

BMJ Open Patient journey during and after a pre-eclampsia-complicated pregnancy: a cross-sectional patient registry study

Rianne C Bijl ,¹ Sophie E Bangert,¹ Raj Shree ,² Alina N Brewer,^{3,4} Norlisa Abrenica-Keffer,³ Eleni Z Tsigas,³ Maria P H Koster,¹ Ellen W Seely ^{5,6}

To cite: Bijl RC, Bangert SE, Shree R, *et al.* Patient journey during and after a pre-eclampsia-complicated pregnancy: a cross-sectional patient registry study. *BMJ Open* 2022;**12**:e057795. doi:10.1136/bmjopen-2021-057795

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-057795>).

Received 29 September 2021
Accepted 28 January 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Department of Obstetrics and Gynaecology, Erasmus University Medical Centre, Rotterdam, The Netherlands

²Department of Obstetrics and Gynecology, University of Washington, Seattle, Washington, USA

³Preeclampsia Foundation, Melbourne, Florida, USA

⁴Juneau Biosciences LLC, Salt Lake City, Utah, USA

⁵Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA

⁶Harvard Medical School, Boston, Massachusetts, USA

Correspondence to

Professor Ellen W Seely;
ESEELY@bwh.harvard.edu

ABSTRACT

Objectives To gain insight into the patient journey through a pre-eclampsia-complicated pregnancy.

Design Cross-sectional patient registry study.

Setting Online patient registry initiated by the Preeclampsia Foundation.

Participants Women with a history of pre-eclampsia enrolled in The Preeclampsia Registry (TPR).

Primary and secondary outcome

measures Retrospective patient-reported experience measures concerning awareness of pre-eclampsia, timing and type of information on pre-eclampsia received, involvement in decision making regarding medical care, mental/emotional impact of the pre-eclampsia-complicated pregnancy and impact on future pregnancy planning.

Results Of 3618 TPR-participants invited to complete the Patient Journey questionnaire, data from 833 (23%) responders were available for analysis. Most responders were white (n=795, 95.4%) and lived in the USA (n=728, 87.4%). Before their pre-eclampsia diagnosis, 599 (73.9%) responders were aware of the term 'pre-eclampsia', but only 348 (43.7%) were aware of its associated symptoms. Women with a lower level of education were less likely to have heard of pre-eclampsia (OR 0.36, 95% CI 0.21 to 0.62). Around the time of diagnosis, 29.2% of responders did not feel involved in the decision making, which was associated with reporting a serious mental/emotional impact of the pre-eclampsia experience (OR 2.46, 95% CI 1.58 to 3.84). Over time, there was an increase in the proportion of women who were aware of the symptoms of pre-eclampsia (32.2% before 2011 to 52.5% after 2016; p<0.001) and in the proportion of responders stating they received counselling about the later-life health risks associated with pre-eclampsia (14.2% before 2011 to 25.6% after 2016; p=0.005).

Conclusions This study demonstrates that improved patient education regarding pre-eclampsia is needed, that shared decision making is of great importance to patients to enhance their healthcare experience, and that healthcare providers should make efforts to routinely incorporate counselling about the later-life health risks associated with pre-eclampsia.

Trial registration number NCT02020174.

INTRODUCTION

Pre-eclampsia complicates 3%–5% of pregnancies, resulting in approximately 150 000 cases per year in the USA alone.^{1 2} Pre-eclampsia often occurs unexpectedly, develops

Strengths and limitations of this study

- A structured questionnaire framework was used to assess three important domains along four critical time points during the pre-eclampsia experience.
- Comprehensive data collection allowed for detailed interpretation of patient responses considering relevant demographic and clinical characteristics.
- Temporal differences in responses were evaluated to reflect changes in patient and provider knowledge and awareness of pre-eclampsia.
- The Preeclampsia Registry is enriched for severe disease, thus experiences may not be generalisable to patients with clinically less severe forms of pre-eclampsia.
- There is inadequate racial/ethnic diversity among participants enrolled in the Preeclampsia Registry, limiting generalisability.

rapidly and has immediate high acuity impact on both mother and fetus, requiring fast and complex medical decision making. Patients with pre-eclampsia often report chronic physical complaints after childbirth (eg, headache, visual disturbances, tiredness) and are at increased risk for future cardiovascular disease and diabetes.^{3–5} Feelings of guilt, shame, lack of control and symptoms of post-traumatic stress disorder are reported more often by pre-eclampsia survivors compared with women with uncomplicated pregnancies.^{6–8} Pre-eclampsia survivors also report a poorer health-related quality of life.⁹

Health-related quality of life includes a patient's physical, emotional and social well-being in relation to a medical condition or treatment and is not just a reflection of medical outcomes (eg, morbidity), but also incorporates the subjective patient experience (eg, energy level and mood).¹⁰ While patient-centred care focuses on optimising individual patient–provider communication, even broader impact can be gained by incorporating the patient voice to identify gaps in patient knowledge and patient/provider

communication that can be targeted through research and education.^{11–13}

By evaluating a patient's journey through a critical health experience, processes worthy of amplifying and areas in need of modifications can be identified so as to improve not only the patient experience, but also the quality of the care provided.^{14 15} Recently, a study in which patients completed a questionnaire specific to well-known concerns regarding pregnancy and childbirth prior to a visit with their provider, found that this tool resulted in improved shared decision making and more personalised care.¹⁶ Given the varied clinical environments in which care for pre-eclampsia is provided, a comprehensive appraisal of the patient experience is imperative to identify common underlying elements that can be addressed to optimise the immediate and ongoing care of women with this condition. This may allow for a more proactive assessment and addressing of patients' concerns surrounding their pre-eclampsia diagnosis.

The objective of this study was to ascertain and describe the patient journey in the setting of pre-eclampsia from the patient's point of view using a structured framework. We hypothesise that a review of patient reported experiences through their journey in a pre-eclampsia-complicated pregnancy will be instructive to aspects of the care provided before, during and after this critical obstetric complication. Knowledge regarding baseline awareness of pre-eclampsia, frequency of provider counselling about pre-eclampsia before a diagnosis is established, perceived shared-decision making, reproductive planning, long-term implications and education regarding later-life complications, has the potential to serve as a guide to implement patient-centred care.

METHODS

Study population

Participants already enrolled in The Preeclampsia Registry (TPR) (<https://clinicaltrials.gov/ct2/show/NCT02020174>), who experienced a pregnancy complicated by a hypertensive disorder of pregnancy (HDP) (n=3618), were invited by email to participate in the Patient Journey Survey to retrospectively assess the patient journey (from before diagnosis, through management and delivery, and to the postdelivery period) of that pregnancy. The questionnaire was first offered January 2016, and data for this study were retrieved up to 24 November 2020. The questionnaire was only available for women who were not currently pregnant since this may initiate reporting bias.

We included participants who self-reported a history of at least one pregnancy complicated by the HDP of: pre-eclampsia, haemolysis, elevated liver enzymes, low platelets syndrome (HELLP syndrome), eclampsia or pre-eclampsia superimposed on chronic hypertension. Previous research using TPR data confirmed self-reported HDP diagnoses in 97.7% after validation with medical records in a random sample of over 200 TPR

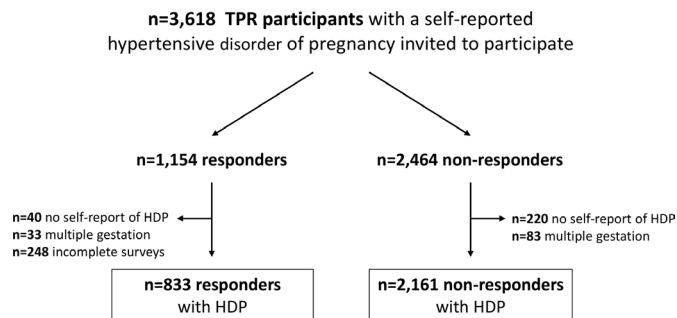


Figure 1 Flow chart of responders Patient Journey questionnaire in the Preeclampsia Registry (TPR). HDP, hypertensive disorder of pregnancy.

participants.¹⁷ Although we use the term 'pre-eclampsia' throughout this manuscript, as this was used in the survey given its familiarity with participants, it is intended to include the four above-mentioned HDPs. If a HDP recurred in subsequent pregnancies, only responses from the first HDP pregnancy were included. We excluded Patient Journey Survey responses from pregnancies with a multifetal gestation and pregnancies with gestational hypertension as the reported HDP (figure 1).

Data collection

Baseline participant characteristics, medical history and pregnancy and delivery outcomes, including year of delivery, were collected on initial enrolment in TPR.

The Patient Journey Survey was created to be at eighth grade reading level using Flesch-Kincaid grade scoring.¹⁸ The survey was chronologically structured to retrospectively query participants about their experience at critical time points along the pre-eclampsia course to systematically appraise the patient perspective (questionnaire in online supplemental material). The questions included in the questionnaire were chosen by members of TPR's Scientific Advisory Council with the inclusion of two patient representatives. The questionnaire was then tested by members of the Patient Advisory Council (PAC) and revised based on input such as relevance and clarity of questions. Questions were crafted to assess baseline awareness of pre-eclampsia, when and what type of information about the diagnosis was provided, counselling around pre-eclampsia management, with a targeted focus on shared-decision making, postdelivery management, communication and future reproductive intentions in light of this experience. Participants answered questions organised into three domains: knowledge/awareness, satisfaction and emotional impact. To capture their experience, we categorised the data into four distinct and relevant time points: before pre-eclampsia diagnosis, at the time of diagnosis and subsequent management, the immediate postpartum period and the long-term postpartum period. To account for possible temporal changes in practice patterns, we evaluated differences in responses over time by year of delivery: prior to 2011, 2011–2013, 2014–2016 and from 2017 onwards. Since the American Heart Association (AHA) published their guideline with

recognition of pre-eclampsia as a major risk factor for future cardiovascular disease in 2011, 2011 was used as a break point.¹⁹

Statistical analysis

Baseline characteristics and outcomes were expressed as number (percentage for total of given answers) and median (IQR). Trends over time by year of delivery were visualised in bar charts and evaluated by linear-by-linear association. We performed univariate logistic regression analysis and multivariate logistic regression analysis with backward selection ($p < 0.15$) to relate patient characteristics to the probability of the following outcomes: pre-eclampsia awareness before diagnosis, serious mental/emotional impact of experiencing pre-eclampsia and reproductive planning. Guided by the available literature and reasonable assumptions, we selected the following comprehensive list of covariates for inclusion into our analyses: maternal age (<25 years, 25–30 years, 30–35 years, >35 years), year of delivery (<2011, 2011–2013, 2014–2016, ≥ 2017), educational level (high school or less and/or technical/vocational school, some college, college, graduate school), parity (1, >1), perinatal loss (yes/no), caesarean delivery (yes/no), maternal intensive care unit (ICU) admission (yes/no), neonatal ICU (NICU) admission (yes/no), and gestational age at delivery (<28+0 weeks, 28+0–31+6 weeks, 32+0–36+6 weeks, $\geq 37+0$ weeks). For analyses pertaining to emotional impact and future reproductive planning, we also considered participants' reported involvement in decision making (yes/no), pre-eclampsia awareness (yes/no), knowledge of pre-eclampsia symptoms (yes/no), whether they reported if the healthcare provider conveyed the seriousness of the condition (yes/no), counselling about pre-eclampsia recurrence (yes/no) and counselling about long term health risks (yes/no).

Statistical analyses were performed using SPSS V.25.0; values of $p < 0.05$ were considered statistically significant. The number of missing values is reported per variable. Unaltered quotes from free text field answers are included as an adjunct to illustrate the results; no thematic analysis was performed.

Patient and public involvement statement

The Preeclampsia Foundation, established in 2000, is a US-based not-for-profit patient advocacy organisation with a key goal of catalysing research. It established TPR in 2013 to build a resource of data and samples intended to support this goal, and key to TPR was governance by a PAC in partnership with other stakeholders. Each member of the PAC is a pre-eclampsia survivor or a family member of a woman who suffered death or disability as the result of pre-eclampsia and are chosen through an application and screening process that ensures demographic, geographical and experiential diversity. Individuals are recruited online to TPR through social media, web searches and emailed invitations. In some instances, healthcare providers direct eligible patients to the

registry. Any questionnaire provided to registry participants is reviewed by the Scientific Advisory Council in consultation with PAC, thereby anchoring patient involvement in the design of this study. A patient representative was involved in the rationale and design of this study, helped with interpretation of the results, and coauthored this manuscript (NA-K). Results of this study will also be disseminated by the Preeclampsia Foundation to the PAC and all stakeholders, making the results available to all relevant parties.

RESULTS

Of 3618 TPR participants, 1154 (32%) initially responded to the Patient Journey Survey. After exclusion of women without self-reported HDP, multiple gestation pregnancies, and incomplete surveys, questionnaire results were available from 833 (23%) women, from here on referred to in this paper as 'responders' (figure 1). Non-responders were more often younger, non-US residents, non-white, had a lower family income and educational level, and more often delivered before 2011 (table 1).

Of the responders, median maternal age at delivery was 30 years (IQR 27–33 years), 795 (95.4%) reported being of white race, 728 (87.4%) lived in the USA and 753 (90.4%) were nulliparous at the time of their pre-eclampsia pregnancy. Caesarean delivery rates were high (542, 65.6%) and 456 infants required NICU admission (58.6%). Perinatal loss, defined as stillbirth, termination of pregnancy, or neonatal/infant demise, occurred in 87 (10.4%) cases (table 1). The median interval between delivery and Patient Journey Survey completion was 2.6 years (IQR 1.1–6.2 years).

Patient experience

Before pre-eclampsia diagnosis

Before diagnosis, 73.9% of responders reported being aware of the term 'pre-eclampsia', however, only 43.7% were aware of associated symptoms. Symptoms were present in 90.9% before diagnosis and 30.6% of these individuals waited more than 6 days before contacting a healthcare provider. If they had known more about the symptoms, 85.4% indicated they would have acted otherwise, of whom 71.5% would have sought care sooner (table 2A).

'I wish I had known what to look for. Looking back on it now, I was symptomatic for weeks.'

[24 years old, delivered at 23 weeks]

At pre-eclampsia diagnosis and subsequent management

A little over one-half of responders (58.6%) reported that the first time a healthcare professional provided any information about pre-eclampsia was at the moment they were diagnosed. Of the responders who received information about pre-eclampsia at any time, 50.2% were dissatisfied with the information provided. A total of 698 (84.9%) responders reported independently researching additional information about pre-eclampsia, mostly on

Table 1 Baseline characteristics responders and non-responders

Individual characteristics	Responders (833)	Non-responders (2161)	P value
	Median (IQR)/N (%)	Median (IQR)/N (%)	
Maternal age (years)	30 (27; 33)	29 (26; 33)	<0.001
<25	97 (11.7%)	393 (18.3%)	
25–29	265 (31.9%)	700 (32.6%)	
30–34	305 (36.7%)	744 (34.6%)	
≥35	163 (19.6%)	312 (14.6%)	
	Missing: 3	Missing: 12	
Country of residence			0.012
United States	728 (87.4%)	1796 (83.1%)	
Other	105 (12.6%)	365 (16.9%)	
	Missing: 0	Missing: 0	
Race			0.001
White	795 (95.4%)	1990 (92.1%)	
Non-white	38 (4.6%)	171 (7.9%)	
	Missing: 0	Missing: 0	
Ethnicity			0.281
Non-Hispanic	781 (94.0%)	1967 (92.9%)	
Hispanic	50 (6.0%)	151 (7.1%)	
	Missing: 2	Missing: 43	
Totally family income per year			0.020
Less than US\$25 000	66 (13.2%)	264 (18.1%)	
US\$5000–US\$99 999	259 (51.9%)	745 (51.2%)	
US\$100 000–US\$249 999	149 (29.9%)	401 (27.6%)	
US\$250 000 or more	25 (5.0%)	45 (3.1%)	
	Missing: 334	Missing: 706	
Highest level of education completed			<0.001
High school or less and technical/vocational school	74 (9.0%)	277 (13%)	
Some college	117 (14.2%)	368 (17.3%)	
College	341 (41.4%)	885 (41.7%)	
Graduate school	292 (35.4%)	593 (27.9%)	
	Missing: 9	Missing: 38	
Marital status			0.978
Married or in a relationship	795 (95.8%)	2056 (95.8%)	
Divorced/single	35 (4.2%)	90 (4.2%)	
	Missing: 3	Missing: 15	
Pregnancy details	Median (IQR) / N (%)	Median (IQR) / N (%)	P value
Parity			0.622
1	753 (90.4%)	1966 (91.0%)	
>1	80 (9.6%)	195 (9.0%)	
	Missing: 0	Missing: 0	
Mode of delivery			0.731
Vaginal birth	284 (34.4%)	747 (35.1%)	
Caesarean section	542 (65.6%)	1384 (64.9%)	
	Missing: 7	Missing: 30	
Gestational age at delivery (weeks+days)	35+2 (32+1; 38+3)	34+5 (31+1; 37+3)	0.566

Continued

Table 1 Continued

Pregnancy details	Median (IQR) / N (%)	Median (IQR) / N (%)	P value
<28+0	99 (12.2%)	266 (12.6%)	
28+0–31+6	117 (14.4%)	334 (15.8%)	
32+0–36+6	306 (37.6%)	815 (38.5%)	
≥37+0	291 (35.8%)	704 (33.2%)	
	Missing: 20	Missing: 42	
Year of delivery			<0.001
Before 2011	187 (22.4%)	623 (28.8%)	
2011–2013	174 (20.9%)	456 (21.1%)	
2014–2016	286 (34.3%)	507 (23.5%)	
From 2017 onwards	186 (22.3%)	574 (26.6%)	
	Missing: 0	Missing: 1	
Pregnancy outcome			0.238
Living child	746 (89.6%)	1931 (89.4%)	
Live birth with subsequent infant death	52 (6.2%)	119 (5.5%)	
Stillbirth(s)	33 (4.0%)	88 (4.1%)	
Miscarriage	0 (0%)	1 (0%)	
Induced pregnancy termination	2 (0.2%)	22 (1%)	
	Missing: 0	Missing: 0	
Birth weight child (grams)	2359 (1,452; 3,039)	2268 (1,406; 3,036)	0.188
	Missing=14	Missing: 56	
Maternal ICU-admittance	156 (19.6%)	413 (20.2%)	0.730
	Missing: 37	Missing: 114	
Baby admitted to the NICU	456 (58.6%)	1208 (60.6%)	0.334
	Missing: 55	Missing: 168	

ICU, intensive care unit; NICU, neonatal intensive care unit.

the internet. Of all responders, 38.1% felt that their healthcare provider did not convey the seriousness of the condition. Almost one-third (29.2%) reported that they did not feel involved in the medical decision making regarding their care, which they attributed to having a poor understanding of what was happening, lack of time before delivery, and inadequate communication from the healthcare provider (table 2B).

‘I wasn’t given any detailed information—perhaps I want more than what is normal, but I felt left out of my care to a degree.’

[22 years old, delivered at 37 weeks]

Immediately post partum

Only 30.7% of the responders indicated that they were provided with information about pre-eclampsia before being sent home and almost a third of responders (29.7%) reported not being instructed to follow up with their healthcare provider regarding their diagnosis of pre-eclampsia.

Almost half of the responders (49.0%) indicated that the experience of having pre-eclampsia seriously impacted their mental/emotional well-being, with the vast majority

reporting a negative impact (70.3%). Additionally, 49.3% reported symptoms of postpartum depression after this pregnancy, and 17.3% reported being diagnosed with postpartum depression (table 2C).

‘I felt robbed of what should have been such an amazing experience.’

[39 years old, delivered at 40 weeks]

Long-term post partum

With respect to long-term management, 36.6% of responders reported not being counselled about pre-eclampsia recurrence risk and 79.1% indicated that they did not receive any counselling regarding later-life health risks associated with pre-eclampsia. For 626 (81.3%) responders, the experience of pre-eclampsia influenced their future pregnancy planning, with 24.3% deciding not to pursue another pregnancy and 13.1% considering (or had already pursued) adoption and/or surrogacy (table 2D).

‘I will have another child, but I have this fear of dying.’

[31 years old, delivered at 38 weeks]

Differences in responses over time

A sequential increase in the proportion of positive responses over time was observed across critical parameters

Table 2 Patient journey (N=833)	
A. Before pre-eclampsia diagnosis	N (%)
Heard of pre-eclampsia	599 (73.9%)
Missing: 22	
Aware of the symptoms associated with pre-eclampsia	348 (43.7%)
Missing: 36	
Experienced any symptoms	746 (90.9%)
Missing: 12	
Symptoms length before reaching out to a healthcare provider	
<1 day	244 (37.7%)
2–5 days	206 (31.8%)
≥6 days	198 (30.6%)
Missing: 185	
Would have done anything differently if had more knowledge about symptoms	536 (85.4%)
Missing: 205	
Would have sought care sooner	383 (71.5%)
B. At pre-eclampsia diagnosis and subsequent management	N (%)
Healthcare provider asked for a family history of pre-eclampsia	248 (39.6%)
Missing: 207	
Moment at which a healthcare provider first shared information about pre-eclampsia	
During or after a previous pregnancy	15 (2.0%)
During a prenatal visit for this pregnancy	258 (33.9%)
After I was diagnosed with pre-eclampsia in this pregnancy	356 (46.8%)
After delivery in this pregnancy	64 (8.4%)
At discharge from the hospital	3 (0.4%)
During a postpartum check-up after this pregnancy	12 (1.6%)
Sometime later	11 (1.4%)
Never	42 (5.5%)
Missing: 72	
Satisfied with the provided information	325 (49.8%)
Missing: 180	
Researched pre-eclampsia by themselves	698 (84.9%)
Missing: 11	
Healthcare provider conveyed the seriousness of the condition	
Yes	460 (61.9%)
No, even though it was serious	283 (38.1%)
Missing: 90	
Degree of mental or emotional impact of pre-eclampsia diagnosis	
No Impact	26 (3.1%)

Continued

Table 2 Continued	
B. At pre-eclampsia diagnosis and subsequent management	N (%)
Minimal Impact	96 (11.6%)
Some Impact	321 (38.8%)
Serious Impact	385 (46.5%)
Missing: 5	
Healthcare provider indicated why delivery was necessary	751 (93.1%)
Missing: 26	
Did not feel involved in making decisions	212 (29.2%)
Missing: 107	
Reasons why women felt not involved (Multiple answers possible)	
I was unconscious or in a coma	10 (4.7%)
I was 'out of it'	65 (30.7%)
I did not understand what was happening	86 (40.6%)
There was no time before delivery	62 (29.2%)
I did not want to be involved	0
My family was involved instead of me	20 (9.4%)
Inadequate communications from healthcare provider(s)	86 (40.6%)
Other	28 (13.2%)
C. Immediately post partum	N (%)
Provided with information about pre-eclampsia before being sent home	220 (30.7%)
Missing: 116	
Instructed to follow-up with a healthcare provider regarding pre-eclampsia	543 (70.3%)
Missing: 61	
Degree of mental or emotional impact	
No Impact	38 (4.6%)
Minimal Impact	76 (9.2%)
Some Impact	308 (37.2%)
Serious Impact	406 (49.0%)
Missing: 5	
Pregnancy negatively affected the emotional/ psychological well-being	565 (70.3%)
Missing: 29	
Believed they had postpartum depression	382 (49.3%)
Missing: 58	
Officially diagnosed with postpartum depression	131 (17.3%)
Missing: 74	
D. Long-term post partum	N (%)
Counselled about the risk of having pre-eclampsia in future pregnancies	505 (63.4%)
Missing: 36	

Continued

Table 2 Continued

D. Long-term post partum	N (%)
Counselled about later-life health risks associated with pre-eclampsia	165 (20.9%)
Missing: 43	
Pre-eclampsia affected relationship with family or friends	392 (54.2%)
Missing: 110	
How did pre-eclampsia affect the relationship with your partner?	
For the better	163 (41.6%)
For the worse	97 (24.7%)
Both for the better and worse	132 (33.7%)
Missing: 0	
Influenced decision to become pregnant again	
My decision to become pregnant again has not been influenced	144 (18.7%)
My decision to become pregnant again has been influenced	626 (81.3%)
I wanted more children but decided not to have another pregnancy	187 (24.3%)
I am considering (or already pursued) adoption and/or surrogacy	101 (13.1%)
I will seek (or already sought) preconception counselling by a high risk pregnancy specialist	246 (31.9%)
If I get pregnant I will be seen by a specialist at that point	217 (28.2%)
With time my perspective on this question has changed	150 (19.5%)
Other	143 (18.6%)
Missing: 63	

Indentations: this question only applies when a specific answer was given to the previous question; percentages are provided for total of given answers.

(figure 2A–D). Of responders who delivered before 2011, only 32.2% reported being aware of the symptoms of pre-eclampsia before diagnosis, which increased to 52.5% in those who delivered after 2016 (figure 2A, $p < 0.001$). Of the responders who delivered before 2011, 60.5% felt involved in the decision making about their care, which increased to 77.1% after 2016 (figure 2B, $p < 0.001$). Also, an increase was seen in the percentage who reported receiving instructions to follow up with their healthcare provider regarding their diagnosis of pre-eclampsia: from 52.1% in the period before 2011 to 85.0% after 2016 (figure 2C, $p < 0.001$). A small, but still significant, increase was observed in the proportion of responders indicating that they were counselled about the later-life health risks associated with pre-eclampsia (14.2% before 2011 to 25.6% after 2016) (figure 2D, $p = 0.005$). No significant

interaction was observed between year of delivery and the interval between delivery and survey completion.

Associations between patient characteristics and outcomes

Results of univariate logistic regression analysis are reported in online supplemental table 1 and the results of the multivariate analysis are reported in table 3. Responders who delivered before 2011 and those with only high school or vocational training were less likely to have been aware of pre-eclampsia before their diagnosis compared with responders who delivered after 2016 (OR 0.28, 95% CI 0.17 to 0.47) and those with college level education (OR 0.36, 95% CI 0.21 to 0.62), respectively. Graduate level education was associated with a higher likelihood of being aware of pre-eclampsia (OR 2.05, 95% CI 1.35 to 3.11) (table 3A).

Perinatal loss (OR 8.26, 95% CI 3.06 to 22.38), NICU admission (OR 1.81, 95% CI 1.19 to 2.76) and not feeling involved in the decision making about their care (OR 2.46, 95% CI 1.58 to 3.84) were all independently associated with the pre-eclampsia experience having a serious impact on the responders' mental/emotional well-being (table 3B).

Responders over the age of 35 years at delivery (OR 1.72, 95% CI 1.02 to 2.89; reference group 25–30 years) and who were multiparous (OR 1.80, 95% CI 1.02 to 3.18) were more likely to decide not to pursue another pregnancy. Conversely, responders who experienced perinatal loss were less likely to avoid future pregnancies (OR 0.20, 95% CI 0.06 to 0.64) (table 3C).

DISCUSSION

Main findings

In this study of women with a history of pre-eclampsia, we describe the patient journey before, during and after diagnosis. In our study population, knowledge about pre-eclampsia improved over time, but still more than half of the responders were unaware of the associated symptoms before diagnosis. Experiencing pre-eclampsia had a notable mental/emotional impact and women who did not feel involved in medical decision making were twice as likely to report a serious negative impact. Moreover, a quarter of the responders desired more children, but elected not to pursue another pregnancy due to the pre-eclampsia experience. Most responders were instructed to follow up with their healthcare provider regarding pre-eclampsia after discharge, however, counselling about related future health risks was reported in only a quarter of the population, despite the evidence supporting an increase in risk for cardiovascular disease in women with prior pre-eclampsia.^{4 20} Although several assessed parameters had more positive responses with more recent deliveries, results from this study demonstrate concrete areas for improved patient–provider communication.

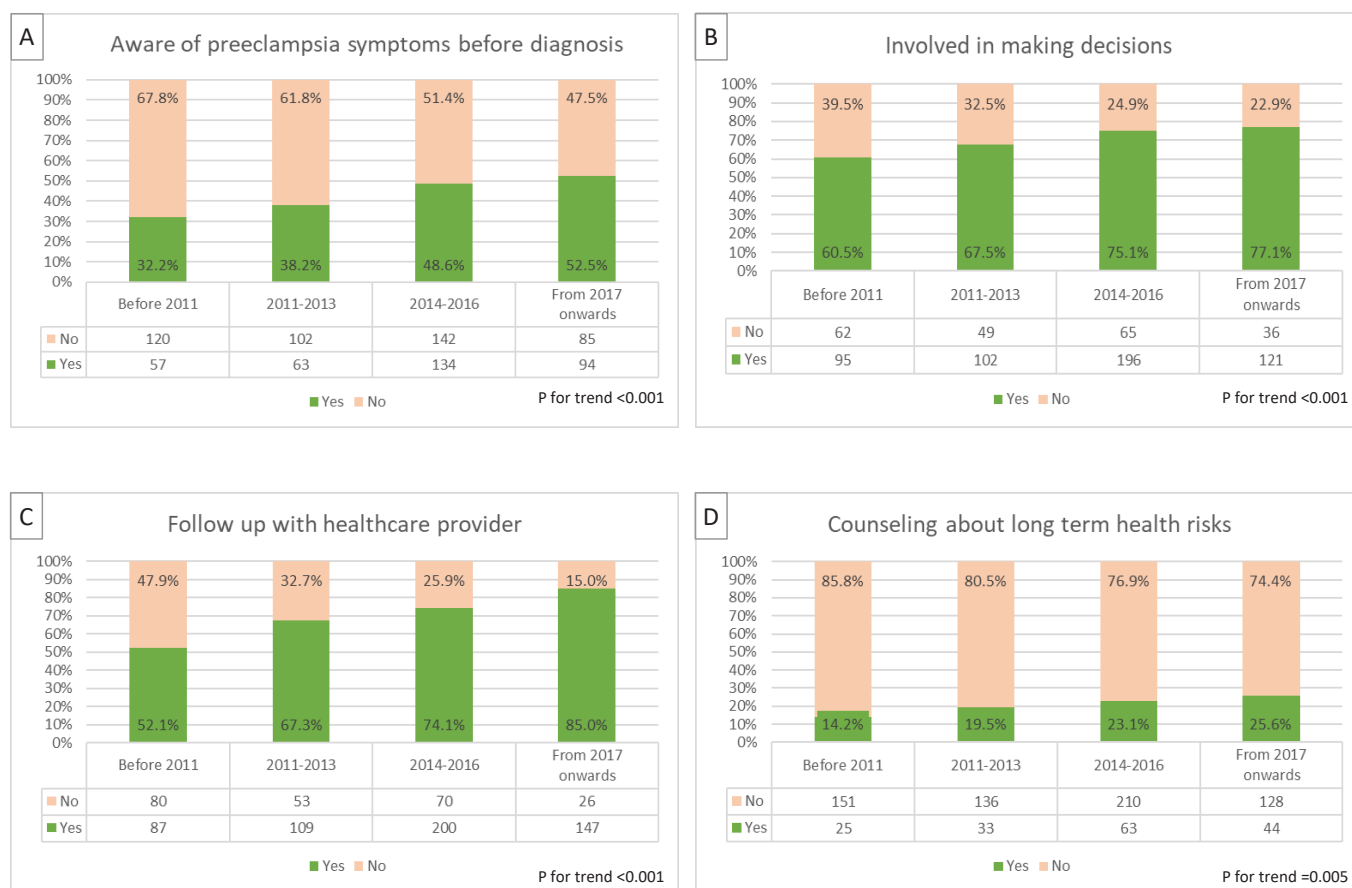


Figure 2 Differences in responses over time. (A) Were you aware of the symptoms associated with pre-eclampsia before you were diagnosed with pre-eclampsia in this pregnancy? (B) Did you feel that you were adequately involved in making decisions about your care? (C) Were you instructed to follow up with your healthcare provider regarding your diagnosis of pre-eclampsia? (D) Did anyone speak to you about the potential long-term health consequences as a result of pre-eclampsia?

Comparison with literature

The perceived lack of knowledge regarding the symptoms associated with pre-eclampsia is in accordance with other, smaller studies.^{21 22} Approximately 85% of responders in our study indicated that they would have acted differently and, for example, sought medical care earlier, had they known more about pre-eclampsia, highlighting the importance of better patient education. We also found that patient-specific characteristics, such as education level, influenced the likelihood of having heard of pre-eclampsia and its symptoms. Given that easily accessible and reliable tools to predict pre-eclampsia, especially in nulliparous women, remain elusive,²³ education regarding pre-eclampsia should be provided to all obstetric patients and the development of education tools should take these patient level factors into consideration.

Our finding of a significant association between not feeling involved in the medical decision making and experiencing a more serious mental/emotional impact from the pre-eclampsia-complicated pregnancy is in

line with the principles of patient-centred healthcare.¹¹ Indeed, patient reported outcomes are substantively important in judging the quality of care, along with purely medical outcomes. As a new pre-eclampsia diagnosis may require urgent action, comprehensive involvement of the patient in shared-decision-making may not always be feasible. This potential constraint, however, underscores the need for rigorous and effective communication. Importantly, inadequate communication was one of the most commonly mentioned reasons for not feeling involved in obstetrical care (40.6%). This lack of effective communication during a stressful event may contribute to feelings of being unprepared, adding to a lingering dissatisfaction conveyed by the women included in our study, even several years after the HDP pregnancy. Shared decision making is positively associated with patient satisfaction,²⁴ and our results suggest that effective communication by the healthcare team can crucially augment the patient experience with a pre-eclampsia pregnancy.

Table 3 Associations between patient characteristics and outcomes

A. Heard of pre-eclampsia before first diagnosis			
	OR	95% CI	P value
Year of delivery			
<2011	0.28	0.17 to 0.47	<0.001
2011–2013	0.64	0.37 to 1.11	0.111
2014–2016	0.66	0.40 to 1.09	0.106
≥2017	ref		
Highest level of education completed			
High school or less and technical/vocational school	0.36	0.21 to 0.62	<0.001
Some college	0.72	0.45 to 1.16	0.182
College	ref		
Graduate school	2.05	1.35 to 3.11	0.001
Multiparity	1.65	0.88 to 3.08	0.118
B. Serious mental/emotional impact			
	OR	95% CI	P value
Year of delivery			
<2011	0.89	0.49 to 1.64	0.718
2011–2013	0.54	0.29 to 1.02	0.056
2014–2016	1.20	0.70 to 2.05	0.508
≥2017	ref		
Perinatal loss	8.26	3.06 to 22.28	<0.001
Caesarean section	0.7	0.45 to 1.09	0.112
Baby admitted to the NICU	1.81	1.19 to 2.76	0.006
Not involved in making decisions	2.46	1.58 to 3.84	<0.001
C. Family planning: wanted more children but decided not to pursue another pregnancy			
	OR	95% CI	P value
Maternal age (years)			
<25	0.57	0.27 to 1.19	0.134
25–29	ref		
30–34	1.07	0.68 to 1.68	0.773
≥35	1.72	1.02 to 2.89	0.040
Multiparity	1.80	1.02 to 3.18	0.041
Gestational age at delivery (weeks+days)			
<28+0	2.00	0.94 to 4.26	0.072
28+0–31+6	1.72	0.98 to 3.01	0.057
32+0–36+6	1.11	0.72 to 1.72	0.632
≥37+0	ref		
Perinatal loss	0.20	0.06 to 0.64	0.007

A. Covariates removed by backward selection: maternal age.

B. Covariates removed by backward selection: gestational age, parity, maternal age, maternal intensive care admittance, healthcare provider conveyed the seriousness of the condition, aware of pre-eclampsia symptoms before diagnosis, heard of pre-eclampsia before diagnosis.

C. Covariates removed by backward selection: child admitted to neonatal intensive care unit, counseled about risk of experiencing pre-eclampsia in future pregnancies, maternal intensive care admittance.

Results are from multivariate logistic regression analysis. NICU, neonatal intensive care unit.

In 2011, the AHA recognised pre-eclampsia as a major risk factor for future cardiovascular disease, recommending an annual cardio-metabolic assessment.^{19 25 26}

Despite these recommendations, only 25.6% of women in our study who delivered after 2011 were counselled about these long-term risks. A German study from 2013 found that, although the majority of obstetricians were aware of the higher risk of cardiovascular disease after pre-eclampsia, knowledge of current guidelines among these physicians was low, suggesting that improved evidence-based counselling is needed in geographically diverse locations.²⁷ Previous research showed that, even when obstetricians are aware of the long term effects of pre-eclampsia, they often do not take action on management to reduce risk.²⁸ Most women in our cohort were instructed to follow-up with their healthcare provider regarding their HDP diagnosis, suggesting that most providers are aware of the possibility for postpartum complications, but they may not have appropriate guidance regarding who is responsible for the long-term counselling and the optimal timing to inform women of these specific risks. To meet these needs, individual healthcare systems should develop evidence-based care pathways and processes for transition of care that are in line with the local healthcare landscape.

Strengths and limitations

We used a large patient cohort with structured and comprehensive data collection, allowing for detailed interpretation of patient responses in light of relevant demographic and clinical characteristics. Our ability to incorporate temporal differences in responses is also important given the rapidly changing landscape of pre-eclampsia research and awareness. Importantly, patient involvement at the time of study design allowed for appropriate centring of the core concepts of the survey and for them to be in line with relevant metrics. Self-report of the diagnosis of pre-eclampsia was proven to be very accurate, since prior work through TPR has confirmed excellent concordance between patient-reported diagnoses and those confirmed by medical record review.¹⁷ Since TPR is an initiative by the Preeclampsia Foundation, patient involvement in TPR design and data use is the basis of TPR and this paper.

Our study is not without limitations. First, given the relatively low response rate, selection bias and lack of representation are a concern as almost all women in our study were non-Hispanic white and highly educated. At 18.5%, Hispanic individuals make up the largest minority in the United States, but only 6% of responders self-identified as Hispanic in our study.²⁹ TPR and the Patient Journey Survey are not available in Spanish, possibly contributing to this lack of representation. Significant differences between responders and non-responders (ie, age, country of residence, racial background, family income and educational level) were observed, thus limiting incorporation of experiences across populations. Further evaluation of the specific experience of adolescent women (under 20 years of age) was not feasible in our cohort, since only 11.7% of responders were under 25 years of age and, of those, only 12 (1.4%) were under the age of 20 years. Other



patient characteristics, such as living in a rural area, living under financial stress or experiencing intimate partner violence, may also impact the patient journey during and after pre-eclampsia. These factors should be addressed in future studies evaluating the social context of experiencing pregnancy complications. Also, whether a family history of pre-eclampsia impacts the patient experience, remains to be explored. The relatively low response rate that may have impacted the lack of representation of all population groups, could be due to the degree of literacy that is necessary to fill out the survey. For further research on this topic, the survey should be evaluated, and potentially rephrased, at a lower level of literacy. Additionally, TPR is notably enriched for severe disease, as indicated by 12.2% of responders who delivered before 28 weeks gestation and 10.4% of responders who experienced perinatal loss. Thus, the experiences of included participants may not be generalisable to patients with clinically less severe forms of pre-eclampsia.

Second, recall bias may have influenced results given the interval from delivery to survey completion (median 2.6 years). As such, for virtually all questions, 'I don't know' or 'I'm not sure' were included as answer options. Literature, however, suggests that emotionally stirring life events are unlikely to be forgotten and that the memory of these events is accurate.^{30 31}

Conclusion and future perspectives

By providing a comprehensive insight into the patient journey before, during and after a pre-eclampsia pregnancy, this study adds to a growing body of literature establishing the importance of a patient-centred approach to healthcare. In our study population of women with a prior pre-eclampsia pregnancy, a large proportion reported being unaware of this condition and its associated symptoms prior to diagnosis and many indicated not feeling involved in the decision making regarding their care. In turn, they noted that their pre-eclampsia experience had a serious negative impact on their mental/emotional well-being and influenced their future pregnancy planning. Counselling regarding the long-term health risks associated with pre-eclampsia was reported to occur infrequently. This systematic assessment of the patient perspective through a pre-eclampsia-complicated pregnancy provides invaluable insights to catalyse enhanced education, communication and counselling for this common obstetric complication associated with significant morbidity. Also, our results emphasise the importance of addressing mental health in women who experience pre-eclampsia. Future research should be replicated in a more diverse population. Such knowledge can help develop targeted tools for improving the experienced patient journey and augmenting pre-eclampsia knowledge based on community level characteristics. Counselling regarding postpartum complications and follow-up clearly needs to be initiated by obstetric providers. Mechanisms to support ongoing counselling and management of this population at risk for long-term

morbidity are best established at the local level, however, blueprints from successful programmes in current practice can be leveraged and tailored to regional needs.^{32–35}

Twitter Eleni Z Tsigas @Eleni_Z_Tsigas

Contributors RS, EZT, MPHK and EWS designed this study. ANB collected the data. Analysis and interpretation of the data was performed by RCB, SEB, RS, MPHK and EWS. RCB, SEB and RS wrote the first draft of the manuscript. Critical feedback was provided by ANB, NA-K, EZT, MPHK and EWS. EWS will act as the guarantor of this study. All authors contributed to reviewing and editing the manuscript.

Funding This work was financially supported by rEVO Biologics, Inc (grant number is not applicable) and the Peter Joseph Pappas Fund (grant number is not applicable).

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval The study protocol regarding the Patient Journey was exempted from IRB approval by Chesapeake IRB (now Advarra Institutional Review Board) (Protocol number Pro00015703). The study protocol regarding TPR was approved by Chesapeake IRB (now Advarra Institutional Review Board) (Pro00008369). All participants provided written informed consent at enrollment with TPR through an online process.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. Data that support the findings of this work are available on reasonable request from the corresponding author.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Rianne C Bijl <http://orcid.org/0000-0002-0914-3206>

Raj Shree <http://orcid.org/0000-0002-2747-2097>

Ellen W Seely <http://orcid.org/0000-0002-4425-1878>

REFERENCES

- 1 Ananth CV, Keyes KM, Wapner RJ. Pre-eclampsia rates in the United States, 1980-2010: age-period-cohort analysis. *BMJ* 2013;347:f6564.
- 2 Martin JA, Hamilton BE, Osterman MJK. Births: final data for 2018. *Natl Vital Stat Rep* 2019;68:1–47.
- 3 Roes EM, Raijmakers MT, Schoonenberg M, et al. Physical well-being in women with a history of severe preeclampsia. *J Matern Fetal Neonatal Med* 2005;18:39–45.
- 4 Bellamy L, Casas J-P, Hingorani AD, et al. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis. *BMJ* 2007;335:974.
- 5 Stuart JJ, Tanz LJ, Missmer SA, et al. Hypertensive disorders of pregnancy and maternal cardiovascular disease risk factor development: an observational cohort study. *Ann Intern Med* 2018;169:224–32.
- 6 PreeclampsiaFoundation. Our stories: preeclampsia Foundation, 2021. Available: <https://www.preeclampsia.org/our-stories>
- 7 Kidner MC, Flanders-Stepans MB. A model for the HELLP syndrome: the maternal experience. *J Obstet Gynecol Neonatal Nurs* 2004;33:44–53.
- 8 Hoedjes M, Berks D, Vogel I, et al. Symptoms of post-traumatic stress after preeclampsia. *J Psychosom Obstet Gynaecol* 2011;32:126–34.

- 9 Hoedjes M, Berks D, Vogel I, *et al.* Poor health-related quality of life after severe preeclampsia. *Birth* 2011;38:246–55.
- 10 Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's Healthy Days Measures - population tracking of perceived physical and mental health over time. *Health Qual Life Outcomes* 2003;1:37.
- 11 Porter ME. What is value in health care? *N Engl J Med* 2010;363:2477–81.
- 12 Kingsley C, Patel S. Patient-reported outcome measures and patient-reported experience measures. *BJA Education* 2017;17:137–44.
- 13 Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open* 2013;3:e001570.
- 14 Trebble TM, Hansi N, Hydes T, *et al.* Process mapping the patient journey: an introduction. *BMJ* 2010;341:c4078.
- 15 Coulter A, Locock L, Ziebland S, *et al.* Collecting data on patient experience is not enough: they must be used to improve care. *BMJ* 2014;348:g2225.
- 16 Depla AL, Ernst-Smelt HE, Poels M, *et al.* A feasibility study of implementing a patient-centered outcome set for pregnancy and childbirth. *Health Sci Rep* 2020;3:e168.
- 17 Gammill HS, Chettier R, Brewer A, *et al.* Cardiomyopathy and preeclampsia. *Circulation* 2018;138:2359–66.
- 18 Flesch R. A new readability yardstick. *J Appl Psychol* 1948;32:221–33.
- 19 Mosca L, Benjamin EJ, 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;57:1404–23.
- 20 Okoth K, Chandan JS, Marshall T, *et al.* Association between the reproductive health of young women and cardiovascular disease in later life: umbrella review. *BMJ* 2020;371:m3502.
- 21 You WB, Wolf M, Bailey SC, *et al.* Factors associated with patient understanding of preeclampsia. *Hypertens Pregnancy* 2012;31:341–9.
- 22 Wilkinson J, Cole G. Preeclampsia knowledge among women in Utah. *Hypertens Pregnancy* 2018;37:18–24.
- 23 Gestational hypertension and preeclampsia: ACOG practice Bulletin, number 222. *Obstet Gynecol* 2020;135:e237–60.
- 24 Glass KE, Wills CE, Holloman C, *et al.* Shared decision making and other variables as correlates of satisfaction with health care decisions in a United States national survey. *Patient Educ Couns* 2012;88:100–5.
- 25 Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' Task Force on Hypertension in Pregnancy. *Obstet Gynecol* 2013;122:1122–31.
- 26 Bushnell C, McCullough LD, Awad IA, *et al.* Guidelines for the prevention of stroke in women: a statement for healthcare professionals from the American heart Association/American stroke association. *Stroke* 2014;45:1545–88.
- 27 Heidrich M-B, Wenzel D, von Kaisenberg CS, *et al.* Preeclampsia and long-term risk of cardiovascular disease: what do obstetrician-gynecologists know? *BMC Pregnancy Childbirth* 2013;13:61.
- 28 Wilkins-Haug L, Celi A, Thomas A, *et al.* Recognition by women's health care providers of long-term cardiovascular disease risk after preeclampsia. *Obstet Gynecol* 2015;125:1287–92.
- 29 U.S. Census Bureau. QuickFacts United States, 2019. Available: <https://www.census.gov/quickfacts/fact/table/US/PST045219>
- 30 Shapiro J. Illness narratives: reliability, authenticity and the empathic witness. *Med Humanit* 2011;37:68–72.
- 31 van Giezen AE, Arensman E, Spinhoven P, *et al.* Consistency of memory for emotionally arousing events: a review of prospective and experimental studies. *Clin Psychol Rev* 2005;25:935–53.
- 32 Celi AC, Seely EW, Wang P, *et al.* Caring for women after hypertensive pregnancies and beyond: implementation and integration of a postpartum transition clinic. *Matern Child Health J* 2019;23:1459–66.
- 33 Seely EW, Celi AC, Chausmer J, *et al.* Cardiovascular health after preeclampsia: patient and provider perspective. *J Womens Health* 2021;30:305–13.
- 34 Benschop L, Duvekot JJ, Versmissen J, *et al.* Blood pressure profile 1 year after severe preeclampsia. *Hypertension* 2018;71:491–8.
- 35 Smith GN, 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;35:831–9.