BJOG An International Journal of Obstetrics and Gynaecology

DOI: 10.1111/1471-0528.16319
www.bjog.org

General obstetrics

A core outcome set for pre-eclampsia research: an international consensus development study

JMN Duffy,[a,b] AE Cairns,[b] D Richards-Doran,[b] J van 't Hooft,[c] C Gale,[d] M Brown,[e] LC Chappell,[f] WA Grobman,[g] R Fitzpatrick,[h] SA Karumanchi,[i] A Khalil,[j] DN Lucas,[k] LA Magee,[f] BW Mol,[l] M Stark,[m] S Thangaratinam,[n] MJ Wilson,[o] P von Dadelszen,[f] PR Williamson,[p] S Ziebland,[b] RJ McManus,[b] the International Collaboration to Harmonise Outcomes for Pre-eclampsia (iHOPE)*

[a] Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK [b] Institute for Women's Health, University College London, London, UK [c] Department of Obstetrics and Gynaecology, Amsterdam UMC, Academic Medical Centre, Amsterdam, The Netherlands [d] Academic Neonatal Medicine, Imperial College London, London, UK [e] Department of Renal Medicine, St George Hospital and University of New South Wales, Kogarah, NSW, Australia [f] Department of Women and Children's Health, School of Life Course Sciences, King's College London, London, UK [g] Department of Obstetrics and Gynecology, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA [h] Health Services Research Unit, Nuffield Department of Population Health, University of Oxford, Oxford, UK [i] Cedars-Sinai Medical Center, Los Angeles, CA, USA [j] Vascular Biology Research Centre, Molecular and Clinical Sciences Research Institute, St George's University of London, London, UK [k] London North West University Healthcare NHS Trust, Harrow, UK [l] Department of Obstetrics and Gynaecology, Monash University, Clayton, Vic., Australia [m] Department of Obstetrics and Gynaecology, University of Adelaide, Adelaide, SA, Australia [n] Women's Health Research Unit, Barts and the London School of Medicine and Dentistry, London, UK [o] School of Health and Related Research, University of Sheffield, Sheffield, UK [p] MRC North West Hub for Trials Methodology Research, Department of Biostatistics, University of Liverpool, Liverpool, UK

Correspondence: JMN Duffy, Nuffield Department of Primary Care Health Sciences, Radcliffe Primary Care Building, Radcliffe Observatory Quarter, Woodstock Road, University of Oxford,Oxford OX2 6GG, UK. Email: james.duffy3@nhs.net

Accepted 11 May 2020. Published Online 21 June 2020.

This article includes Author Insights, a video abstract available at https://vimeo.com/rcog/authorinsights16319

Objective To develop a core outcome set for pre-eclampsia.

Design Consensus development study.

Setting International.

Population Two hundred and eight-one healthcare professionals, 41 researchers and 110 patients, representing 56 countries, participated.

Methods Modified Delphi method and Modified Nominal Group Technique.

Results A long-list of 116 potential core outcomes was developed by combining the outcomes reported in 79 pre-eclampsia trials with those derived from thematic analysis of 30 in-depth interviews of women with lived experience of pre-eclampsia. Forty-seven consensus outcomes were identified from the Delphi process following which 14 maternal and eight offspring core outcomes were agreed at the consensus development meeting. Maternal core outcomes: death, eclampsia, stroke, cortical blindness, retinal detachment, pulmonary oedema, acute kidney injury, liver haematoma or rupture, abruption, postpartum haemorrhage, raised liver enzymes, low platelets, admission to intensive care required, and intubation and ventilation. Offspring core outcomes: stillbirth, gestational age at delivery, birthweight, small-for-gestational-age, neonatal mortality, seizures, admission to neonatal unit required and respiratory support.

Conclusions The core outcome set for pre-eclampsia should underpin future randomised trials and systematic reviews. Such implementation should ensure that future research holds the necessary reach and relevance to inform clinical practice, enhance women's care and improve the outcomes of pregnant women and their babies.

Keywords Consensus development study, core outcome set, modified Delphi method, modified nominal group technique, outcome reporting bias, pre-eclampsia.

Tweetable abstract 281 healthcare professionals, 41 researchers and 110 women have developed #preeclampsia core outcomes @HOPEoutcomes @jamesmnduffy. [Correction added on 29 June 2020, after first online publication: the order has been corrected.]

Linked article This article is commented on by Beune et al, p. 1527 in this issue. To view this mini commentary visit https://doi.org/10.1111/1471-0528.16419

*The members of the International Collaboration to Harmonise Outcomes for Pre-eclampsia (iHOPE) are listed in Appendix 1.

Please cite this paper as: Duffy JMN, Cairns AE, Richards-Doran D, van 't Hooft J, Gale C, Brown M, Chappell LC, Grobman WA, Fitzpatrick R, Karumanchi SA, Khalil A, Lucas DN, Magee LA, Mol BW, Stark M, Thangaratinam S, Wilson MJ, von Dadelszen P, Williamson PR, Ziebland S, McManus RJ; the International Collaboration to Harmonise Outcomes for Pre-eclampsia (iHOPE). A core outcome set for pre-eclampsia research: an international consensus development study. BJOG: Int J Obstet Gy 2020;127:1516–1526.

Introduction

When untreated, pre-eclampsia is life-threatening, and in low- and middle-income countries it is one of the leading causes of maternal mortality, severe maternal morbidity and stillbirth.[1] The development of effective and safe treatments for pre-eclampsia is urgently needed. Potential treatments should be evaluated in randomised trials, and to ensure the greatest gains in reducing the current burden of mortality and severe morbidity associated with pre-eclampsia, research should be undertaken in all settings, including low- and middle-income countries. Several national and international organisations, including the World Health Organization, have prioritised over 50 unanswered research questions relating to the evaluation of potential treatments for pre-eclampsia.[2–4] However, complex issues including a failure to consider the perspectives of women with lived experience of pre-eclampsia when designing randomised trials, variations in outcome measures and outcome reporting bias, could undermine the translation of future pre-eclampsia research into clinical practice.[5] Such research waste represents a substantial barrier to improving the care that women and their babies receive.

A recent systematic review characterised outcome reporting across published pre-eclampsia trials.[6] This systematic evaluation illustrated the widespread variation in the reporting of maternal and offspring outcomes. Most pre-eclampsia trials did not report information on clinically important outcomes, including stroke, liver failure and renal failure, and did not evaluate efficacy and safety in the participants' infants, particularly over the longer term.

The challenges of poor outcome selection, measurement and reporting can be addressed by developing, disseminating and implementing a core outcome set for future pre-eclampsia research.[7] A core outcome set represents a minimum dataset, developed using robust consensus science methods, engaging diverse stakeholders including healthcare professionals, researchers and patients.[7,8] Core outcomes should be routinely used by researchers, collected in a standardised manner and reported consistently in the final publication allowing comparability between individual randomised trials and efficient meta-analysis.[7,9]

The objective of this study was to develop a clinically relevant core data set to standardise outcome selection, collection and reporting across future randomised trials and systematic reviews evaluating potential treatments for pre-eclampsia.

Methods

The study was prospectively registered with the Core Outcome Measures in Effectiveness Trials (COMET) Initiative, registration number 588. A protocol with explicitly defined objectives, formal consensus development methods, criteria for participant identification and selection, and statistical methods has been published.[10]

An international steering group, including healthcare professionals, researchers and women with lived experience of pre-eclampsia, was established to provide a perspective to inform key methodological decisions. The core outcome set was developed in a three-stage process using consensus science methods advocated by the COMET initiative.[7]

There is no international consensus regarding the diagnostic criteria for pre-eclampsia. The study did not seek to reach consensus regarding the definition of pre-eclampsia and adopted the International Society for the Study of Hypertension in Pregnancy's pre-eclampsia definition, which is defined as gestational hypertension presenting with new-onset proteinuria, other maternal organ dysfunction and/ or uteroplacental dysfunction.[11] This study is complementary to the work of the Global Pregnancy Collaboration and the International Society for the Study of Hypertension in Pregnancy who are engaged with the standardisation of other aspects of study design, the development of a standardised database for perinatal research studies and the development of clinical practice guidelines.

Potential core outcomes were identified by extracting outcomes reported in published pre-eclampsia trials and undertaking a thematic analysis of in-depth interviews with women with lived experience of pre-eclampsia. Both studies have been published.[6,12] A comprehensive inventory of outcomes and plain-language descriptions was developed in consultation with the study's steering group. This inventory was entered into a modified Delphi method, which was delivered through sequential online surveys using Delphi survey software (DelphiManager, University of Liverpool, Liverpool, UK).

Healthcare professionals, researchers and women with lived experience of pre-eclampsia were invited to participate. Healthcare professionals were recruited through the Core Outcomes in Women's and Newborn Health (CROWN)

initiative, Global Obstetrics Network and the International Society for the Study of Hypertension in Pregnancy. Researchers were recruited through participation in ongoing pre-eclampsia research studies including: (1) community blood pressure monitoring in rural Africa and Asia;[13] (2) detection of underlying pre-eclampsia study, development and validation of a prediction model for risk of complications in early-onset pre-eclampsia study;[14] (3) international prediction of pre-eclampsia individual patient data collaborative network and (4) pre-eclampsia: eclampsia monitoring, prevention and treatment initiative.[15] Women with lived experience of pre-eclampsia were recruited through patient organisations including Action on Pre-eclampsia; Count the Kicks; Group B Strep Support and Tommy's. The Delphi method does not depend on statistical power and between 10 and 15 participants has been demonstrated to yield sufficient results.[16–18] The study aimed to recruit at least 18 participants for each stakeholder group but planned to maximise the number to increase generalisability, anticipating an overall attrition rate of 20%.

The round 1 survey was piloted by the study's steering group before use. Feedback was specifically sought regarding the survey instructions, ease of completion, the appropriateness of terminology and time taken to complete the survey. The survey was adjusted in response to feedback.

Before entering the round 1 survey, participants received an explanatory video abstract, a plain-language summary and survey instructions, provided demographic details and made an explicit commitment to complete all three rounds. Following registration, a unique identifier was generated and allocated to each participant, to ensure that future responses were both linked and anonymised. In round 1, participants scored individual outcomes on a nine-point Likert scale.[19] Participants were able to select an 'unable to score' category if they did not feel they had sufficient expertise or experience to score an individual outcome. Before completing the survey, participants were able to suggest additional outcomes. After the round 1 survey had closed, the scores for each outcome were aggregated across individual stakeholder groups. The percentage of participants scoring each outcome at every possible response from one to nine was calculated by the Delphi survey software and tabulated for individual stakeholder groups. Suggested additional outcomes were reviewed by the steering group and unique outcomes were entered into round 2.

In round 2, participants received their own scores and individual stakeholder group feedback for each round 1 outcome. Participants were asked to reflect on their own scores and on the scores of other participants, before re-scoring each outcome. Before completing the survey, participants were able to score additional outcomes suggested by participants in the round 1 survey. After the round 2 survey had closed, the percentage of participants scoring each outcome at every possible response from one to nine was calculated and tabulated for individual stakeholder groups.

In round 3, participants received their own scores and individual stakeholder group feedback for each round 2 outcome. Participants were asked to reflect on their own scores and on the scores of other participants before re-scoring each outcome. After the round 3 survey had closed, it was agreed before review of the results that a consensus definition would be identified when >70% of participants in each stakeholder group scored the outcome 'critical for decision-making' (score seven to nine) and <15% of participants in each stakeholder group scored the outcome 'of limited importance for decision-making' (score one to three).[7] Participants who withdrew from the Delphi survey were requested to complete an anonymous online questionnaire providing free-text comments outlining their reason(s) for withdrawing. These responses were coded and summarised.

With regard to the other consensus method used in the study, the modified nominal group technique was delivered through a half-day consensus development meeting.[18] Healthcare professionals, researchers and women with lived experience of pre-eclampsia, resident in the UK and who had completed all three rounds of the Delphi survey were invited to participate in a consensus development meeting. Anyone who responded favourably was extended an invitation to attend the consensus development meeting. The modified nominal group technique does not depend on statistical power and there is no robust method for calculating the required number of participants. The study aimed to recruit between 10 and 15 participants as this number has assured validity in other settings.[18,20]

Before the meeting, participants provided demographic details and made an explicit commitment to participate actively. All consensus outcomes were entered into the process. Participants were able to enter other outcomes which had not reached the consensus threshold, upon request. Following an initial discussion, outcomes were divided into three provisional categories: (1) outcomes to be considered for inclusion in the final core outcome set, (2) outcomes where no consensus existed and (3) outcomes that should not be considered for inclusion in the final core outcome set. Participants were invited to discuss the ordering of the outcomes within each category, considering contextual information, including the relative importance of individual outcomes, feasibility to collect the outcome data and the availability of suitable definitions and measurement instruments. They were encouraged to reformulate outcomes to improve clarity or comprehension. The discussion focused upon ranking the outcomes being considered for inclusion in the final core outcome set and the outcomes where no consensus existed. During the discussion, the outcomes could be moved between the categories. Finally, the core outcome set was agreed.

Descriptive statistics were used to describe participant demographics. Medians ($\tilde{x}$), interquartile ranges (IQR) and scoring distributions were calculated across individual stakeholder groups (healthcare professionals, researchers and patients) and pooled across individual outcomes. The skewness of each scoring distribution was calculated using Pearson's coefficient of skewness (Sk_2). All analyses were performed using GraphPad Prism (GraphPad, San Diego, CA, USA).

The study was funded by the National Institute for Health Research, Barts Charity and Elisabeth Garrett Anderson Hospital Charity Travelling Fellowship in Memory of Anne Boutwood, Royal College of Obstetricians and Gynaecologists.

Results

Seventy-nine pre-eclampsia trials reported 106 different outcomes and thematic analysis of 30 in-depth interviews with women with lived experience of pre-eclampsia identified 71 outcomes (Figure 1).[6,12] Combining these resulted in 116 unique outcomes, which were entered into the Delphi survey.[21]

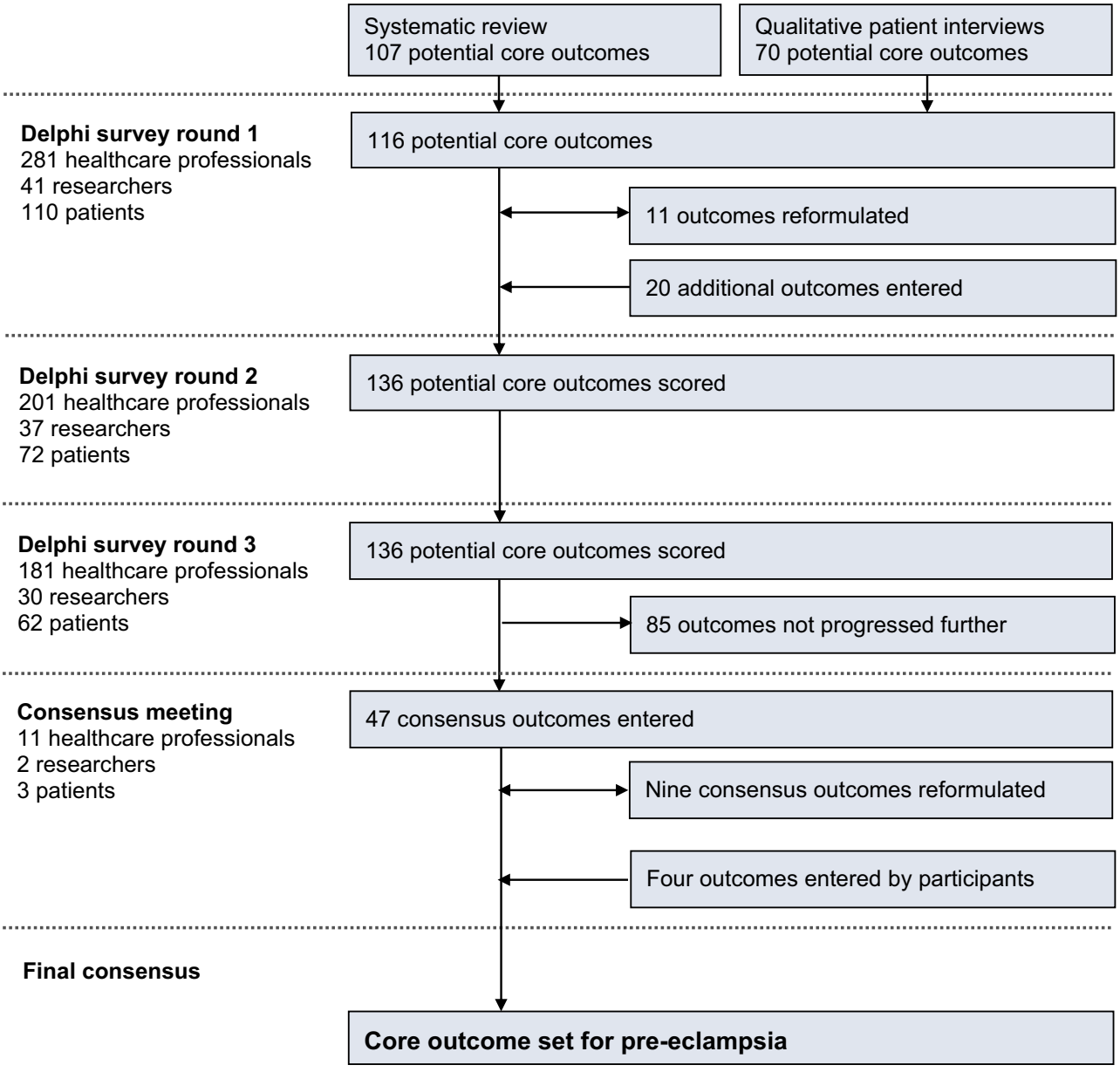

Figure 1. Flow of participants and outcomes.

The Delphi survey was started by 281 healthcare professionals, 41 researchers and 110 women with lived experience of pre-eclampsia, representing 31 high-income countries and 25 low- and middle-income countries (Table 1). Over the three Delphi survey rounds, 159 participants (37%) withdrew, including 100 healthcare professionals (35%), 11 researchers (27%) and 48 patients (44%). The majority of participants who withdrew from the survey provided an explanation (see Supplementary material, Table S1). In response to the outcomes suggested by participants, the steering group recommended the reformulation of 11 outcomes to improve clarity and added 20 new outcomes to round 2 (see Supplementary material, Figure S1). Therefore, 136 outcomes were subsequently entered into rounds 2 and 3. In round 3 results, 47 outcomes reached the consensus threshold (see Supplementary material, Appendix S1).

The consensus development meeting included 11 healthcare professionals, two researchers and four women with lived experience of pre-eclampsia. Nine participants (56%) had lived, worked or conducted research in low- or middle-income countries. Forty-seven consensus outcomes were considered using the modified nominal group technique. Participants recommended the reformulation of nine consensus outcomes and entered an additional four no consensus outcomes into the process.

Participants prioritised 22 outcomes, comprising 14 maternal and eight offspring outcomes, for inclusion in the core outcome set for pre-eclampsia (Table 2). Outcomes represented maternal and infant mortality and severe morbidity. These included maternal mortality, stroke, pulmonary oedema, acute kidney injury, placental abruption and postpartum haemorrhage. Outcomes demonstrating the impact of pre-eclampsia on the fetus and neonate included stillbirth and neonatal mortality, gestational age at delivery and birthweight, and neonatal seizures. Finally, outcomes representing the resource utilisation resulting from the management of severe maternal and neonatal morbidity included the requirement for maternal admission to intensive care, the requirement for neonatal unit admission and respiratory support.

Table 1. Participant characteristics

	Delphi survey			Consensus development meeting
	Round 1 *n* = 432	Round 2 *n* = 310	Round 3 *n* = 273	*n* = 16
Stakeholder group, *n* (%)				
Patients	110 (25)	72 (23)	62 (23)	4 (25)
Healthcare professionals	281 (65)	201 (65)	181 (66)	11 (69)
Anaesthetists	39 (9)	30 (10)	28 (10)	2 (13)
General practitioners	42 (10)	34 (11)	31 (11)	2 (13)
Midwives	35 (8)	30 (10)	27 (10)	3 (19)
Neonatologists or paediatricians	24 (6)	17 (5)	15 (5)	1 (6)
Obstetricians	113 (26)	72 (23)	65 (24)	2 (13)
Physicians	28 (6)	18 (6)	15 (5)	1 (6)
Researchers	41 (9)	37 (12)	30 (11)	2 (13)
Gender, *n* (%)				
Male	154 (36)	114 (37)	101 (37)	7 (44)
Female	277 (64)	195 (63)	171 (63)	10 (56)
Prefer not to say	1 (<1)	1 (<1)	1 (<1)	
Age (years), *n* (%)				
20–29	16 (3)	10 (3)	9 (3)	1 (6)
30–39	159 (37)	111 (36)	103 (38)	6 (38)
40–49	113 (26)	79 (25)	74 (27)	4 (25)
50–59	84 (19)	63 (20)	60 (11)	4 (25)
60–69	54 (13)	41 (13)	22 (8)	1 (6)
Over 70	4 (<1)	4 (1)	4 (1)	1 (6)
Prefer not to say	2 (<1)	2 (<1)	1 (<1)	0 (0)
Geographical location, *n* (%)				
Africa	20 (5)	17 (5)	16 (6)	0 (0)
Asia	26 (6)	14 (5)	13 (5)	0 (0)
Australia	35 (8)	28 (9)	23 (8)	0 (0)
Europe	237 (55)	175 (56)	159 (58)	16 (100)
Middle East	7 (2)	4 (13)	4 (1)	0 (0)
North America	82 (19)	58 (19)	47 (17)	0 (0)
South America	23 (5)	13 (4)	11 (4)	0 (0)
Prefer not to say	2 (<1)	1 (<1)	0 (0)	0 (0)

Table 2. Core outcome set for pre-eclampsia

Maternal core outcomes
Maternal mortality
Eclampsia
Stroke
Cortical blindness
Retinal detachment
Pulmonary oedema
Acute kidney injury
Liver capsule haematoma or rupture
Placental abruption
Postpartum haemorrhage
Raised liver enzymes
Low platelets
Admission to intensive care unit required
Intubation and mechanical ventilation (not for childbirth)
Offspring outcomes
Stillbirth
Gestational age at delivery
Birthweight
Small-for-gestational-age
Neonatal mortality
Neonatal seizures
Admission to neonatal unit required
Respiratory support

Discussion

Main findings

Using robust consensus science methods, healthcare professionals, researchers and women with experience of pre-eclampsia have developed a core outcome set to standardise outcome selection, collection and reporting across future pre-eclampsia trials and systematic reviews.

Strengths and limitations

This study has met the recently published standards for core outcome set development, developed by an international group of experienced core outcome set developers, methodologists and potential core outcome set end users.[22] By meeting these recommendations, this study has objectively demonstrated its methodological quality. When considering core outcome set development, a high number of diverse participants is desirable to secure the generalisability of the results and increase its credibility with other researchers. With over 400 participants from 56 countries, the global participation achieved in this study should secure the relevance of the results across an international context. The core outcome set for pre-eclampsia is perceived as an exemplar of core outcome set development and the study's approach has been adopted by many other core outcome set development studies.[23–26]

This consensus study is not without limitations. There is considerable uncertainty regarding core outcome set development methods.[27] The optimal approaches to selecting participants, structuring interaction embedded in different consensus methods, including modified Delphi method, modified Nominal Group Technique and consensus development conference, and methods of synthesising individual judgements. Further methodological research is required to inform future core outcome set development.

When considering the Delphi survey, there was a higher response from participants who identified as white (83%), living in Europe (55%) and living in high-income countries (82%). To participate in the Delphi survey, English proficiency, a computer and internet access were required. Limitations in the representativeness of the sample could have impacted upon the outcomes prioritised; however, given the wide range of outcomes from the previous worldwide literature that fed into the process, this should not have been a major issue.

The study's attrition rate was 37%, which is comparable to other core outcome set development studies in health of women and neonates.[8] This did vary between stakeholder groups with more patients (44%) dropping out than other groups, such as healthcare professionals (35%) and researchers (27%). It may have been possible to reduce attrition, particularly within the patient stakeholder group, by reducing the length of the survey. However, attrition needed to be balanced with the requirement to enter a comprehensive long-list of potential core outcomes into the Delphi survey and for participants to be able to reflect on and re-score individual outcomes in relation to each other.

Although the notion of achieving consensus is fundamental to core outcome set development, the definition of what constitutes consensus is less clear. The pre-specified consensus definition applied within the Delphi survey could be considered as being too accommodating, as it resulted in the identification of 47 initial consensus outcomes. Further methodological research is required to develop an appropriate consensus definition that could accommodate the skewed scoring distribution of the respondents.[28]

Interpretation

Most trials evaluating potential treatments for pre-eclampsia have neglected to report many of the outcomes included in the core outcome set.[6,29] For example, only one-third of trials have reported eclampsia, less than a tenth of trials have reported stroke and only three trials have reported pulmonary oedema.[6] Selective reporting of outcomes, based on statistical significance could be contributing to these omissions.[30] Systematic implementation of the core outcome set for pre-eclampsia should ensure future pre-eclampsia research reports outcomes that matter to healthcare professionals, researchers and women with pre-eclampsia, and help to limit selective reporting of results based upon statistical significance. Such an approach could be replicated in other areas of the health of women and newborn infants, including endometriosis, twin–twin transfusion syndrome and neonatal care, to tackle the variation in outcome reporting and suspected outcome-reporting bias.[31–33]

It is considered good practice for researchers planning randomised trials to implement the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) statement which outlines the scientific, ethical and administrative elements that should be addressed in a clinical trial protocol.[34] This statement specifically recommends the use of core outcome sets where they exist. In addition, the importance of implementing core outcome sets is recognised by the funders of health research.

The CROWN initiative, supported by over 80 specialty journals, have resolved to implement this core outcome set.[8] Participating journals will require researchers to report core outcomes within manuscripts and offer conclusions based on these outcomes. Where core outcome sets have not been collected, the researchers will be asked to report this deficiency and its implications for their findings.[9]

The Cochrane Pregnancy and Childbirth Group have committed to implementing the core outcome set for pre-eclampsia when new and updated reviews are being

prepared. Uptake of the core outcome set should facilitate the possibility of more sophisticated methods of evidence synthesis, including individual patient data meta-analysis and network meta-analysis.

The core outcome set has been developed specifically for comparative effectiveness research. The use of this core outcome set in other types of research is highly desirable. There is currently a research priority setting partnership developing research priorities for hypertension in pregnancy.[35] This work should be considered complementary to a wider agenda of reducing research waste across hypertension in pregnancy research. Such agendas have been proposed in areas relevant to women's health, including twin and multiple pregnancy research with research priority setting and core outcome set development as important components.[36,37]

Blood pressure and severe hypertension were not identified as core outcomes. In adult non-pregnant populations, blood pressure is a valid surrogate outcome for heart disease, stroke and mortality.[38–40] In the context of pre-eclampsia research, maternal blood pressure has been commonly selected as a surrogate outcome, which represents a single pathway that operates within a complex multifactorial disease, characterised by vasoconstriction, coagulation and intravascular fluid redistribution, resulting in widespread formation of microthrombi and necrosis within maternal end organs.[6,41,42] Reliable conclusions around the impact of pre-eclampsia interventions cannot necessarily be informed by reductions in maternal blood pressure because the consequences of blood pressure changes upon a diverse range of clinically meaningful outcomes, including maternal mortality, pulmonary oedema and renal failure, may be unclear. Developing a core outcome set for pre-eclampsia represents an opportunity to deliver a paradigm shift by measuring treatment effectiveness as a clinical rather than a biological response. Researchers should continue to report blood pressure as a descriptive outcome.

Core outcomes require standardised outcome measures. Without a standardised approach, researchers would be able to choose from a variety of different outcome measures for individual core outcomes. Such variation can make it difficult to synthesise the results of individual trials within secondary research.[36] The collaboration has standardised definitions using formal consensus development methods to secure additional harmony across future pre-eclampsia trials and ensure that secondary research can be undertaken prospectively, efficiently and harmoniously.[43] It is intended that these consensus outcome measures will be used for core outcomes included in other core outcome sets relevant to the health of women and newborn infants.[44–50]

Conclusion

This core outcome set for pre-eclampsia should now underpin all future randomised trials and systematic reviews evaluating potential treatments for pre-eclampsia. Such rationalisation should ensure that future research addresses outcomes agreed as important in a consistent manner, facilitate meta-analysis, enhance patient care and ultimately improve the outcomes of pregnant women and their babies.

Disclosure of interests

CG received expenses to attend an educational conference from Chiesi Pharmaceuticals and his institution has received research funding from Chiesi Pharmaceuticals. SAK reports receiving research funding from Siemens, serving as a consultant to Roche and Thermo Fisher Scientific, having a financial interest in Aggamin Pharmaceuticals and holding multiple patents. AK reports being the inventor of the Hampton system. BWM reports consultancy fees from Guerbet, iGenomix, Merck KGaA and ObsEva. RJM reports research support from Omron. The remaining authors declare no competing interests. Completed disclosure of interests forms are available to view online as supporting information.

Contribution to authorship

Study concept and design were by JMND, PRW, SZ and RJM. Acquisition of data, analysis and interpretation of data and critical revision of the manuscript for important intellectual content were performed by JMND, AEC, DR-D, JvH, CG, MB, LCC, WAG, RF, SAK, AK, DNL, LAM, BWM, MS, ST, MJW, PvD, PRW, SZ and, RJM. The manuscript was drafted by JMND, SZ and RJM. JMND, PRW, SZ and RJM obtained the fuding and supervised the study.

Details of ethics approval

Ethical approval was received from the National Research Ethics Service (reference number: 12/SC/0495; 1 July 2015).

Funding

This study was funded by the Barts Charity, Elisabeth Garrett Anderson Hospital Charity and National Institute for Health Research. The funders have no role in the design and conduct of the study, the collection, management, analysis or interpretation of data or the manuscript preparation.

Acknowledgements

This work reports independent research arising from a doctoral fellowship (DRF-2014-07-051) supported by the National Institute for Health Research, Barts Charity and Elisabeth Garrett Anderson Hospital Charity Travelling Fellowship in Memory of Anne Boutwood. Dr Chris Gale was

supported by a Medical Research Council Clinician Scientist Fellowship. Prof. Richard McManus was supported by a National Institute for Health Research Professorship (NIHR-RP-R2-12-015) and the National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care Oxford. Prof. Richard McManus, Prof. Paula Williamson and Prof. Sue Ziebland are supported by National Institute for Health Research Senior Investigator awards. Prof. Ben Mol is supported by a National Health and Medical Research Council Investigator Grant. The views expressed in this publication are those of the authors and not necessarily those of the National Health Service, the National Institute for Health Research or the Department of Health.

We would like to thank the Delphi survey and consensus development meeting participants. We would like to thank the Radcliffe Women's Health Patient Participation group, Action on Pre-eclampsia and our patient and public representatives who assisted with study design, data interpretation and planned dissemination. We would like to thank colleagues at the Nuffield Department of Primary Care Health Sciences, University of Oxford including Jacqui Belcher, Carla Betts, Lucy Curtin, Dawn Evans, Caroline Jordan, Sarah King, Sam Monaghan, Nicola Small and Clare Wickings for administrative, technical or material support. We would like to thank Prof. Marian Knight, Nuffield Department of Population Health, University of Oxford, for providing subject-specific expertise. We would like to thank colleagues at the Women's Health Research Unit, Queen Mary, University of London, including Khalid Khan, Rehan Khan and Tracy Holtham for administrative and technical support or subject-specific expertise. We would like to thank David J. Mills for administrative and logistical support.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1. Participants and flow of outcomes.

Table S1. Stated reasons for withdrawal from the Delphi survey.

Appendix S1. Round 3 Delphi survey results reported as the percentage of participants scoring the outcome as critical.

Video S1. Author insights. ■

References

1 Duley L. The global impact of preeclampsia and eclampsia. *Semin Perinatol* 2009;33:130–7.
2 Task Force on Hypertension in Pregnancy. *Hypertension in Pregnancy*. Washington, DC: American College of Obstetricians and Gynecologists; 2013.
3 National Collaborating Centre for Women's and Children's Health. *Hypertension in Pregnancy: The Management of Hypertensive Disorders During Pregnancy*. NICE Clinical Guidelines, No. 107. London: Royal College of Obstetricians and Gynaecologists Press; 2010.
4 World Health Organization Department of Reproductive Health and Research. *WHO Recommendations for Prevention and Treatment of Preeclampsia and Eclampsia*. Geneva: World Health Organization; 2011.
5 Duffy JMN, Ziebland S, von Dadelszen P, McManus RJ. Tackling poorly selected, collected, and reported outcomes in obstetrics and gynecology research. *Am J Obstet Gynecol* 2019;220:71.e1–4.
6 Duffy JMN, Hirsch M, Kawsar A, Gale C, Pealing L, Plana MN, et al. Outcome reporting across randomised controlled trials evaluating therapeutic interventions for pre-eclampsia. *BJOG* 2017;124:1829–39.
7 Williamson PR, Altman DG, Bagley H, Barnes KL, Blazeby JM, Brookes ST, et al. The COMET handbook: version 1.0. *Trials* 2017;18 (Suppl 3):280.
8 Duffy JMN, Rolph R, Gale C, Hirsch M, Khan KS, Ziebland S, et al. Core outcome sets in women's and newborn health: a systematic review. *BJOG* 2017;124:1481–9.
9 Khan KS, Romero R. The CROWN Initiative: journal editors invite researchers to develop core outcomes in women's health. *Am J Obstet Gynecol* 2014;211:575–6.
10 Duffy JMN, van 't Hooft J, Gale C, Brown M, Grobman W, Fitzpatrick R, et al. A protocol for developing, disseminating, and implementing a core outcome set for pre-eclampsia. *Pregnancy Hypertens* 2016;6:274–8.
11 Brown MA, Magee LA, Kenny LC, Karumanchi SA, McCarthy FP, Saito S, et al. Hypertensive disorders of pregnancy. *Hypertension* 2018;72:24–43.
12 Duffy JMN, Thompson T, Hinton L, Salinas M, McManus RJ, Ziebland S. What outcomes should researchers select, collect, and report in pre-eclampsia research? A qualitative study exploring the views of women with lived experience of pre-eclampsia. *BJOG* 2019;126:637–46.
13 de Greeff A, Nathan H, Stafford N, Liu B, Shennan AH. Development of an accurate oscillometric blood pressure device for low resource settings. *Blood Press Monit* 2008;13:342–8.
14 Allotey J, Snell KIE, Chan C, Hooper R, Dodds J, Rogozinska E, et al. External validation, update and development of prediction models for pre-eclampsia using an Individual Participant Data (IPD) meta-analysis: the International Prediction of Pregnancy Complication Network (IPPIC pre-eclampsia) protocol. *Diagn Progn Res* 2017;1:16.
15 von Dadelszen P, Sawchuck D, Hofmeyr JG, Magee LA, Bracken H, Mathai M, et al. PRE-EMPT (PRE-eclampsia-Eclampsia Monitoring, Prevention and Treatment): a low and middle income country initiative to reduce the global burden of maternal, fetal and infant death and disease related to pre-eclampsia. *Pregnancy Hypertens* 2013;3:199–202.
16 Giannarou L, Zervas E. Using Delphi technique to build consensus in practice. *Int J Bus Sci Appl Manag* 2014;9:65–82.
17 Skulmoski GJ, Hartman FT, Krahn J. The Delphi method for graduate research. *J Inf Technol Educ Res* 2007;6:1–21.
18 Murphy M, Sanderson C, Black N, Askham J, Lamping D, Marteau T, et al. Consensus development methods, and their use in clinical guideline development. *Health Technol Assess* 1998;2:1–88.
19 Guyatt GH, Oxman AD, Kunz R, Atkins D, Brozek J, Vist G, et al. GRADE guidelines: 2. Framing the question and deciding on important outcomes. *J Clin Epidemiol* 2011;64:395–400.
20 Gallagher M, Hares TIM, Spencer J, Bradshaw C, Webb IAN. The nominal group technique: a research tool for general practice? *Fam Pract* 1993;10:76–81.
21 Duffy J, Hirsch M, Ziebland S, McManus R. Methodological decisions influence the identification of potential core outcomes in studies

related to pre-eclampsia: an analysis informing the development of recommendations for future core outcome set developers. *BJOG* 2019;126:1482–90.
22 Kirkham JJ, Davis K, Altman DG, Blazeby JM, Clarke M, Tunis S, et al. Core Outcome Set-STAndards for Development: The COS-STAD recommendations. *PLoS Medicine* 2017;14:e1002447.
23 Webbe J, Brunton G, Ali S, Duffy JM, Modi N, Gale C. Developing, implementing and disseminating a core outcome set for neonatal medicine. *BMJ Paediatr Open* 2017;1:e000048.
24 Whitehouse KC, Kim CR, Ganatra B, Duffy JMN, Blum J, Brahmi D, et al. Standardizing abortion research outcomes (STAR): a protocol for developing, disseminating and implementing a core outcome set for medical and surgical abortion. *Contraception* 2017;95:437–41.
25 Khalil A, Perry H, Duffy J, Reed K, Baschat A, Deprest J, et al. Twin–Twin transfusion syndrome: study protocol for developing, disseminating, and implementing a core outcome set. *Trials* 2017; 18:325.
26 Khalil A, Duffy JMN, Perry H, Ganzevoort W, Reed K, Baschat AA, et al. Study protocol: developing, disseminating, and implementing a core outcome set for selective fetal growth restriction in monochorionic twin pregnancies. *Trials* 2019;20:35.
27 Duffy J, McManus R. Influence of methodology upon the identification of potential core outcomes: recommendations for core outcome set developers are needed. *BJOG* 2016;123:1599.
28 Diamond IR, Grant RC, Feldman BM, Pencharz PB, Ling SC, Moore AM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol* 2014;67:401–9.
29 Duffy J, Hirsch M, Pealing L, Showell M, Khan K, Ziebland S, et al. Inadequate safety reporting in pre-eclampsia trials: a systematic evaluation. *BJOG* 2018;125:795–803.
30 Duffy J, Bhattacharya S, Herman M, Mol B, Vail A, Wilkinson J, et al. Reducing research waste in benign gynaecology and fertility research. *BJOG* 2017;124:366–9.
31 Hirsch M, Duffy JMN, Kusznir JO, Davis CJ, Plana MN, Khan KS, et al. Variation in outcome reporting in endometriosis trials: a systematic review. *Am J Obstet Gynecol* 2016;214:452–64.
32 Perry H, Duffy JMN, Umadia O, Khalil A, Syndrome tICtHOfTTT. Outcome reporting across randomized trials and observational studies evaluating treatments for twin–twin transfusion syndrome: systematic review. *Ultrasound Obstet Gynecol* 2018;52:577–85.
33 Webbe JWH, Ali S, Sakonidou S, Webbe T, Duffy JMN, Brunton G, et al. Inconsistent outcome reporting in large neonatal trials: a systematic review. *Arch Dis Child Fetal Neonatal Ed* 2020;105: 69–75.
34 Chan A, Tetzlaff JM, Gøtzsche PC, Altman DG, Mann H, Berlin JA, et al. SPIRIT 2013 explanation and elaboration: guidance for protocols of clinical trials. *BMJ* 2013;346:e7586.
35 Graham L, Illingworth B, Showell M, Vercoe M, Crosbie E, Gingel L, et al. Research priority setting in women's health: a systematic review. *BJOG* 2020;127:694–700.
36 Townsend R, Duffy JMN, Khalil A. Increasing value and reducing research waste in obstetrics: towards woman-centered research. *Ultrasound Obstet Gynecol* 2020;55:151–6.
37 Lam JR, Liu B, Bhate R, Fenwick N, Reed K, Duffy JMN, et al. Research priorities for the future health of multiples and their families: the Global Twins and Multiples Priority Setting Partnership. *Ultrasound Obstet Gynecol* 2019;54:715–21.
38 Baigent C, Blackwell L, Emberson J, Holland LE, Reith C, Bhala N, et al. Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170,000 participants in 26 randomised trials. *Lancet* 2010;376:1670–81.
39 James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, et al. Evidence-based guideline for the management of high blood pressure in adults. *JAMA* 2014;311:507–20.
40 Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, et al. ESH/ESC guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European Society of Hypertension and of the European Society of Cardiology. *J Hypertens* 2013;31:1281–357.
41 Duffy JMN, Hirsch M, Gale C, Pealing L, Kawsar A, Showell M, et al. A systematic review of primary outcome and outcome measure reporting in randomized trials evaluating treatments for preeclampsia. *Int J Gynecol Obstet* 2017;139:262–7.
42 Karumanchi SA, Granger JP. Preeclampsia and pregnancy-related hypertensive disorders. *Hypertension* 2016;67:238–42.
43 Duffy JMN, Cairns AE, Magee L, von Dadelszen P, van 't Hooft J, Gale C, et al. Standardising definitions for the pre-eclampsia core outcome set: a consensus development study. Pregnancy Hypertens. In press.
44 Jansen L, Koot M, van 't Hooft J, Dean C, Duffy J, Ganzevoort W, et al. A core outcome set for hyperemesis gravidarum research: an international consensus study. *BJOG* 2020. https://doi.org/10.1111/1471-0528.16172
45 Duffy J, Hirsch M, Vercoe M, Abbott J, Barker C, Collura B, et al. A core outcome set for future endometriosis research: an international consensus development study. *BJOG* 2020. https://doi.org/10.1111/1471-0528.16157
46 van 't Hooft J, Duffy JMN, Daly M, Williamson PR, Meher S, Thom E, et al. A core outcome set for evaluation of interventions to prevent preterm birth. *Obstet Gynecol* 2016;127:49–58.
47 Webbe JWH, Duffy JMN, Afonso E, Al-Muzaffar I, Brunton G, Greenough A, et al. Core outcomes in neonatology: development of a core outcome set for neonatal research. *Arch Dis Child Fetal Neonatal Ed* 2019. https://doi.org/10.1136/archdischild-2019-317501
48 Perry H, Duffy JMN, Reed K, Baschat A, Deprest J, Hecher K, et al. Core outcome set for research studies evaluating treatments for twin–twin transfusion syndrome. *Ultrasound Obstet Gynecol* 2019;54:255–61.
49 Townsend R, Duffy JMN, Sileo F, Perry H, Ganzevoort W, Reed K, et al. Core outcome set for studies investigating management of selective fetal growth restriction in twins. *Ultrasound Obstet Gynecol* 2020;55:652–60.
50 Duffy JMN, Bhattacharya S, Curtis C, Evers JLH, Farquharson RG, Franik S, et al. A protocol developing, disseminating and implementing a core outcome set for infertility. *Hum Reprod Open* 2018;2018:hoy007.

Appendix 1

International Collaboration to Harmonise Outcomes for Pre-eclampsia (iHOPE)

Dr Edgardo J. Abalos, Centro Rosarino de Estudios Perinatales, Argentina; Christine C. D. Adamson, Chelsea and Westminster Hospital NHS Foundation Trust, UK; Dr Adebayo A. Akadri, Babcock University, Nigeria; Professor Zekeriya Akturk, Ailem Academic Counselling, Turkey; Professor Karel Allegaert, KU Leuven, Belgium; Dr Edith Angel-Müller, Universidad Nacional de Colombia,

Colombia; Jessica Antretter, Northwell Health, USA; Dr Helen F. Ashdown, University of Oxford, UK; Professor Francois Audibert, Université de Montréal, Canada; Dr Nathalie Auger, University of Montreal Hospital Centre, Canada; Professor Canan Aygun, Ondokuz Mayıs University, Turkey; Dr Inas Babic, Prince Sultan Military Medical City, Saudi Arabia; Professor Rashmi Bagga, Postgraduate Institute of Medical Education and Research, Chandigarh, India; Judith M. Baker, South Africa; Dr Pradipta Bhakta, University Hospital Limerick, Ireland; Professor Vineet Bhandari, Drexel University, USA; Dr Sohinee Bhattacharya, University of Aberdeen, UK; Dr Marco H. Blanker, University of Groningen, The Netherlands; Professor Frank H. Bloomfield, University of Auckland, New Zealand; Dr Anna Bof, Australia; Siobhan M. Brennan, Ireland; Dr Kim Broekhuijsen, Haaglanden Medisch Centrum, The Netherlands; Professor Emeritus Fiona Broughton Pipkin, Nottingham University Medical School, UK; Dr Joyce L. Browne, Utrecht University, The Netherlands; Dr Roger M. Browning, King Edward Memorial Hospital for Women, Australia; Jameson W. Bull, USA; Dr Amina Butt, Saudi Arabia; Dena Button, USA; Dr Jeremy P. Campbell, Imperial College Healthcare NHS Trust, UK; Dr Doris M. Campbell, University of Aberdeen, UK; Professor Lionel Carbillon, Jean-Verdier Hospital, France; Sarah Carthy, UK; Dr Emma Casely, UK; Dr James A. Cave, Downland Practice, UK; Professor Jose G. Cecatti, University of Campinas, Brazil; Dr Mónica E. Chamillard, Centro Rosarino de Estudios Perinatales, Argentina; Professor Dominique Chassard, Université Lyon, France; Dr Nancy C. Checheir, University of North Carolina School of Medicine, USA; Professor Vasilii S. Chulkov, South Ural State Medical University, Russia; Dr Catherine A. Cluver, Stellenbosch University, South Africa; Carole F. Crawford, University of Oxford, UK; Mandy C. Daly, Irish Neonatal Health Alliance, Ireland; Professor Dorota A. Darmochwal-Kolarz, University of Rzeszow, Poland; Ruth E. Davies, UK; Professor Mark W. Davies, Royal Brisbane and Women's Hospital, Australia; Dr James S. Dawson, Nottingham University Hospitals NHS Trust, UK; Nichola Dobson, UK; Claire N. Dodd, University Hospitals of Leicester, UK; Dr Fiona Donald, North Bristol NHS Trust, UK; Emeritus Professor Lelia Duley, University of Nottingham, UK; Jorie Epstein-Mares, USA; Professor Offer Erez, Soroka University Medical Centre Ben Gurion University of the Negev, Israel; Dr Emma Evans, St George's University Hospitals NHS Foundation Trust, UK; Dr Richard N. Farlie, Hospitalsenhed Midt, Denmark; Amy V. Ferris, UK; Elizabeth M. Frankland, UK; Dr Dilys J. Freeman, University of Glasgow, UK; Dr Shalini Gainder, Postgraduate Institute of Medical Education and Research, India; Dr Wessel Ganzevoort, Amsterdam Universitair Medische Centra, The Netherlands; Dr Oghenekome A. Gbinigie, UK; Dr Sanjib K. Ghosh, All India Institute of Medical Sciences Patna, India; Dr Margaret Glogowska, University of Oxford, UK; Andrea Goodlife, University Hospitals of Leicester, UK; Dr Katie L. Gough, Luton and Dunstable University Hospital, UK; Jessica R. Green, UK; Professor Fouzia Gul, Khyber Medical University Institution of Medical Sciences, Pakistan; Lorraine Haggerty, Midwife Mid Essex Hospitals NHS Trust, UK; Professor David R. Hall, Stellenbosch University, South Africa; Professor Mikko Hallman, University of Oulu, Finland; Leigh M. Hamilton, New Zealand; Dr Sarah J. Hammond, St George's University Hospitals NHS Foundation Trust, UK; Professor SIoban D. Harlow, University of Michigan, USA; Dr Karen E. Hays CNM, Bastyr University, USA; Stacey C. Hickey, New Zealand; Mary Higgins, Irish Nurses and Midwives Organisation, Ireland; Dr Lisa Hinton, University of Oxford, UK; Associate Professor Sebastian R. Hobson, University of Toronto, Canada; Dr Matthew J. Hogg, Barts Health NHS Trust, UK; Heidi J. Hollands, University Hospitals Plymouth NHS Trust, UK; Professor Caroline S. E. Homer, Burnet Institute, Australia; Dr Zahra Hoodbhoy, Aga Khan University, Pakistan; Dr Paul Howell, Barts Health NHS Trust, UK; Professor Berthold Huppertz, Medical University of Graz, Austria; Dr Shahid Husain, Homerton University Hospital NHS Foundation Trust, UK; Dr Susan D. Jacoby, Mount Royal University, Canada; Professor Evelyne Jacqz-Aigrain, Université de Paris, France; Dr Gareth Jenkins, Royal Surrey County Hospital, UK; Dr David Jewel, UK; Dr Mark J. Johnson, University Hospital Southampton NHS Foundation Trust, UK; Dr Carolyn L. Johnston, St George's University Hospitals NHS Foundation Trust, UK; Paige M. Jones, UK; Professor Ira Kantrowitz-Gordon, University of Washington School of Nursing, USA; Dr Rehan-Uddin Khan, Barts Health NHS Trust, UK; Lisa J. Kirby, UK; Catherine Kirk, UK; Professor Marian Knight, University of Oxford, UK; Mary T. Korey, USA; Dr Geraint J. Lee, Evelina London Children's Hospital Neonatal Unit, UK; Associate Professor Vincent W. Lee, University of Sydney, Australia; Dr Louis S. Levene, University of Leicester, UK; Dr Ambrogio P. Londero, Academic Hospital of Udine, Italy; Associate Professor Karin M. Lust, Royal Brisbane and Women's Hospital, Australia; Dr Vanessa MacKenzie, NHS Borders, UK; Dr Line Malha, Weill Cornell Medical College, USA; Dr Massimo Mattone, Italy; Dr David E. McCartney, UK; Professor Alison McFadden, University of Dundee, UK; Professor Brian H. McKinstry, University of Edinburgh, UK; Associate Professor Philippa F. Middleton, South Australian Health and Medical Research Institute, Australia; Dr Hiten D. Mistry, University of Nottingham, UK; Dr Caroline A. Mitchell, University of Sheffield, UK; Joanne C. Mockler, Monash University and Monash Health, Australia; Sally-Ann Molsher, United Lincolnshire Hospitals NHS Trust, UK; Elizabeth S. Monast, USA;

Professor Emeritus Jagidesa Moodley, University of Kwa Zulu-Natal, South Africa; Dr Rob Mooij, Beatrix Hospital, The Netherlands; Emma L. Moore, UK; Dr Linda Morgan, University of Nottingham, UK; Dr Angela Moulson, UK; Dr Faraz Mughal, Keele University, UK; Dr Shuchita R. Mundle, Government Medical College, Nagpur, India; Dr Miguel Angel Munoz, Institut Catala de la Salut. IdiapJgol, Spain; Professor Elizabeth Murray, University College London, UK; Dr Chie Nagata, National Centre for Child Health and Development, Japan; Dr Abhijit S. Nair, Basavatarakam Indo-American Cancer Hospital and Research Institute, India; Professor Annettee Nakimuli, Uganda; Dr Gita Nath, Axon Anaesthesia Associates, India; Rachel S. Newport, Pennine Acute Hospitals NHS Trust, UK; Professor Pippa Oakeshott, St George's, University of London, UK; Dr Maria R. Ochoa-Ferraro, Norfolk and Norwich University Hospital, UK; Professor Hein Odendaal, Stellenbosch University, South Africa; Professor Akihide Ohkuchi, Jichi Medical University School of Medicine, Japan; Professor Leandro Oliveira, São Paulo State University, Brazil; Dr Eduardo Ortiz-Panozo, National Institute of Public Health, Mexico; Dr Martijn A. Oudijk, Amsterdam Universitair Medische Centra, The Netherlands; Dr Seyhan E. Oygucu, University of Kyrenia, Turkey; Emeritus Professor Michael J. Paech, King Edward Memorial Hospital, Australia; Dr Rebecca C. Painter, Amsterdam University Centres, The Netherlands; Claire L. Parry, UK; Dr Beth A. Payne, University of British Columbia, Canada; Emma L. Pearson, UK; Professor Vorapong Phupong, Chulalongkorn University, Thailand; Naomi Pickett, UK; Katie A. Pickles, UK; Louise K. Plumb, UK; Dr Federico Prefumo, University of Brescia, Italy; Professor Roanne Preston, University Of British Columbia, Canada; Dr Joel G. Ray, University of Toronto, Canada; Dr Juliet Rayment, UK; Lynsey V. Regan, UK; Dr Evelyne Rey, University of Montreal, Canada; Dr Emily J. Robson, UK; Antonia N. Rubin, UK; Professor Jorge A. Rubio-Romero, Universidad Nacional de Colombia, Colombia; Dr Kristiina Rull, Women's Clinic of Tartu University Hospital, Estonia; Professor Nelson Sass, Universidade Federal de São Paulo, Brazil; Professor Nadine Sauvé, Université de Sherbrooke, Canada; Nicola A. Savory, University Hospital of Wales, UK; Professor James R. Scott, University of Iowa, USA; Dr Sarah E. Seaton, University of Leicester, UK; Paul T. Seed, King's College London, UK; Dr Judy M. Shakespeare, UK; Dr Antonia W. Shand, University of Sydney, Australia; Dr Sanjay Sharma, Westmead Hospital, Australia; Dr Tammy Y. Shaw, Canada; Dr Kate L. Smedley, UK; Dr Drew Smith, Princess Royal Maternity, UK; Ashley Smith Conk, USA; Donna Soward, Australia; Professor Holger Stepan, Leipzig University, Germany; Dr Konstantinos Stroumpoulis, Centre Hospitalier Public du Cotentin, France; Dr Anoop Surendran, Lewisham and Greenwich NHS Trust, UK; Professor Satoru Takeda, Juntendo University Faculty of Medicine, Japan; Dr Lawrence Tan, Western Sydney University, Australia; Becky S. Theriot, USA; Hayley F. Thomas, Netherlands; Karen Thompson, Australia; Dr Peter I. Thompson, National Institute of Health Research, UK; Professor Matthew J. Thompson, University of Washington, USA; Laura Toms, UK; Kate L. H. T. Torney, UK; Dr Julian S. Treadwell, University of Oxford, UK; Dr Katherine L. Tucker, University of Oxford, UK; Dr Mark A. Turrentine, Baylor College of Medicine, USA; Dr Oliver Van Hecke, University of Oxford, UK; Dr Miriam F. Van Oostwaard, Capelle aan den Ijssel, The Netherlands; Dr Daniela N. Vasquez, Sanatorio Anchorena, Argentina; Dr David J. A. Vaughan, London North West University Healthcare NHS Trust, UK; Dr Angela VInturache, Oxford University Hospitals NHS Foundation Trust, UK; Professor James Walker, University of Leeds, UK; Dr Stephen P. Wardle, Nottingham University Hospitals NHS Trust, UK; Professor Tayyiba Wasim, Institute of Medical Sciences, Lahore, Pakistan; Dr Jonathan H. Waters, UPMC Magee Womens Hospital, USA; Dr Clare L. Whitehead, University of Toronto, Canada; Dr Alexander Wolfson, Penn Medicine Princeton Health, USA; Professor Seonae Yeo, University of North Carolina at Chapel Hill, USA and Dr Arnold G. Zermansky, University of Leeds, UK.