [98].	Offer a medical review with GP/ specialist if antihypertensive treatment is to be continued.	Medical review with GP/spec. If U-reagent-strip test shows proteinuria (1 + or more), further review to assess kidney function.			**<140/90 mm Hg**	Advise about how to reduce CVD-risk. Consider pre-pregnancy counseling about risk of HDP recurrence in future pregnancy and how to lower the risk.
Swedish Society of Obstetrics and Gynecology, SFOG [99].	Review of blood pressure 5–7 days postpartum. Medical review if ongoing antihypertensive treatment.	Postpartum follow-up by medical doctor is recommended: BP, U-reagent-strip. Advise to ask for remaining neurological symptoms after eclampsia.		If early onset- and/ or severe PE and/or repeated PE, women are remitted to GP for yearly follow-up. All women with HDP are recommended yearly BP-measurement.	**<140/90 mm Hg**	Women are informed about future CVD-risk, risk for repeated HDP in next pregnancy and lifestyle interventions are advocated.
Society of Obstetricians and Gynaecologists of Canada, SOGC [100].	BP measured at least once daily in hospital days 3–7 followed by home self-monitoring.	Screening & treatment of CVD-risk factors is individualized, and health behaviors is first-line therapy. ECG; Urinalysis; serum sodium, potassium & creatinine; fasting glucose & lipid profile.	If persistent hypertension beyond 6–12 months, investigation for secondary causes of hypertension. Antihypertensive treatment is individualized, based on CVD-risk & future reproductive plans.		**<140/90 mm Hg**	Health care centers must establish protocols to monitor, recognize and treat postpartum hypertension. May provide interventions to reduce risk of a HDP in a future pregnancy and from screening for CVR factors.
Society of Obstetric Medicine of Australia and New Zealand, SOMANZ [101].	Monitoring of blood pressure and slow withdrawal of antihypertensive therapy.	6-weeks follow up to ensure resolution of pregnancy related changes and if necessary further investigation for renal disease.		Annual blood pressure check and regular (5 yearly) assessment of CVD-risk factors including serum lipids and blood glucose.	**<140/90 mm Hg**	Counseling about the benefits of smoking cessation, regular exercise, and healthy diet. Women should receive appropriate counseling about increased risk of recurrent HDP and possible prophylactic measures.

Abbreviations: ACR, Albumin-Creatinine-Ratio; BMI, Body Mass Index; BP, Blood Pressure; CRP, C-Reactive Protein; CVD, Cardiovascular Disease; CVR, Cardiovascular Risk; ECG, Electrocardiography; Gyn, Gynecologist; GP, General Practitioner; HDP, Hypertensive Disorder of Pregnancy; LDL, Low-Density Lipoprotein; PE, Preeclampsia.

Boxes in the table were left empty when information was not provided from the society or if information given did not follow the criteria for the table.

5. Postpartum interventions to reduce the risk of future cardiovascular disease

There are limited studies investigating the effect of interventions in the postpartum period. One study investigated the effect of an online education program to increase awareness of CVR in those who had preeclampsia in the five years preceding enrolment. Compared to those who did not participate, those who did, had increased knowledge of CVR, reported healthier eating, and decreased physical inactivity [52]. Individuals with severe preeclampsia attending the *Follow-Up PreEClampsia Outpatient Clinic* demonstrated a preference for an interactive app as a tool to optimize health after pregnancy [53]. Another study, investigating patient's knowledge regarding future CVRs after a HDP, identified that those that were aware of future CVR had higher compliance to both antihypertensive treatment and follow up visits with blood pressure, blood glucose and cholesterol assessments [54]. However, they did not observe significant lifestyle changes regarding smoking, diet or exercise despite increased awareness. The result from a qualitative study from the *BP* [2]*-cohort*, where individuals receive structured interventions to engage in health optimizing activities like exercise and diet, indicated that these sort of interventions might motivate individuals to lifestyle changes in this otherwise demanding life period with a newborn [55].

6. Recommendations for postpartum follow up

Postpartum follow up visits after a P-CVR should optimally be synchronized with the newborn vaccination program, when individuals are already accessing the health care system [32]. The first year of parenthood can be overwhelming and mothers might deprioritize their own health. Visits should include maternal screening, most importantly for hypertension but hypercholesterolemia, high body mass index/appropriate weight loss postpartum and type 2 diabetes can also be important to include in the screening program [14]. As shown in Table 1, there is a heterogenicity regarding recommendations for CVR screening and interventions during the first year postpartum. The ACOG underlines the importance of making postpartum care easily accessible for these individuals. Services like app-based support or home BP monitoring [37] could improve this process and perhaps increase participation in postpartum care. Both FIGO and the AHA stress the importance of postpartum visits with CVD risk factor checked at 3, 6 and 12 months postpartum (Table 1) [32,38]. There is a consensus regarding counseling about the increased risk of recurrent HDP in a future pregnancy and encouragement for a healthy lifestyle at some point during the first year postpartum. However, recommendations on how these individuals should be monitored longer term vary between societies, demonstrating the need for further investigations on postpartum interventions and their effect on long term health. The FIGO Committee on *Impact of Pregnancy on Long-term Health* [32] recommends the use of a postpartum health record (Fig. 1) after any P-CVR.

Following delivery, the postpartum health record should be filled out together with the individual and their health care provider. If a P-CVR has occurred, specific follow up recommendations will be advised. The timing of follow ups in the first year postpartum would ideally be coordinated with the follow up of the baby. At each follow up assessment, specific physical- and/or biochemical measurements are recommended. For example, hemoglobin should be assessed at 6 weeks postpartum to detect anemia and a random urine for residual proteinuria at 3 months postpartum. There are additional tests that may be specific to a certain P-CVR. For instance, an OGTT and HbA1c should be ordered within the first six months postpartum for those with gestational diabetes. Depending on availability and national guidelines, a lipid profile can also be ordered in the first year postpartum. If any of these tests are abnormal, the postpartum health record provides individualized follow up and advice depending on type of pregnancy complication and geographical setting. In addition, as it should remain in the possession of the female individual themselves, it empowers them to be in charge of their own health and follow up.

7. Recommendations for interventions after a pregnancy associated cardiovascular risk event

7.1. Physical activity

Pregnancy and the postpartum is an opportunity for risk screening and lifestyle modification in general to improve health and wellbeing. It is a "teachable moment" [56]. There is substantial evidence that physical activity has demonstrable cardiovascular benefits [57], and in addition to diet, plays a role in attaining an appropriate weight after pregnancy [58]. International guidelines recommend 150 min of moderate-intensity physical activity or 75 min of vigorous-intensity physical activity per week [57]. In the *Nurses' Health Study*, self-identified adherence to a healthy lifestyle was associated with a lower risk of chronic hypertension in those who had a pregnancy complicated by a HDP [59]. Physical activity in a research setting, after preeclampsia, has also been shown to improve measures of cardiovascular fitness and CVRs [60,61]. Lifestyle programs that are affordable and translatable to the local setting are needed; not all individuals can afford, or have access to, a gym or a trainer. As a start to postpartum physical activity, individuals should be encouraged to walk and to gradually increase the average number of steps per day; 6000–9000 steps per day is associated with a reduction in all-cause mortality [62]. While higher step rates (walking pace) may equate to vigorous-intensity activity, it is unclear whether this has a greater effect on CVD risk over actual number of steps [62]. While certainly a cardiovascular benefit, postpartum physical activity has significant mental health and antidepressant effect [63].

By six weeks postpartum, female individuals report feeling ready to make a start at lifestyle modification [64]. Social support, in particular partner support, is an important factor in initiating and maintaining physical activity postpartum [65]. With the popularity of wearable fitness trackers (e.g. watches, smart phone apps), monitoring and promoting steps per day is a simple metric for quantifying and communication of physical activity with a health care provider. And while not all individuals may be able to afford or find these devices useful, the regular communication with, and motivation from, a health care provider is perhaps the most important piece.

7.2. Diet and nutrition

Most international dietary recommendations to improve cardiovascular health stress the importance of diet quality and micronutrients [66]. When counseling individuals about their diet, the FIGO nutrition checklist [67] for pre-pregnant/early pregnant individuals can certainly be used postpartum as well.

There is a well-established link between an unhealthy gut microbiome and the development of CVR and CVD [68,69]. The gut microbiome includes all the trillions of microorganisms, their genetic material and their metabolically active by-products that are in our gastrointestinal tract which are involved with many of our most important bodily functions and is a key component of human health. Dysbiosis (defined as an "imbalance" in the gut microbial community that is associated with disease) of the gut microbiome contributes to the development of oxidative stress and inflammation which is important in the development of cardiovascular dysfunction and CVD. A healthy gut microbiome can help to improve CVR and prevent CVD [70] and has important therapeutic implications [71].

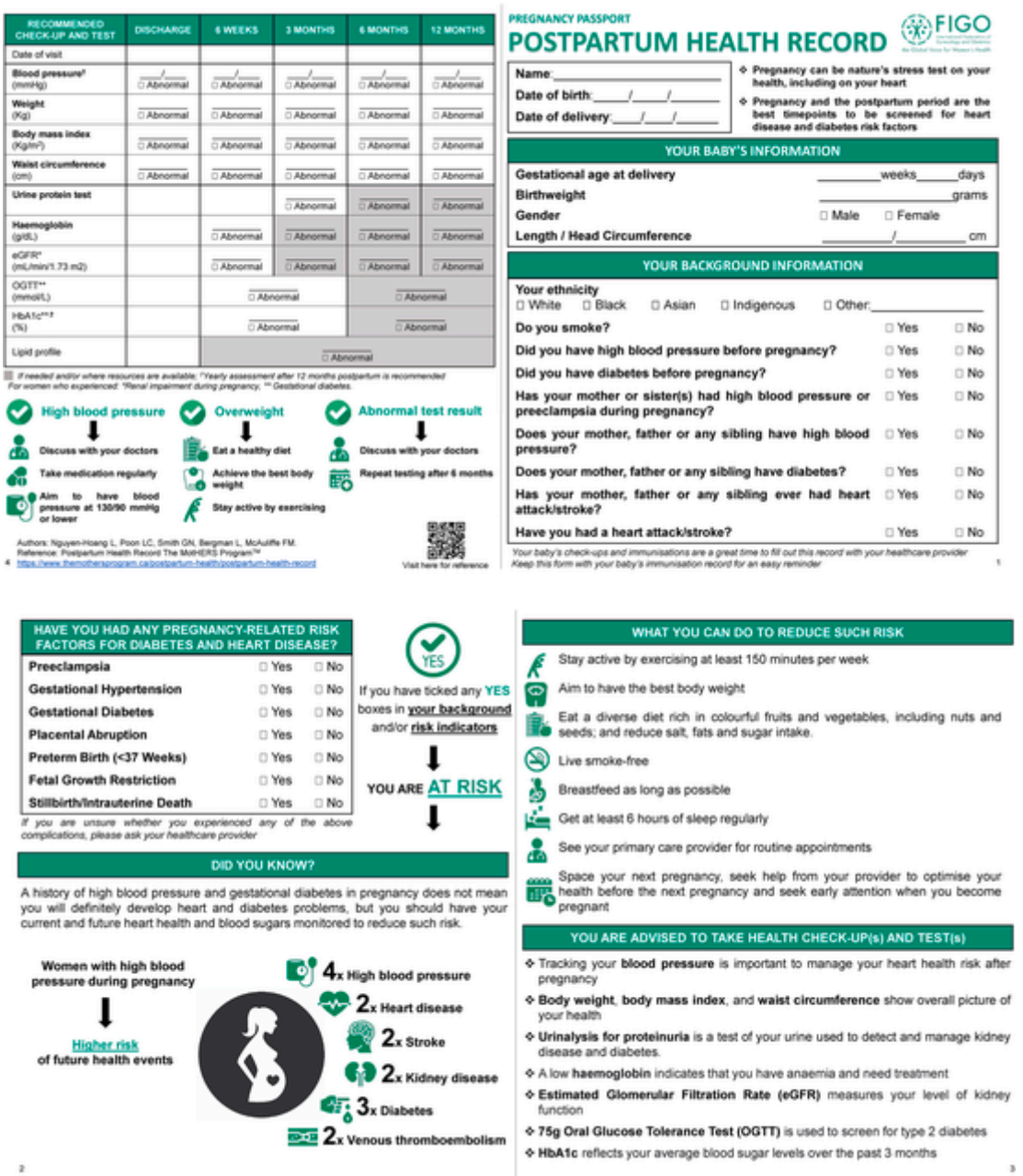

Fig. 1. International Federation of Gynecology and Obstetrics (FIGO) Pregnancy Passport Postpartum Health Record (reused with permission International Journal of Obstetrics & Gynecology (IJOG)).

We can influence the microbes that live in our gut through everything that we consume. Some microbe species prefer certain macro/micronutrients over others, so ideally we want a large number of different microbes to gain the maximal physiological health benefit [72]. In order to have as diverse a microbiome as possible, individuals should prioritize a (mostly) plant-based diet with at least thirty different plant species (defined as a fruit, vegetable, nut, seed, herb or spice) a week focusing on whole, unprocessed foods [73,74]. Unfortunately, the highly processed foods that many people regularly eat, such as fast food, premade meals, bread/wraps and pasta/white rice are low in macro/micronutrients, especially fiber, resulting in a low microbiome diversity which is associated with ill health.

The gut microbiome can be effectively targeted to improve health [75]. A diverse dietary pattern can quickly result in important compositional changes in the gut microbiome. Though some health benefits gained (specifically reduction in CVD) would take a longer time.

When discussing nutrition and diet with individuals, stress the important of a diverse diet rich in whole foods. The potential for overnutrition, undernutrition and micronutrient deficiencies can contribute to cardiometabolic ill health and needs to be highlighted [66]. It is also important to recognize food insecurity, especially in the face of rising food prices and difficulty accessing fresh fruits and vegetables.

7.3. Breast feeding and lactation

The World Health Organization recommends exclusive breastfeeding for the first six months of life [76]. And while there are real benefits to the infant, there is also well documented benefits to the mother. For those who've had an uncomplicated pregnancy, lactation is associated with a 10 % reduction in the risk of fatal and non-fatal CVD, including stroke when compared to those that didn't breastfeed [77]. Similarly, for those who had a P-CVR, increasing lactation duration significantly improved markers of cardiometabolic health that are associated with a future risk of CVD and reduced the risk of the metabolic syndrome [78]. It has been postulated that the identified CVD protection afforded by lactation may due to a reset of maternal metabolism [79]. During pregnancy, in order to create an environment to support fetal growth and development, maternal visceral fat accumulates, and insulin resistance and lipid and triglyceride levels increase. These changes appear to reverse sooner, and more completely, with lactation.

Unfortunately, those who have had a HDP have lower rates of breastfeeding initiation, duration and exclusivity compared to those with an uncomplicated pregnancy [80]. There are a number of physical (e.g. Cesarean section, preterm birth, mother-infant separation) or metabolic (e.g. obesity, diabetes, metabolic syndrome) disruptors that may impact on lactogenesis [81]. Individualized breastfeeding support has been shown to have a positive impact on breastfeeding duration and exclusivity, at least among healthy term pregnancies [82]. But in a small pilot study, a breastfeeding self-efficacy intervention also led to improved breastfeeding initiation and duration in those who had had an HDP [83]. While it is not entirely certain how lactation influences cardiometabolic health [84], all postpartum individuals, especially those with a P-CVR, should be encouraged and supported to help them achieve lactation for as long as possible [81].

7.4. Next pregnancy

Postpartum screening is an opportunity to assess risk factors and intervene to decrease the risk of a repeated complication in the next pregnancy [85]. One important goal after a P-CVR is to aim for BMI normalization or at least delaying a future pregnancy until pre-pregnancy weight has been attained [86]. Another important aspect is to space the pregnancies to reduce the risk for complications such as recurrent preterm birth [87,88]. Pre-pregnancy screening is also an opportunity to review all medications and supplements that an individual might be taking to ensure safety from a fetal development point of view. It is also an opportune time to review or change medications in a timely fashion to ensure any medical condition is well controlled prior to conception. Those with previous gestational diabetes should be encouraged to initiate diabetes diet recommendations as soon as they get pregnant to reduce the chance of another affected pregnancy. Plan should be for earlier glucose screening and potentially repeat screening. Lastly, there are a few medications specific for reducing the risk for some pregnancy complications such as low dose aspirin to reduce the risk for preeclampsia [89] and preterm birth [90] and progesterone to reduce the risk of preterm birth that should be considered [91]. Individuals should be appropriately counselled to seek health care early in pregnancy so that these interventions can be discussed [42].

8. Conclusion

Around the world, female individuals cardiovascular health should be a key health priority addressed through improved awareness, screening, prevention and intervention. This can reduce care inequities for females in general, and younger females in particular. Given the substantial costs of treating CVD, novel and innovative ways to identify who should undergo CVR screening are critical to achieve this. For the majority of females, pregnancy and the postpartum period provides a unique early window of opportunity. Risk screening models designed for those following a P-CVRs are needed. Before these are developed and validated, presence of a P-CVR should be enough to initiate appropriate follow up according to current guidelines or by using pragmatic tools such as the FIGO *Post Partum Health Record*.

One thing that has largely gone unnoticed, is that not all those who have had an uncomplicated pregnancy are without risk of future CVD and/or cardiovascular death. In a recent study looking at cardiovascular death within ten years following a pregnancy complicated by a HDP, of the uncomplicated pregnancy cohort, 0.05 % died of CVD [92]. In our own cohort studies, 17 % of those with an uncomplicated pregnancy were found to be at high risk of future CVD and 6–7% met the criteria for Metabolic Syndrome [24]. Current guidelines would not be recommending any form of screening or follow up for those individuals with an uncomplicated pregnancy, which is a missed opportunity. *Low risk is not no risk*. Clearly, we need to do a better job identifying which individuals, based on traditional, pregnancy-related and novel risk factors, should be offered postpartum CVR screening. But perhaps every female, after every pregnancy, should have a follow up blood pressure within the first six to twelve months. One wonders how many cardiovascular events and cardiovascular deaths, whether following a P-CVR or an uncomplicated pregnancy, could have been prevented if they had had postpartum CVR screening and intervention.

9. Practice points

1. Certain pregnancy complications, known as pregnancy-associated cardiovascular risks (P-CVR), are associated with an increased risk of future cardiovascular disease.
2. Pregnancy and the postpartum provide and early window of opportunity for cardiovascular risk screening for health preservation and disease prevention.
3. Pregnancy-associated cardiovascular risks include the hypertensive disorders of pregnancy, gestational diabetes, idiopathic preterm birth, delivery of a growth restricted baby and a placental abruption that leads to delivery.
4. As recommended by FIGO, an individualized plan for postpartum screening and follow up should be established with the individual at the time of delivery of their baby.
5. Support for breastfeeding, which has been shown to reduce cardiovascular risks and decrease the risk of future cardiovascular disease, should be put in place.
6. Lifestyle modification, in terms of dietary and physical activity recommendations, should be discussed and started after six weeks postpartum.
7. Blood pressure monitoring should be initiated as early as six weeks postpartum.

10. Research Agenda

There is substantial data demonstrating the association of P-CVR and the presence of underlying cardiovascular risk factors and the development of future cardiovascular disease.

Research Agenda should focus on:

1. There is no international consensus on what form postpartum screening should take and when it should start.
2. Given that the development of cardiovascular disease as an outcome measure is years in the future, surrogate markers in the form of cardiovascular risk factors are used to assess effectiveness of the interventions. Studies using hard markers of cardiovascular disease following screening/intervention in this population are needed.
3. Interventions that are known to reduce the risk of cardiovascular disease in other populations include dietary and physical activity recommendations. Specific postpartum recommendations that are readily accessible to all individuals need to be studied and established.

Uncited references

[39]; [41]; [43]; [44]; [45]; [102].

Declaration of competing interest

The authors declare no conflicts of interest except that GNS and LB do hold external peer-reviewed research grant funding related to the topic.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bpobgyn.2023.102435.

References

[1] Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392(10159):1736–88.
[2] Mosca L, Benjamin E.J, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women--2011 update: a guideline from the American Heart Association. J Am Coll Cardiol 2011;57(12):1404–23.
[3] Lee D.S, Chiu M, Manuel D.G, et al. Trends in risk factors for cardiovascular disease in Canada: temporal, socio-demographic and geographic factors. CMAJ (Can Med Assoc J) 2009;181(3–4):E55–66.
[4] Anderson T.J, Gregoire J, Pearson G.J, et al. Canadian cardiovascular society guidelines for the management of dyslipidemia for the prevention of cardiovascular disease in the adult. Can J Cardiol 2016;32(11):1263–82. 2016.
[5] Tarride J.E, Lim M, DesMeules M, et al. A review of the cost of cardiovascular disease. Can J Cardiol 2009;25(6):e195–202.
[6] Heidenreich P.A, Trogdon J.G, Khavjou O.A, et al. Forecasting the future of cardiovascular disease in the United States: a policy statement from the American Heart Association. Circulation 2011;123(8):933–44.
[7] McSweeney J.C, Cody M, O'Sullivan P, Elberson K, Moser D.K, Garvin B.J. Women's early warning symptoms of acute myocardial infarction. Circulation 2003;108(21):2619–23.
[8] Mosca L, Banka C.L, Benjamin E.J, et al. Evidence-based guidelines for cardiovascular disease prevention in women: 2007 update. Circulation 2007;115:1481–501.
[9] Canada HaSFo. 2007 report on Canadians. Health; 2007.
[10] Mulvagh S.L, Mullen K.A, Nerenberg K.A, et al. The Canadian women's heart health alliance atlas on the epidemiology, diagnosis, and management of cardiovascular disease in women - chapter 4: sex- and gender-unique disparities: CVD across the lifespan of a woman. CJC open 2022;4(2):115–32.
[11] Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modificable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004;364:937–52.
[12] Irgens H.U, Reisaeter L, Lie R.T. Long term mortality of mothers and fathers after pre-eclampsia: population based cohort study. BMJ 2001;323:1213–7.

[13] Smith G.C.S, Pell J.P, Walsh D. Pregnancy complications and maternal risk of ischaemic heart disease: a retrospective cohort study of 129,290 births. Lancet 2001;357:2002–6.
[14] Stuart J.J, Tanz L.J, Rimm E.B, et al. Cardiovascular risk factors mediate the long-term maternal risk associated with hypertensive disorders of pregnancy. J Am Coll Cardiol 2022;79(19):1901–13.
[15] Heida K.Y, Bots M.L, de Groot C.J, et al. Cardiovascular risk management after reproductive and pregnancy-related disorders: a Dutch multidisciplinary evidence-based guideline. Eur J Prev Cardiol 2016;23(17):1863–79.
[16] Bellamy L, Casas J.P, Hingorani A.D, Williams D.J. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systemic review and meta-analysis. BMJ 2007;335:974.
[17] Gladstone R.A, Pudwell J, Nerenberg K.A, Grover S.A, Smith G.N. Cardiovascular risk assessment and follow-up of women after hypertensive disorders of pregnancy:A prospective cohort study. J Obstet Gynaecol Can 2019;41(8):1157–11567.e1.
[18] Ray J.G, Vermeulen M.J, Schull M.J, Redelmeier D.A. Cardiovascular health after maternal placental syndromes (CHAMPS): population-based retrospective cohort study. Lancet 2005;366:1797–803.
[19] Leon L.J, McCarthy F.P, Direk K, et al. Preeclampsia and cardiovascular disease in a large UK pregnancy cohort of linked electronic health records: a CALIBER study. Circulation 2019;140(13):1050–60.
[20] Nerenberg K.A, Cooke C.L, Smith G.N, Davidge S.T. Optimising women's cardiovascular health after hypertensive disorders of pregnancy: a translational approach to cardiovascular disease prevention. Can J Cardiol 2021;37(12):2056–66.
[21] O'Kelly A.C, Michos E.D, Shufelt C.L, et al. Pregnancy and reproductive risk factors for cardiovascular disease in women. Circ Res 2022;130(4):652–72.
[22] Grandi S.M, Filion K.B, Yoon S, et al. Cardiovascular disease-related morbidity and mortality in women with a history of pregnancy complications. Circulation 2019;139(8):1069–79. *.
[23] Smith G.N, Walker M, Liu A, et al. A history of preeclampsia identifies women who have underlying cardiovascular risk factors. Am J Obstet Gynecol 2009; 200:58. e1-.e8 (Epub 2008 Aug 8).*.
[24] Cusimano M.C, Pudwell J, Roddy M, Cho C.K, Smith G.N. The maternal health clinic: an initiative for cardiovascular risk identification in women with pregnancy-related complications. Am J Obstet Gynecol 2014;210(5):438 e1-438 e1e9.
[25] Sederholm Lawesson S, Swahn E, Pihlsgård M, et al. Association between history of adverse pregnancy outcomes and coronary artery disease assessed by coronary computed tomography angiography. JAMA 2023;329(5):393–404.
[26] Giorgione V, Khalil A, O'Driscoll J, Thilaganathan B. Peripartum screening for postpartum hypertension in women with hypertensive disorders of pregnancy. J Am Coll Cardiol 2022;80(15):1465–76.
[27] Ackerman-Banks C.M, Grechukhina O, Spatz E, et al. Seizing the window of opportunity within 1 Year postpartum: early cardiovascular screening. J Am Heart Assoc 2022;11(8):e024443.
[28] Smith G.N, Pudwell J, Saade G.R. Impact of the new American hypertension guidelines on the prevalence of postpartum hypertension. Am J Perinatol 2019; Mar;36(4):440-442.
[29] Whelton P.K, Carey R.M, Aronow W.S, et al. ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American college of cardiology/American heart association task force on clinical practice guidelines. Hypertension 2017. 2017.
[30] Smith G.N, Pudwell J, Walker M, Wen S.W. Risk estimation of metabolic syndrome at one and three years following a pregnancy complicated by pre-eclampsia (PE-NET) ftP-ENET. J Obstet Gynaecol Can 2012;34:836–41.
[31] Smith G.N, Pudwell J, Roddy M. The Maternal Health Clinic: a new window of opportunity for early heart disease risk screening and intervention for women with pregnancy complications. J Obstet Gynaecol Can 2013;35(9):831–9.
[32] Poon L.C, Nguyen-Hoang L, Smith G.N, et al. Hypertensive disorders of pregnancy and long-term cardiovascular health: FIGO Best Practice Advice. Int J Gynaecol Obstet 2023;160(Suppl 1):22–34. *.
[33] Smith G.N, Louis J.M, Saade G.R. Pregnancy and the postpartum period as an opportunity for cardiovascular risk identification and management. Obstet Gynecol 2019;134(4):851–62.
[34] Firoz T, Nerenberg K, Praekh J, Smith G.N. Postpartum cardiometabolic clinics: survey of current practices of North American centres. International society of obstetric medicine congress. 2022. Toronto, Canada.
[35] Flatt S.B, Pudwell J, Smith G.N. Evaluation of a postpartum cardiovascular risk screening clinic: an analysis of interpregnancy and subsequent pregnancy outcomes. J Obstet Gynaecol Can 2022;44(2):157–66.
[36] Rich-Edwards J.W, Stuart J.J, Skurnik G, et al. Randomized trial to reduce cardiovascular risk in women with recent preeclampsia. J Womens Health (Larchmt) 2019.
[37] ACOG. Committee opinion No. 736: optimizing postpartum care. Obstet Gynecol 2018;131(5):e140–50.
[38] Parikh N.I, Gonzalez J.M, Anderson C.A.M, et al. Adverse pregnancy outcomes and cardiovascular disease risk: unique opportunities for cardiovascular disease prevention in women: a scientific statement from the American heart association. Circulation 2021;143(18):e902–16.
[39] Lise Hald Nielsen I.S, Vestgaard Marianne Jenlev, Persson Lisa, Storgaard Lone, Berit Woetmann Pedersen L.B.A, Johansen Marianne, et al. Hypertension og præeklampsi. 2018.
[40] Magee L.A, Brown M.A, Hall D.R, et al. The 2021 International Society for the Study of Hypertension in Pregnancy classification, diagnosis & management recommendations for international practice. Pregnancy Hypertens 2022;27:148–69.
[41] Staff A, Kvie A, et al. Hypertensive svangerskapskomplikasjoner og eklampsi. Obstetric Guidelines. The Norwegian Society for Gynecology and Obstetrics; 2020. 2020.
[42] NIfHaC Excellence, editor. Hypertension in pregnancy: diagnosis and management. NICE Guideline. NICE; 2019. 2022.
[43] Bergman L, Bremme K, Hansson S, et al. Riktlinjer för hypertonisjukdomar under graviditet, SFOG 2019-10-23. Reviderad 210121. 2019. rev 2021.
[44] Magee L.A, Smith G.N, Bloch C, et al. Guideline No. 426: hypertensive disorders of pregnancy: diagnosis, prediction, prevention, and management. J Obstet Gynaecol Can 2022;44(5). 547-71.e1.
[45] Lowe S.A.B.L, Lust K, McMahon M.R, et al. Guideline for the management of hypertensive disorders of pregnancy. Society of Obstetric Medicine of Australia and New Zealand; 2015.
[46] Grandi S.M, Smith G.N, Platt R.W. The relative contribution of pregnancy complications to cardiovascular risk prediction: are we getting it wrong? Circulation 2019;140(24):1965–7. *.
[47] Arnett D.K, Blumenthal R.S, Albert M.A, et al. ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the American college of cardiology/American heart association task force on clinical practice guidelines. Circulation 2019;140(11):e596–646. 2019.
[48] SCORE2 risk prediction algorithms: new models to estimate 10-year risk of cardiovascular disease in Europe. Eur Heart J 2021;42(25):2439–54.
[49] D'Agostino Rb Sr, Vasan R.S, Pencina M.J, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. Circulation 2008; 117(6):743–53.
[50] Pearson G.J, Thanassoulis G, Anderson T.J, et al. Canadian cardiovascular society guidelines for the management of dyslipidemia for the prevention of cardiovascular disease in adults. Can J Cardiol 2021;37(8):1129–50. 2021.
[51] Agarwala A, Michos E.D, Samad Z, Ballantyne C.M, Virani S.S. The use of sex-specific factors in the assessment of women's cardiovascular risk. Circulation 2020;141(7):592–9.
[52] Rich-Edwards J.W, Stuart J.J, Skurnik G, et al. Randomized trial to reduce cardiovascular risk in women with recent preeclampsia. J Womens Health (Larchmt) 2019;28(11):1493–504.
[53] Kókai L.L, van der Bijl M.F, Hagger M.S, et al. Needs and preferences of women with prior severe preeclampsia regarding app-based cardiovascular health promotion. BMC Wom Health 2022;22(1):427.
[54] Atkinson J, Wei W, Potenza S, et al. Patients' understanding of long-term cardiovascular risks and associated health-seeking behaviours after pre-eclampsia.

Open Heart 2023;10(1).
[55] Rossiter C, Henry A, Roberts L, et al. Optimising mothers' health behaviour after hypertensive disorders of pregnancy: a qualitative study of a postnatal intervention. BMC Publ Health 2022;22(1):1259.
[56] Phelan S. Pregnancy: a "teachable moment" for weight control and obesity prevention. Am J Obstet Gynecol 2010;135:e1–8.
[57] Arnett D.K, Blumenthal R.S, Albert M.A, et al. ACC/AHA guideline on the primary prevention of cardiovascular disease: executive summary: a report of the American college of cardiology/American heart association task force on clinical practice guidelines. Circulation 2019;140(11):e563–95. 2019.
[58] Nascimento S.L, Pudwell J, Surita F.G, Adamo K.B, Smith G.N. The effect of physical exercise strategies on weight loss in postpartum women: a systematic review and meta-analysis. Int J Obes 2014;38(5):626–35.
[59] Timpka S, Stuart J.J, Tanz L.J, Rimm E.B, Franks P.W, Rich-Edwards J.W. Lifestyle in progression from hypertensive disorders of pregnancy to chronic hypertension in Nurses' Health Study II: observational cohort study. BMJ (clinical research ed) 2017;358(8900488):j3024. bmj, 101090866.
[60] Hoedjes M, Berks D, Vogel I, et al. Effect of postpartum lifestyle interventions on weight loss, smoking cessation, and prevention of smoking relapse: a systematic review. Obstet Gynecol Surv 2010;65(10):631–52.
[61] Scholten R.R, Thijssen D.J, Lotgering F.K, Hopman M.T, Spaanderman M.E. Cardiovascular effects of aerobic exercise training in formerly preeclamptic women and healthy parous control subjects. Am J Obstet Gynecol 2014;211(5):516 e1-516 e1e11.
[62] Paluch A.E, Bajpai S, Ballin M, et al. Prospective association of daily steps with cardiovascular disease: a harmonized meta-analysis. Circulation 2023;147(2):122–31.
[63] Morres I.D, Tzouma N.A, Hatzigeorgiadis A, et al. Exercise for perinatal depressive symptoms: a systematic review and meta-analysis of randomized controlled trials in perinatal health services. J Affect Disord 2022;298(Pt A):26–42.
[64] Horn C.E, Seely E.W, Levkoff S.E, Isley B.C, Nicklas J.M. Postpartum women's experiences in a randomized controlled trial of a web-based lifestyle intervention following Gestational Diabetes: a qualitative study. J Matern Fetal Neonatal Med 2023;36(1):2194012.
[65] Saligheh M, McNamara B, Rooney R. Perceived barriers and enablers of physical activity in postpartum women: a qualitative approach. BMC Pregnancy Childbirth 2016;16(1):131.
[66] Lichtenstein A.H, Appel L.J, Vadiveloo M, et al. Dietary guidance to improve cardiovascular health: a scientific statement from the American heart association. Circulation 2021;144(23):e472–87. 2021.
[67] Killeen S.L, Donnellan N, O'Reilly S.L, et al. Using FIGO Nutrition Checklist counselling in pregnancy: a review to support healthcare professionals. Int J Gynaecol Obstet 2023;160(Suppl 1):10–21.
[68] Choroszy M, Litwinowicz K, Bednarz R, et al. Human gut microbiota in coronary artery disease: a systematic review and meta-analysis. Metabolites 2022;12(12).
[69] Qian B, Zhang K, Li Y, Sun K. Update on gut microbiota in cardiovascular diseases. Front Cell Infect Microbiol 2022;12:1059349.
[70] Pavlidou E, Fasoulas A, Mantzorou M, Giaginis C. Clinical evidence on the potential beneficial effects of probiotics and prebiotics in cardiovascular disease. Int J Mol Sci 2022;23(24).
[71] Tousoulis D, Guzik T, Padro T, et al. Mechanisms, therapeutic implications, and methodological challenges of gut microbiota and cardiovascular diseases: a position paper by the ESC Working Group on Coronary Pathophysiology and Microcirculation. Cardiovasc Res 2022;118(16):3171–82.
[72] Gilbert J.A, Blaser M.J, Caporaso J.G, Jansson J.K, Lynch S.V, Knight R. Current understanding of the human microbiome. Nat Med 2018;24(4):392–400.
[73] Spector T.D. Food for life. Jonathan Cape; 2022.
[74] McDonald D, Hyde E, Debelius J.W, et al. American gut: an open platform for citizen science microbiome research. mSystems 2018;3(3).
[75] Hernández-Calderón P, Wiedemann L, Benítez-Páez A. The microbiota composition drives personalized nutrition: gut microbes as predictive biomarkers for the success of weight loss diets. Front Nutr 2022;9:1006747.
[76] Organization) WWH. Protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services. Geneva, Switzerland: WHO Document Production Service; 2017.
[77] Tschiderer L, Seekircher L, Kunutsor S.K, Peters S.A.E, O'Keeffe L.M, Willeit P. Breastfeeding is associated with a reduced maternal cardiovascular risk: systematic review and meta-analysis involving data from 8 studies and 1 192 700 parous women. J Am Heart Assoc 2022;11(2):e022746.
[78] Yu J, Pudwell J, Dayan N, Smith G.N. Postpartum breastfeeding and cardiovascular risk assessment in women following pregnancy complications. J Womens Health (Larchmt) 2019.
[79] Stuebe A.M, Rich-Edwards J.W. The reset hypothesis: lactation and maternal metabolism. Am J Perinatol 2009;26(1):81–8. *.
[80] Burgess A, Eichelman E, Rhodes B. Lactation patterns in women with hypertensive disorders of pregnancy: an analysis of Illinois 2012-2015 pregnancy risk assessment monitoring system (PRAMS) data. Matern Child Health J 2021;25(4):666–75.
[81] Dayan N, Smith G, Nedelchev A, et al. Study protocol for the sheMATTERS study (iMproving cArdiovascular healTh in new moThERS): a randomized behavioral trial assessing the effect of a self-efficacy enhancing breastfeeding intervention on postpartum blood pressure and breastfeeding continuation in women with hypertensive disorders of pregnancy. BMC Pregnancy Childbirth 2023;23(1):68.
[82] Brockway M, Benzies K, Hayden K.A. Interventions to improve breastfeeding self-efficacy and resultant breastfeeding rates: a systematic review and meta-analysis. J Hum Lactation 2017;33(3):486–99.
[83] Dayan Ss N, Fiorda A, Ukah V, Da Costa D, Morency A.-M, Hailu E, et al. Breastfeeding and blood Pressure patterns in MOthers with recent hypertensive coMplications of pregnancy: BP-MOM Feasibility Study. Can J Cardiol 2021;37(2):e25.
[84] Lane A, Lewis C.E, Gunderson E.P. Adverse pregnancy outcomes: the missing link in discovering the role of lactation in cardiovascular disease prevention. J Am Heart Assoc 2022;11(20):e027707.
[85] Rich-Edwards J.W, McElrath T.F, Karumanchi S.A, Seely E.W. Breathing life into the lifecourse approach: pregnancy history and cardiovascular disease in women. Hypertension 2010;56(3):331–4. *.
[86] Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: a population-based study. Lancet 2006;368:1164–70.
[87] Simonsen S.E, Lyon J.L, Stanford J.B, Porucznik C.A, Esplin M.S, Varner M.W. Risk factors for recurrent preterm birth in multiparous Utah women: a historical cohort study. Bjog 2013;120(7):863–72.
[88] Kalengo N.H, Sanga L.A, Philemon R.N, Obure J, Mahande M.J. Recurrence rate of preterm birth and associated factors among women who delivered at Kilimanjaro Christian Medical Centre in Northern Tanzania: a registry based cohort study. PLoS One 2020;15(9):e0239037.
[89] Joudi N, Rode M. Aspirin in pregnancy: a review of indications, timing, dosing and efficacy. Curr Opin Obstet Gynecol 2023;35(2):94–100.
[90] Kupka E, Hesselman S, Hastie R, Lomartire R, Wikstrom A.K, Bergman L. Low-dose aspirin use in pregnancy and the risk of preterm birth: a Swedish register-based cohort study. Am J Obstet Gynecol 2023;228(3):336 e1-336 e1e9.
[91] Wennerholm U.B, Bergman L, Kuusela P, et al. Progesterone, cerclage, pessary, or acetylsalicylic acid for prevention of preterm birth in singleton and multifetal pregnancies - a systematic review and meta-analyses. Front Med 2023;10:1111315.
[92] Welters S.M, de Boer M, Teunissen P.W, et al. Cardiovascular mortality in women in their forties after hypertensive disorders of pregnancy in The Netherlands: a national cohort study. The lancet Healthy longevity 2023;4(1):e34–42.
[93] ACOG. Committee opinion No. 736: optimizing postpartum care. Obstet Gynecol 2018;131(5):e140–50.
[94] Parikh N.I, Gonzalez J.M, Anderson C.A.M, et al. Adverse pregnancy outcomes and cardiovascular disease risk: unique opportunities for cardiovascular disease prevention in women: a scientific statement from the American heart association. Circulation 2021;143(18):e902–16.
[95] Lise Hald Nielsen I.S, Vestgaard Marianne Jenlev, Persson Lisa, Storgaard Lone, Berit Woetmann Pedersen L.B.A, Johansen Marianne, et al. Hypertension og præeklampsi. 2018.
[96] Magee L.A, Brown M.A, Hall D.R, et al. The 2021 International Society for the Study of Hypertension in Pregnancy classification, diagnosis & management recommendations for international practice. Pregnancy Hypertens 2022;27:148–69.
[97] Staff A, Kvie A, et al. Hypertensive svangerskapskomplikasjoner og eklampsi. Obstetric Guidelines. The Norwegian Society for Gynecology and Obstetrics; 2020. 2020.

[98] NIfHaC Excellence, editor. Hypertension in pregnancy: diagnosis and management. NICE Guideline. NICE 2022; 2019.
[99] Bergman L, Bremme K, Hansson S, et al. Riktlinjer för hypertonisjukdomar under graviditet, SFOG 2019-10-23. Reviderad 210121. 2019. rev 2021.
[100] Magee L.A, Smith G.N, Bloch C, et al. Guideline No. 426: hypertensive disorders of pregnancy: diagnosis, prediction, prevention, and management. J Obstet Gynaecol Can 2022;44(5). 547-71.e1.
[101] Lowe S.A.B.L, Lust K, McMahon M.R, et al. Guideline for the management of hypertensive disorders of pregnancy. Society of Obstetric Medicine of Australia and New Zealand; 2015.
[102] Nguyen-Hoang L, Smith G.N, Bergman L, McAuliffe F.M, Poon L.C. The need of written information regarding health risks following a complicated pregnancy: pregnancy passport. Int J Obstet Gynecol May 2023 (In press.