Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa

Maternal Morbidity Working Group

Maternal Morbidity Working Group Annual Report

Te Pūrongo ā-Tau a Te Rōpū Mahi mō te Manaaki i te Whaea Matemate

1 September 2017 to 31 August 2018

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Acknowledgements | He mihi

The Maternal Morbidity Working Group (MMWG) would like to thank everyone who has provided input throughout the programme's duration. Your engagement, contribution and dedication enabled us to undertake our work programme with the vision of better outcomes for mothers in Aotearoa New Zealand.

We acknowledge the women and their families and whānau whose cases were reviewed to inform this report. We express our gratitude to women who shared their narratives. Hearing the women's experience of maternal morbidity helped us to understand the impact of the events on women and their families and whānau.

We would like to thank the women and clinicians who have provided such excellent input into the review panels, the lead maternity carers and general practitioners who provided clinical notes, and the district health boards for their support in providing notifications and clinical notes, and in releasing clinicians to participate in this work.

The MMWG commends the summarising midwives, Chris Heiss, Gail Austin and Sarah Gilbertson, for their high-quality work. Without their input, the panel reviews would not have been possible.

Report content prepared and written by Alice McCallum, Dr Leona Dann, Anna Lee and Kat Lawrie.

More information | Ētahi atu mōhiohio

For more information about the MMWG, visit www.hqsc.govt.nz.

Maternal Morbidity Working Group members | Ngā mema o Te Rōpū Mahi mō te Manaaki i te Whaea Matemate

Ms Arawhetu Gray (co-chair)
Director, Māori health, Capital & Coast District Health Board

Dr Seton Henderson (co-chair)
Intensive care specialist, Canterbury District Health Board

Dr Matthew Drake
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Consumer representative

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Dr Claire McLintock
Clinical director, regional maternity services, haematologist and obstetric physician, Auckland District Health Board

Dr Craig Skidmore
Obstetrician and gynaecological consultant, Hawke's Bay District Health Board

The symbolism of the harakeke in our logo and publications

We have woven harakeke (flax) in our logo and along the side of our publications. The beauty of the harakeke is reflected in its symbolism and versatility. As a plant, it represents whānau, with the child at the centre. In its woven form, it reflects the strengthening of the whole through the overlaying weave. We chose the harakeke as our logo to acknowledge that by weaving women's experiences and review processes together, we will gain a greater understanding of how the maternity system can be strengthened and improved.

Contents | Rārangi take

Foreword | Kupu whakataki

As the chair of the Perinatal and Maternal Mortality Review Committee (the PMMRC), I am pleased to introduce the third report of the Maternal Morbidity Working Group (the MMWG).

The vision created by the MMWG is 'better outcomes for mothers in New Zealand', with an aim to 'to improve the quality and experience of maternity care for women, babies, families and whānau, informed by robust, consistent, reportable and women-centred maternal morbidity review'.

On behalf of the PMMRC, I would like to acknowledge the women at the centre of this report. Their narratives have conveyed the lived experience of severe maternal morbidity, helped inform systems changes and contributed to better outcomes for women in Aotearoa New Zealand. I would also like to recognise the dedication and expertise of the MMWG in working toward this vision. Lastly, I would like to acknowledge those involved in collecting and summarising the cases, those who contributed to panel reviews and those who worked behind the scenes to produce this report.

The Ministry of Health funding to support the morbidity review work was time-limited and expired on 30 June 2019. The MMWG strongly believes there is a need for this valuable work to continue and the PMMRC agrees. Therefore, a new morbidity sub-committee under the auspices of the PMMRC will be convened from 1 July 2019. While this is the last report from the MMWG under its current structure, the new sub-committee will continue to address systemic factors that may contribute to illness severity, and identify opportunities for improvement.

This report focuses on peripartum hysterectomy and hypertensive disorders of pregnancy. It presents findings and key themes from the panel reviews and includes practice points and recommendations for DHBs and clinicians. These are aimed at highlighting best practice, addressing inequity, aligning with Te Tiriti o Waitangi, and sharing information with the woman and supporting her wellbeing.

On behalf of the PMMRC, I congratulate the MMWG co-chairs Arawhetu Gray and Seton Henderson and the members of the MMWG for their dedication over the last three years to improving outcomes for mothers in Aotearoa New Zealand.

Mr John Tait

Chair, Perinatal and Maternal Mortality Review Committee

Introduction from the co-chairs | He kōrero whakataki nā ngā heamana takirua

We are pleased to present the third report of the Maternal Morbidity Working Group (the MMWG).

The MMWG was established for a three-year term to improve the quality and experience of maternity care for women, babies, families and whānau. We have done this through robust, women-centred maternal morbidity review, and through the development of quality improvement initiatives.

We are heartened to note that some of the recommendations released in our second report (June 2018) have been implemented. Maternity services have collaborated regionally to adopt a consistent and streamlined approach to these quality improvement initiatives, such as the development of sepsis pathways and bundles.

In this, our third and final report, we present the findings of our regional review panels. These panels reviewed a random selection of peripartum hysterectomy and hypertensive disorder cases. The findings from the 41 reviewed cases have informed the practice points and recommendations included in this report. We consulted with district health boards on the draft recommendations and received positive feedback demonstrating plans for implementation. This assured us the draft recommendations were appropriate, timely and achievable.

This report also provides updates on the MMWG's two big quality improvement initiatives, which have now been released to the sector for implementation: the maternity early warning system (MEWS) and the maternal morbidity review toolkit for maternity services. We are excited to see how these initiatives will be implemented in the sector to ultimately improve outcomes for mothers, babies and their families and whānau.

Thank you to all those who have been involved in and supported the MMWG's work over the past three years. To the women who willingly shared their experiences of being very unwell when pregnant, or recently pregnant, we are immensely grateful. Their gift of personal narratives enabled women's voices to be present at the reviews. We acknowledge that our achievements are the result of collaborative efforts from clinicians across the maternity sector. We are grateful for your mahi.

As co-chairs, we would also like to acknowledge the members of the MMWG for the compassion, expertise and commitment they have brought to improve maternal health for women in Aotearoa New Zealand. Each member has significant calls upon their expertise and time, and we are privileged to have had them lead, guide and direct the work of the MMWG.

For any group to successfully meet its goals requires a dedicated team of individuals whose expertise and drive are exemplary. We have such a team in the Health Quality & Safety Commission: Dr Leona Dann and her colleagues Anna Lee, Kat Lawrie, Alice McCallum, Gail Austin, Sarah Gilbertson and Chris Hiess. We could not have achieved what we have without their incredible support and guidance.

Ms Arawhetu Gray and Dr Seton Henderson
Co-chairs, Maternal Morbidity Working Group

Introduction from the consumer representatives | He kōrero whakataki nā ngā māngai kaiwhakapeto

Ko Ranginui e tū iho nei
Ko Papatūānuku e takoto ake nei
Ka puta ki te whai ao,
ki te ao mārama.
Ngā tamariki Te Kāhui Atua
Mai i te onetapu i Kurawaka
Ko Hineahuone
Ko Hinetītama
Ko Hinenuitepō
Nā Hineteiwaiwa te takapau wharanui
kia puta te pā harakeke
Ko Te Whare Tapu o te tangata
Te pito mata ki te pito ora
E puta ake ana a Puanga
te tohu o te ora
Tihei mauri ora!
(Mokopuna Ora Collective karakia)

Sky father protects us from above
Earth mother nurtures us from below
Brought forth into the world of light,
the world of knowing.
Their children,
our spiritual guardians
Hineahuone – first maiden, formed from clay
Hinetītama – dawn maiden
Hinenuitepō – maiden of the underworld From
Hineteiwaiwa, maiden of reproduction and weaving,
is the weaved birthing mat on which legacies are
conceived The sacred house for nurturing humankind
The fruition of our potential
The Rigel Star rises to welcome in
the new year as a sign of good health
Breathe the breath of life!

Tēnā koutou katoa

Being a member of the MMWG over the last three years has generated for me a range of thoughts and emotions. The MMWG holds a privileged seat to act as the voice of women, families and whānau in Aotearoa New Zealand who have used, are using or will use maternity services. These three tenses are of equal significance, as through notifications and reviews we consider experiences that have led women to being very unwell either in pregnancy, childbirth or immediately after birth. Many of these experiences have significant short- and long-term physical and emotional impacts on women, families and whānau. Through the robust review of these experiences we take key learnings in what practice may be done differently or which systems may be implemented to give women having or planning for babies the best possible care for the best possible outcome.

The two significant pieces of work that have come out of the MMWG are the maternity early warning system (MEWS) and the review toolkit for maternity services. I implore our clinicians and maternity services to take heed of these valuable resources. I implore the Ministry of Health to make sure our maternity services are staffed in a way that allow these resources to be practically implemented. The experiences of the unwell women whose cases were reviewed, which led to the trial and development of these resources, must not be in vain. Let us learn and use these additional tools to improve experiences and outcomes for our current and future child-bearing women.

I would like to acknowledge the members of the MMWG who, at times, have overwhelmed me with their focus and commitment to improving outcomes for women and whānau. There is no truer example of this than the Health Quality & Safety Commission staff who have led this work with conviction and dedication. The forward-thinking approach of ensuring consumer input, not only on the MMWG and on the regional review panels but also in inviting and including women whose cases were reviewed to share their accounts in their own words, has been a significant step forward for consumers. To the brave women who so generously shared their stories, we thank you.

Nāku noa,

Nā Jenny Warren
MMWG consumer member

Introducing the Maternal Morbidity Working Group | Te whakamōhio atu i Te Rōpū Mahi mō te Manaaki i te Whea Matemate

The Maternal Morbidity Working Group (the MMWG) was established in May 2016 under the umbrella of the Perinatal and Maternal Mortality Review Committee (the PMMRC) for a three-year period. The MMWG's role is to review and report on maternal morbidity, and to develop quality improvement initiatives to reduce maternal morbidity and improve maternal outcomes.

This is the MMWG's third and final annual report.[1] It provides an overview of the MMWG's work and highlights what we have achieved since our establishment, with a focus on the past 12 months. It presents key information on both aspects of the MMWG's role – maternal morbidity review, and quality improvement.

The report focuses on the review aspect of our work. This includes:

- key findings from the notifications
- insights from case reviews for the areas of focus (unplanned peripartum hysterectomy and hypertensive disorders in pregnancy)
- a summary of the factors that were identified in the panel reviews as having frequently contributed to the severity of maternal morbidity in Aotearoa New Zealand.

The report closes with information on the MMWG's national quality improvement initiatives, and the future shape of the group's work.

Defining maternal morbidity

While most women are healthy throughout their pregnancies, a small number of women experience severe acute maternal morbidity (also known as maternal 'near miss mortality'). This is when a pregnant or recently pregnant woman is very unwell and 'would have died had it not been luck or good care was on her side'.[2] Maternal morbidity rates are used alongside maternal mortality as a measure of the quality of maternity care and to address health and disability system failures, with the goal of improving maternity care.[3] Maternal morbidity is also considered a useful key indicator of a population's health status.[4]

The MMWG identifies cases of severe acute maternal morbidity by receiving notifications of pregnant or recently pregnant women who are admitted to a high dependency unit (HDU) and/or an intensive care unit (ICU). Research shows that nearly all maternity ICU admissions are cases of severe morbidity (ie, high specificity) and make up more than three-quarters of all severe acute maternal morbidity (ie, high sensitivity).[5, 6]

We acknowledge some women receive specialised care in other areas of hospitals, such as delivery suites. We cannot robustly collect information about these cases, but this does not discount or diminish the experiences of either those women or the people who care for them.

1 The first and second annual reports can be found at www.hqsc.govt.nz/our-programmes/mrc/pmmrc/publications-and-resources/publication/2929/ and www.hqsc.govt.nz/our-programmes/mrc/pmmrc/publications-and-resources/publication/3369.

2 Mantel GD, Buchmann E, Rees H, et al. 1998. Severe acute maternal morbidity: A pilot study of a definition for a near-miss. *BJOG: An international Journal of Obstetrics and Gynaecology* 105(9): 985–90. URL: http://dx.doi.org/10.1111/j.1471-0528.1998.tb10262.x (accessed April 2017).

3 Vandenberghe G, Guisset M, Janssens I, et al. 2017. A nationwide population-based cohort study of peripartum hysterectomy and arterial embolisation in Belgium: Results from the Belgian Obstetric Surveillance System. *BMJ Open* 7: e016208. DOI: 10.1136/bmjopen-2017-016208 (accessed January 2019).

4 de la Cruz CZ, Coulter M, O'Rourke K, et al. 2016. Post-traumatic stress disorder following emergency peripartum hysterectomy. *Archives of Gynecology and Obstetrics* 294: 681–8. DOI: 10.1007/s00404-016-4008-y (accessed January 2019).

5 Geller S, Rosenberg D, Cox S, et al. 2004. A scoring system identified near-miss maternal morbidity during pregnancy. *Journal of Clinical Epidemiology* 57(7): 716–20. URL: https://doi.org/10.1016/j.jclinepi.2004.01.003 (accessed April 2017).

6 You W, Chandrasekaran S, Sullivan J, et al. 2012. Validation of a scoring system to identify women with near-miss maternal morbidity. *American Journal of Perinatology* 30(1): 21–4. URL: https://doi.org/10.1055/s-0032-1321493 (accessed April 2017).

The role of the MMWG

The role of the MMWG is twofold: to review and report on maternal morbidity in Aotearoa New Zealand, and to develop quality improvement initiatives to reduce morbidity and improve outcomes. These two elements are closely linked, in that it is through the review process that the MMWG identifies factors that may be contributing to maternal morbidity, which then allows the development of quality improvement initiatives to address these.

Maternal morbidity panel reviews

In its first year, the MMWG developed four regional review panels to review a selection of cases from the notifications received. The panels are multidisciplinary and comprise midwives, obstetricians, intensivists, general practitioners and consumers. The regional panels come together to review cases and identify ways to improve processes and practices with maternity services.

Quality improvement initiatives

The insights and lessons learned through the panel reviews are used to inform recommendations and initiatives to improve the quality and safety of the maternity system. Ultimately, the aim is to reduce maternal morbidity in Aotearoa New Zealand.

The MMWG led two national quality improvement activities: the development and implementation of a national maternity early warning system (MEWS) and the development of a maternal morbidity review toolkit for maternity services.

Recommendations and practice points

The reviews led to a number of recommendations and practice points, which are threaded throughout this report. The practice points are also listed in Appendices 1 and 2. These are aimed at all levels of the maternity sector, including at a national level (macro), district health board (DHB) level (meso), and individual practitioner level (micro). The recommendations and practice points should be used to inform further quality improvement initiatives and to guide changes in practice.

Generally, the recommendations focus on the first two levels (national and DHB). The practice points focus on advice regarding evidence-informed best practice and are aimed predominantly at clinicians (identified in orange) who work most directly with mothers and babies in Aotearoa New Zealand. There are also practice points aimed at DHBs (identified in blue).

Including the woman's voice

The MMWG values the woman's voice as integral to our work programme. We believe that offering a woman the opportunity to share her narrative allows her to tell of her experience, and share her memories, thoughts, perceptions and reflections. Together, these form her reality of the event.

In 2017 the MMWG established a process to record the narratives of women whose cases were going to be reviewed. Since then, we have received 26 narratives of women's experiences of serious acute maternal morbidity.

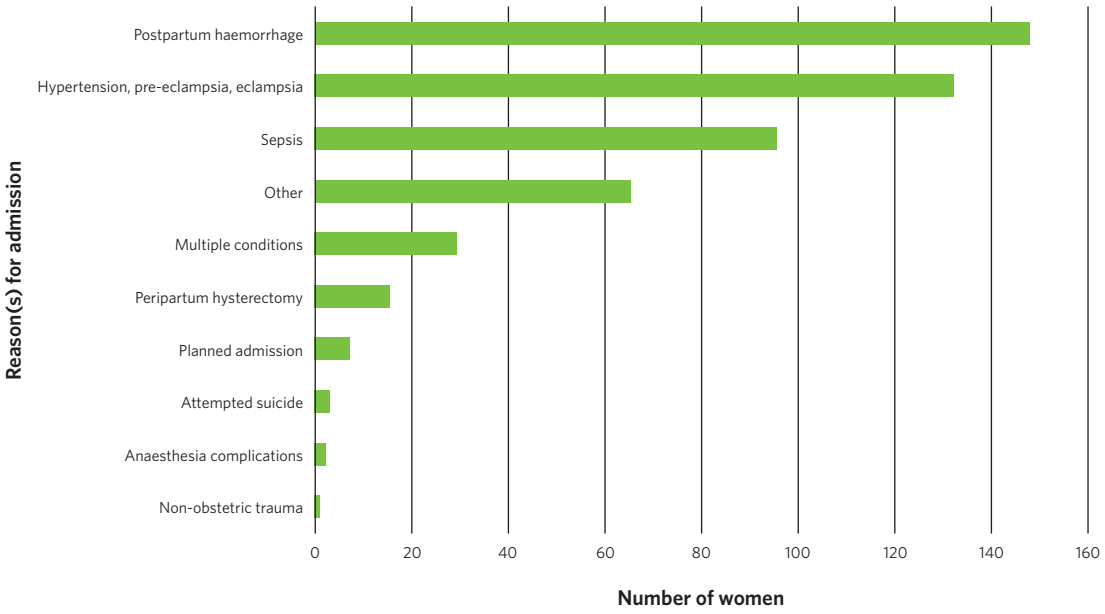
The MMWG has endeavoured to reflect the woman's voice throughout this report. Women's narratives have informed the case reviews, panel findings and recommendations. This year, we have chosen to include two narratives in this report. One narrative details a woman's experience of undergoing an emergency peripartum hysterectomy. The other is a composite story, which draws on the narratives of women's experiences of being very unwell with pre-eclampsia. We hope that by including these narratives, we can help to convey the significance of maternal morbidity for women and their families and whānau.

Maternal morbidity in Aotearoa New Zealand – notifications | Te manaaki i te whaea matemate i Aotearoa – ngā whakamōhiotanga

The MMWG receives notifications for women who have been admitted to an HDU or ICU while pregnant, or within 42 days of the end of the pregnancy. These notifications include demographics, reason for admission and the treatment received by the women. The MMWG reviews a portion of the notified cases of severe maternal morbidity, develops system-level recommendations from the review findings, and develops and implements quality improvement initiatives based on the recommendations.

The MMWG received 468 notifications of maternal morbidity for 437 women between 1 September 2017 and 31 August 2018. The leading reason for admission was postpartum haemorrhage, which accounted for 33.9 percent of cases. This was followed by hypertensive disorders, which accounted for 30.2 percent, and sepsis, which accounted for 15.1 percent (Figure 1).

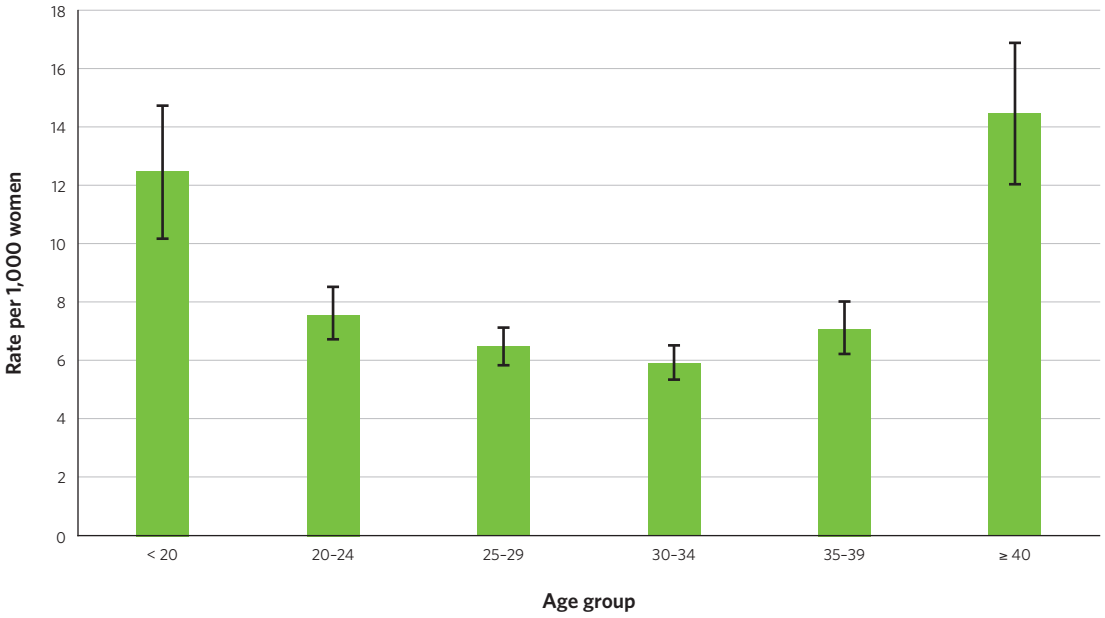
Figure 1: Number of pregnant or recently pregnant women admitted to an HDU or ICU, by reason(s) for admission, Aotearoa New Zealand, 1 September 2017 to 31 August 2018



Data source: MMWG Notifications Database: Admissions to an HDU or ICU during or within 42 days of pregnancy.
Note: 'Other' includes a wide range of other conditions or causes for admission, including but not limited to cardiac issues, anaphylaxis and chronic co-morbidities. 'Multiple conditions' includes all women who were admitted with more than one diagnosis. These women are counted multiple times.

As shown in Figure 2, women aged 30–34 years made up 25.4 percent of cases, followed by those aged 25–29 (25.17 percent) and 20–24 (16.7 percent). The highest rate of admission was among women over 40 years old, followed by women aged under 20 years.

Figure 2: Rate per 1,000 women giving birth with an HDU or ICU notification, by age, Aotearoa New Zealand, 1 September 2017 to 31 August 2018



Numerator: MMWG Notification Database: Admissions to an HDU or ICU during or within 42 days of pregnancy.
Denominator: National Maternity Collection: Women who had babies born ≥ 20 weeks, average between 2016 and 2017.

Table 1: Rate per 1,000 women giving birth with an HDU or ICU notification, by ethnicity, Aotearoa New Zealand, 1 September 2017 to 31 August 2018

	Number of women admitted to an HDU or ICU	Total number of women giving birth*	Rate/1,000
New Zealand European	160	26,757	5.98
Māori	132	14,941	8.84
Pacific peoples	56	5,951	9.41
Asian (not including Indian)	42	6,981	6.02
Indian	26	3,604	7.22
Total **	416	58,234	7.14

Numerator: MMWG Notification Database: Admissions to an HDU or ICU during or within 42 days of pregnancy.
Denominator: National Maternity Collection: Women who had babies born ≥ 20 weeks, average between 2016 and 2017.
* Average number of women giving birth between 2016 and 2017, by ethnicity (National Maternity Collection (MAT) data set).
** **Note:** An additional 1,462 women who birthed during this period, with an ethnicity of 'other', were excluded from this table due to differences in the definition of 'other' between the two data sets. Twenty-one of the 437 notifications were excluded as their ethnicity was stated as 'other'.

The notifications in Table 1 suggest the rate of maternal morbidity in Aotearoa New Zealand to be 7.14/1,000 women giving birth (refer to Appendix 3: Methods and limitations). This is in line with other high-income countries where the maternal morbidity incidence rate is suggested to range from 3.8

(95% confidence interval (CI) 3.3–4.4) to 12 (95% CI 11.2–13.2) per 1,000 births.[7] It is important to note that the classification of maternal morbidity varies internationally. The rate in this report reflects Aotearoa New Zealand women who were severely unwell and required HDU and/or ICU care; it does not reflect women who were very unwell and received care in other areas.

Applying the principles of Te Tiriti o Waitangi

In Aotearoa New Zealand, Te Tiriti o Waitangi provides the foundation for the relationship between Māori and the Crown. Te Tiriti o Waitangi should be central in positioning organisational stewardship responsibility to Māori as tangata whenua, regardless of whether health inequities exist or not. In Aotearoa New Zealand, health inequities are pervasive and persistent, particularly for Māori.[8] The historical cumulative impact relates to failures to uphold Te Tiriti o Waitangi. Historical injustices are well documented and existed in parallel with the establishment of structures of colonial governance that have embedded inequity. Organisations should use Te Tiriti o Waitangi as a framework to eliminate current health inequities and to design health care that is authentic and relevant to the needs of Māori.

Due to differences in translation and understanding of the literal texts of Te Tiriti (in English versus te reo Māori), the Waitangi Tribunal and the courts have referred to core 'principles' implied by the spirit and intent of Te Tiriti to guide subsequent interpretation.[9] Within health, these are typically understood to be partnership, participation and protection.

- **Partnership** requires organisations to authentically partner with Māori to understand their aspirations, priorities and needs to better improve Māori health outcomes. Meaningful Māori health gains are gains in areas that are priorities for Māori, not necessarily areas where there is greater inequity. Equity with non-Māori populations on given indicators, in and of itself, may not be the main focus for Māori.
- **Participation** requires Māori to be involved at all levels of the health and disability sector, including in decision-making, planning, development and delivery of health and disability services. Sir Mason Durie writes that Māori health development can only occur when Māori define their own health priorities, have control over health strategies and programmes, manage and deliver their own services, taking a preventative and integrated approach, and work in partnership with the State, rather than being relegated to the position of passive bystanders.[10]
- **Protection** requires the concept that health is a taonga, or a treasure, in Te Tiriti to be respected to enable self-determination. It involves the Government (and health care services and providers) working to ensure Māori have the same health as non-Māori, and safeguarding Māori cultural concepts, values and practices.

Practice point for DHBs: Principles of Te Tiriti

DHBs should partner with wāhine Māori (Māori women) and their whānau in meaningful, participatory ways to understand their maternity health priorities and work with them to design and implement solutions.[11] These solutions must recognise and respond to the authentic needs of Māori aspirations for self-determination in the health and wellbeing of themselves and their whānau, and must safeguard Māori cultural concepts, values and practices. We highly recommend using co-design[12] to best develop a service that is responsive to the needs and outcomes of wāhine Māori.

7 van Roosmalen J, Zwart J. 2009. Severe acute maternal morbidity in high-income countries. *Best Practice & Research Clinical Obstetrics Gynaecology* 23(3): 297–304.

8 Ministry of Health. 2018. *Achieving equity in health outcomes: Highlights of important national and international papers.* Wellington: Ministry of Health.

9 Waitangi Tribunal. 2016. *The Treaty of Waitangi/Te Tiriti o Waitangi: Principles of the Treaty.* Wellington: Waitangi Tribunal. URL: www.waitangitribunal.govt.nz/treaty-of-waitangi/principles-of-the-treaty (accessed February 2019).

10 Durie M. 1994. *Whaiora: Māori health development.* Auckland: Oxford University Press.

11 Chin MH, King PT, Jones RG, et al. 2018. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. *Health Policy* 122: 837–53.

12 Co-design is an approach that allows staff and consumers (or other people who use hospital and other care services) to share the designing of health services. It is sometimes called 'experience-based co-design'.

Outcomes for Māori women

In Aotearoa New Zealand, inequities in health, and in the determinants of health, are pervasive and pronounced, with a significant burden of the inequitable outcomes being carried by Māori.[13] Large and persistent inequities experienced by Māori are evident in a wide range of health outcomes, including psychological distress and mental health, self-rated health, and life expectancy.[14]

While we don't have robust epidemiological data, the notifications data suggests that Māori women are disproportionately and adversely affected by maternal morbidity, as shown in Figure 3. Māori women were over-represented in the notifications of women admitted to an HDU or ICU compared with non-Māori women. Māori women were 29 percent more likely than non-Māori women (rate ratio (RR) = 1.29, 95% CI = 1.27–1.32) and 47 percent more likely than New Zealand European women (RR = 1.47, 95% CI = 1.44–1.52) to have an HDU or ICU notification.

Outcomes for Pacific women

In Aotearoa New Zealand, Pacific populations also share the inequities in health and in the determinants of health. Pacific peoples experience similar health outcomes to Māori, including psychological distress and mental health, self-rated health, and life expectancy.[15]

As shown in Figure 3, the notifications data suggests that Pacific women are also disproportionately and adversely affected by maternal morbidity. Pacific women were over-represented in the notifications of women admitted to an HDU or ICU compared with non-Pacific women. Pacific women were 32 percent more likely than non-Pacific women (RR = 1.32, 95% CI 1.27–1.38) and 57 percent more likely than New Zealand European women (RR = 1.57, 95% CI = 1.50–2.36) to have an HDU or ICU notification.

A recent study found that Pacific women were more than twice as likely to suffer a preventable severe maternal morbidity event compared with New Zealand European women.[16]

These findings are consistent with other research that shows that Māori and Pacific women are more likely to experience poorer birth outcomes, including higher perinatal mortality, and higher maternal morbidity[17] and mortality.[18]

13 Ministry of Health. 2018. *Achieving equity in health outcomes: Highlights of important national and international papers.* Wellington: Ministry of Health.

14 Ministry of Health. 2017. *Annual Data Explorer 2016/17: New Zealand Health Survey* [Data File]. Wellington: Ministry of Health. URL: https://minhealthnz.shinyapps.io/nz-health-survey-2016-17-annual-data-explorer/_w_de343730/#!/home (accessed April 2019).

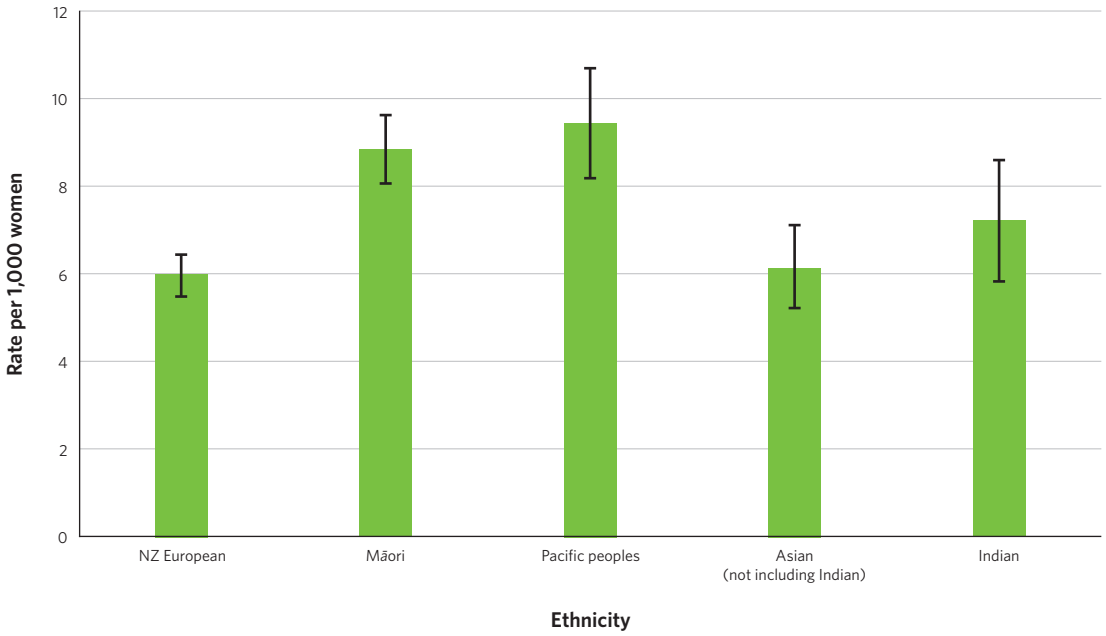
15 *Ibid.*

16 Lawton B, MacDonald EJ, Stanley J, et al. 2019. Preventability review of severe maternal morbidity. *Acta Obstetricia et Gynecologica Scandinavica* 98: 515–22. URL: https://doi.org/10.1111/aogs.13526 (accessed February 2019).

17 *Ibid.*

18 PMMRC. 2018. *Twelfth Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2016.* Wellington: Health Quality & Safety Commission. URL: www.hqsc.govt.nz/assets/PMMRC/Publications/12th-PMMRC-report-final.pdf (accessed November 2018).

Figure 3: Rate per 1,000 women giving birth with an HDU or ICU notification, by ethnicity, Aotearoa New Zealand, 1 September 2017 to 31 August 2018



Numerator: MMWG Notification Database: Admissions to an HDU or ICU during or within 42 days of pregnancy.
Denominator: National Maternity Collection: Women who had babies born ≥ 20 weeks, average between 2016 and 2017.

A framework for understanding inequalities

Dr Camara Jones[19] has developed a useful framework for considering and understanding ethnic/racial disparities in health outcomes. It involves considering inequalities at three different levels:

- **Differences in exposures and life opportunities:** This level includes the structural factors (such as education, employment, food and housing security) that may impact on an individual's opportunity for health.
- **Differential access to health care:** This level considers the accessibility of health care services, whereby the ability to financially and physically access appropriate health care may contribute to ethnic and racial inequalities in health.
- **Differential care within the health and disability system:** The third level concerns the quality of care delivered by the health and disability system.

Dr Jones' framework would suggest that *inequalities* in the wider determinants, and in access to and the quality of care within the health and disability system, may be contributing to *inequity* in the severity of maternal morbidity for Māori and Pacific women. Other Aotearoa New Zealand research focusing on maternity services also suggests that work is needed in each of these three areas to achieve equity in maternity services.

Health inequity can be defined as 'differences in health, which are not only unnecessary and avoidable but, in addition, are considered unfair and unjust'.[20] The underlying causes of health inequity are social. That is, they reflect society and its organisation.

19 Jones CP. 2002. Confronting institutionalised racism. *Phylon* 50(1): 7–22. URL: https://sph.umd.edu/sites/default/files/files/Jones-Confronting-Institutionalized-Racism_Phylon%202003.pdf (accessed January 2019).

20 Whitehead M. 1991. The concepts and principles of equity and health. *Health Promotion International* 6(3): 217–28. URL: https://doi.org/10.2190/986L-LHQ6-2VTE-YRRN (accessed April 2019).

Māori and Pacific peoples often experience greater obstacles to achieving good health, including 'poverty, discrimination, and powerlessness. They also have poorer access to good jobs with fair pay, quality education and housing, safe environments and health care'.[21] Aotearoa New Zealand data shows that Māori and Pacific women more often live in areas of higher deprivation, which relates strongly to exposures and life opportunities.[22, 23]

Other barriers to care for Māori and Pacific women include poor access to relevant and appropriate information,[24] and poor access to culturally responsive care, including whānau-centred services.[25] A study by Payne et al found that Māori and Pacific women have the lowest uptake of completed first versus second trimester screening after adjusting for age, deprivation and DHB, which could indicate poor access to health care.[26]

Furthermore, there is evidence that Māori and Pacific women receive differential care within the health and disability system. Rumball-Smith reports that studies on obstetric intervention in Aotearoa New Zealand have found that 'Māori were less likely to receive the current acceptable standard of care despite clinical indication'.[27] Other studies have found that Māori women were significantly less likely to undergo induction of labour, prelabour caesarean section and operative vaginal delivery.[28] A recent study identified substandard care as a factor in all cases of preventable severe maternal morbidity in Pacific women.[29]

Responding to inequities

An equity approach

The differences observed at these levels warrant an equity approach to maternity care. An equity approach recognises that different people with different levels of advantage may require different approaches to get the same outcome.

Many of the inequitable outcomes people experience are due to an approach that favours 'sameness' and uniform approaches to health care, rather than recognising that different groups may benefit from different approaches in order to get comparable outcomes. Uniform approaches fail to account for contextual and cultural differences between people and groups of people – for example, age, gender, ethnicity and socioeconomic status, among other things.[30] In contrast, equitable approaches are seldom equal because they are deliberately designed to minimise the impact of differences between groups.[31, 32]

21 Chin MH, King PT, Jones RG, et al. 2018. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. *Health Policy* 122: 837–53.

22 McAra-Couper J, Farry A, Marsters N, et al. 2018. Pasifika women's choice of birthplace. *New Zealand College of Midwives Journal* 54: 15–21.

23 Makowharemahihi C, Lawton BA, Cram F, et al. 2014. Initiation of maternity care for young Māori women under 20 years of age. *Journal of the New Zealand Medical Association* 127(1393): 52–61. URL: www.nzma.org.nz/__data/assets/pdf_file/0018/35037/content.pdf (accessed April 2019).

24 *Ibid.*

25 Ratima M, Crengle S. 2013. Antenatal, labour, and delivery care for Māori: Experiences, location within a lifecourse approach, and knowledge gaps. *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 10(3): 353–66.

26 Payne O, Pillai A, Wise M, et al. 2017. Inequity in timing of prenatal screening in New Zealand: Who are our most vulnerable? *The Royal Australian and New Zealand College of Obstetricians and Gynaecologists* 57: 609–16. DOI: 10.1111/ajo.12649 (accessed January 2019).

27 Rumball-Smith J. 2012. *Inequality in Quality? The selection and use of quality indicators to investigate ethnic disparities in the quality of hospital care, Aotearoa New Zealand.* Thesis, Doctor of Philosophy. University of Otago . URL: https://ourarchive.otago.ac.nz/handle/10523/2576 (accessed January 2019). Page 96.

28 Sadler L, McCowan L, Stone P. 2002. Associations between ethnicity and obstetric intervention in New Zealand. *New Zealand Medical Journal* 115: 36–9. URL: https://researchspace.auckland.ac.nz/bitstream/handle/2292/4496/11942512.pdf?sequence=1 (accessed January 2019).

29 Lawton B, MacDonald EJ, Stanley J, et al. 2019. Preventability review of severe maternal morbidity. *Acta Obstetricia et Gynecologica Scandinavica* 98: 515–22. URL: https://doi.org/10.1111/aogs.13526 (accessed February 2019).

30 Articles 23 and 24 of the United Nations Declaration on the Rights of Indigenous Peoples (2007) support participation by declaring that indigenous populations have the right to be actively involved in developing and determining health and social programmes affecting them, and the right to use traditional medicine to maintain their health practices. URL: www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf (accessed February 2019).

31 MidCentral DHB. 2018. *Achieving health equity think piece 2018.* Palmerston North: MidCentral DHB. URL: www.midcentraldhb.govt.nz/Publications/AllPublications/Documents/Equity%20Brochure.pdf (accessed February 2019).

32 Health Quality & Safety Commission. 2017. *Quality improvement: No quality without equity?* Wellington: Health Quality & Safety Commission. URL: www.hqsc.govt.nz/our-programmes/other-topics/publications-and-resources/publication/3093 (accessed February 2019).

Practice point for DHBs: Addressing equity

DHBs should use the Health Equity Assessment Tool (the HEAT) to assess their services for the impact on health equity.

The HEAT aims to promote equity in health in Aotearoa New Zealand. It comprises 10 questions for assessing policy, programme or service interventions for the current or future impact on health inequities. The HEAT is a flexible tool that can be used in its entirety or, alternatively, selected questions can be asked for specific purposes.

The HEAT is available online at www.health.govt.nz/system/files/documents/publications/health-equity-assessment-tool-guide.pdf.

Combating institutional racism

In Aotearoa New Zealand and internationally, there is growing recognition of the role of racism as an underlying cause of inequalities at each of the levels discussed earlier, and as a determinant of health in and of itself.[33, 34] Jones defines racism as 'a system (consisting of structure, policies, practices and norms) that structures opportunities and assigns value based on [ethnicity]'.[35] Racist systems are characterised by unequal, racialised power relations and 'produce inequities that manifest as disadvantage for some groups and privilege for others'.[36]

From this perspective, racism is not simply viewed as personally mediated prejudice and discrimination, but rather from a structural/systems perspective. Institutionalised racism can be defined as 'differential access to the goods, services, and opportunities of society by [ethnicity]'.[37] The New Zealand Human Rights Commission asserts that 'there is strong, consistent evidence that structural discrimination [institutional racism] is a real and ongoing issue for New Zealand', with examples of institutional racism and its consequences rife throughout the education system, justice system, public service, and the health and disability system.[38] This view is supported by Cormack et al, who state that 'in colonial societies, including Aotearoa New Zealand, racism is a fundamental dimension of the 'system' of oppression that shapes the lives, opportunities and exposures of all people in ways that create and sustain racialised hierarchies of privilege and disadvantage'.[39]

In seeing that Māori and Pacific women are over-represented in HDU and ICU notifications, maternity services must consider whether they are contributing to these inequities by way of institutionalised racism. For example, are they providing maternity care that fails to account for different health needs and cultural values of Māori and Pacific communities? Strategies to recognise and reduce the imbalance in their systems and structures that perpetuate the unequal distribution of health care, the determinants of health, and ultimately, health outcomes should be developed and embedded in maternity services.

33 Cormack D, Stanley J, Harris R. 2018. Multiple forms of discrimination and relationships with health and wellbeing: Findings from national cross-sectional surveys in Aotearoa/New Zealand. *International Journal for Equity in Health* 17: 26.

34 Came H, Griffith D. 2018. Tackling racism as a 'wicked' public health problem: Enabling allies in anti-racism praxis. *Social Science and Medicine* 199: 181–8. URL: http://dx.doi.org/10.1016/j.socscimed.2017.03.028 (accessed January 2019).

35 Jones CP. 2002. Confronting institutionalised racism. Phylon 150: 7–22. Cited in Harris RC, Cormack DM, Stanley J. 2013. The relationship between socially-assigned ethnicity, health and experience of racial discrimination for Māori: Analysis of the 2006/07 New Zealand Health Survey. *BMC Public Health* 13: 844. URL: https://doi.org/10.1186/1471-2458-13-844 (accessed April 2019).

36 Cormack D. 2018. *Racism and health impacts for mothers and babies.* Presentation. URL: www.ttophs.govt.nz/vdb/document/1955 (accessed February 2019).

37 Jones PJ. 2000. Levels of racism: A theoretic framework and a gardener's tale. *American Journal of Public Health* 90(8): 1212–5. URL: https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.90.8.1212 (accessed January 2019).

38 Human Rights Commission. 2012. *A fair go for all? Addressing Structural Discrimination in Public Services.* Wellington: Human Rights Commission.

39 Cormack D, Stanley J, Harris R. 2018. Multiple forms of discrimination and relationships with health and wellbeing: Findings from national cross-sectional surveys in Aotearoa/New Zealand. *International Journal for Equity in Health* 17: 26.

Practice point for DHBs: Addressing equity

DHBs should increase their surveillance and monitoring of maternal morbidity, with a focus on identifying opportunities for achieving equitable outcomes for wāhine Māori and their whānau. The MMWG's maternal morbidity review toolkit for maternity services (see page 37) and the HEAT can be used to support this process, as well as Dr Jones' framework.[40]

Practice point for DHBs: Addressing equity

When undertaking maternal morbidity reviews, panels should use the HEAT and Dr Jones' framework to apply an equity lens to the review process. They should consider whether inequities existed in relation to the maternal morbidity event, and if so, how the inequities occurred and how they will be addressed through the review and recommendation process. When possible, this should be done in partnership with the woman and her family and whānau.

For more information on how to use the HEAT in maternal morbidity reviews, please see the maternal morbidity review toolkit for maternity services.[41]

Practice point for DHBs: Addressing equity

When data on maternal morbidity reveals inequities, DHBs should initiate 'free, frank and fearless'[42] conversations about the causes of inequitable outcomes in maternity, and how they can be proactively addressed. In addressing these, DHBs should focus on the way they work, the environment they work in, and the systems and processes within which they deliver care, and should take action in all of these domains.[43]

The Ministry for Pacific Peoples has developed two documents, *Yavu: Foundations of Pacific Engagement*[44] and *Kapasa: The Pacific Policy Analysis Tool.*[45] These offer guidance on how to meaningfully engage with Pacific communities, and how to develop policies that work for Pacific peoples. DHBs and maternity services can apply the principles and guidance to improve services for Pacific women and their families.

The frameworks identified in this report are a guide for engaging with Māori and Pacific units within DHBs and working with them to authentically engage in co-design with women, whānau and hapū so that services meet their needs.

40 Jones CP. 2002. Confronting institutionalised racism. *Phylon* 50(1): 7–22. URL: https://sph.umd.edu/sites/default/files/files/Jones-Confronting-Institutionalized-Racism_Phylon%202003.pdf (accessed January 2019).

41 Health Quality & Safety Commission. 2018. *Maternal morbidity review toolkit for maternity services: A foundational document.* Wellington: Health Quality & Safety Commission. www.hqsc.govt.nz/our-programmes/mrc/pmmrc/publications-and-resources/publication/3604/

42 Chin MH, King PT, Jones RG, et al. 2018. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. *Health Policy* 122: 837–53.

43 MidCentral DHB 2018. *Achieving health equity think piece 2018.* Palmerston North: MidCentral DHB.

44 Ministry for Pacific Peoples. 2018. *Yavu: Foundations of Pacific Engagement.* Wellington: Ministry for Pacific Peoples. URL: www.mpp.govt.nz/assets/Uploads/MPP8836-Yavu-Pacific-Engagement-Digital-Book.pdf (accessed February 2019).

45 Ministry for Pacific Peoples. 2017. *Kapasa: The Pacific Policy Analysis Tool.* Wellington: Ministry for Pacific Peoples. URL: www.mpp.govt.nz/assets/Uploads/2-Kapasa2017-A4-Pages-WEB4.pdf (accessed February 2019).

MMWG's focus areas: Unplanned peripartum hysterectomy and hypertensive disorders in pregnancy | Ngā wāhi arotahi a te MMWG: Te poka ohorere i te kōpū i te whānautanga me ngā mate takawhita i te hapūtanga

In 2017/18, the panels reviewed cases of unplanned peripartum hysterectomy and hypertensive disorders in pregnancy. This part the report summarises information from the associated notifications. It also includes insights from case file reviews, and key themes that emerged through the review process.

Mrs K's narrative[46]

After a discussion with my husband and midwife I opted late afternoon to have a caesarean section as I felt this was the safest option for both baby and me at this point. I had had a previous caesarean section with my first birth. I was third on the list. However, due to delays in theatre I was not taken in till approximately 10.30pm. Throughout the operation my blood pressure dropped several times, which made me feel very light-headed and nauseated. The anaesthetist was amazing, ready with the anti-emetic every time my blood pressure dropped.

My beautiful boy was delivered at 10.45pm and I was awake to see him being delivered, even though I felt like I was going to vomit. I had him on my chest for as long as I could tolerate; however, the nausea got too much, and my husband had to hold him as I was scared I was going to drop him. I now feel that being awake for a caesarean section is overrated!

I was taken into recovery and got to breastfeed my baby boy. Not long after being there I began to feel very light-headed, had nausea and was extremely tired. Again, I asked my husband to take our baby. It was around the same time I overheard my midwife tell her colleagues that there was blood in my catheter. While my recollection of events got a bit blurry at this point, I remember my midwife calling out to get the doctor, and I remember him arriving and assessing me.

I was getting more and more tired and felt like the room started filling with lots of people. They were talking, prodding me, asking me questions, massaging my uterus, taking blood, giving me medication and fluid, and giving orders. I remember a very loud gurgling sound from my lower abdomen and feeling blood pour out my vagina and turning my head and vomiting. Whenever my husband talks about the night he always recaps the noise and the blood flowing out of me. I knew at this stage I needed my husband to ring my Mum and tell her to start praying for me, as I was really sick.

I remember seeing the obstetrician appear at the end of my bed and being glad to see him but thinking to myself, 'I'm now very sick'. This was reiterated when my midwife asked if my husband should tell my Mum to come to the hospital. I was told I needed to go back to theatre and there was a risk I would need a hysterectomy. I told them to do whatever it took to save me, as I now had two children who needed a Mum. I remember thinking, 'I can't wait to get put to sleep' as I was so tired and didn't have any energy to look after my son.

I remember the journey to theatre. There was a midwife on top of the bed with me, massaging my uterus. I thought it must be very serious if that needed to continue. I remember getting into theatre, which seemed to be three times the size of the previous theatre and so bright with so many people. I wasn't scared as I was so tired.

46 Mrs K's narrative details one woman's experience, using her own words, of undergoing an emergency peripartum hysterectomy.

My poor husband and Mum had to endure hours of waiting and updates from the operating team. At 5am, the surgeon told my Mum and husband that they had taken out my uterus, but that I should be okay. My Mum said up until that point they had just prayed and held on to my baby, not even dressing him. The stress I put them under that night!

I woke up in the intensive care unit with my Mum, husband and baby visiting me. One of the first questions I asked was, 'Did I need a hysterectomy?' and my Mum said, yes, that they needed to, to save my life. In the days following I found out how sick I was and that I was lucky to be alive. My surgeon told me afterwards that it was one of the worst nights of his career.

The following days were full of four-hourly observations, multiple health professionals visiting, including many doctors, physiotherapists, social workers, nurses, phlebotomists, midwives and lactation consultants. And of course, I was determined to breastfeed despite being told I probably wouldn't be able to. I was feeding my son, hand expressing and using the electric pump, which was exhausting. I was so fortunate that my family did shifts so that for 20–22 hours of the day I had someone with me.

I remember in the days following feeling very anxious that I was going to have every complication. I was paranoid I was going to get a blood clot, and even worse would need to go back to theatre for another operation. I thought that if they were to operate again I may not survive as there would be nothing left inside me, just an inflamed mess. I had a high risk of infection because I still had a drain in, which was still filling with blood, and this scared me. I passed several big clots vaginally in the days following the surgery which caused me to feel very faint and created a lot of anxiety for me. I remember feeling very fixated on medical problems that could occur and ways to reduce the risks.

After eight days in hospital and a bit of persuasion from me, I was discharged. It was the best feeling in the world leaving the hospital with my husband and baby. While I wasn't in hospital any longer I had a lot of recovering to do. I wasn't allowed to lift my two-year-old, hang out the washing, or even drive. I could barely walk to the front door. The first two weeks after my baby was born is a blur for me. I am thankful I had family around me to help look after baby and give him the care I couldn't give him, but I feel like I missed out on his first two weeks of life.

After my operation, I felt that I had an empty hole between my upper and lower abdomen. I felt empty. That did pass but the sadness I feel that I can't have any more children is with me daily. I feel sad that the choice has been taken away from me. I grieve for that. Both my husband and I have had comments from people who don't know about the hysterectomy about having a third child, which makes us feel sad. And I guess we will continue to get these in the future. I have had people report how good I look and how I have got back into shape so quickly. I feel like saying, 'That's what a hysterectomy does to you'.

While I am sad I can't have any more children, I am thankful that I am alive and here to tell my story.

Unplanned peripartum hysterectomy | Te poka ohorere i te kōpū i te whānautanga

Peripartum hysterectomy is a major operation where a woman's uterus is removed during or immediately after delivery. It is most often a life-saving procedure, usually performed in cases of severe intractable obstetric haemorrhage,[47] when medical treatment and conservative measures have failed to control the bleeding.[48] Unplanned peripartum hysterectomies are a treatment of last resort, as the procedure inevitably causes additional maternal morbidity and results in a woman's inability to carry any future pregnancies. It is invariably a life-changing and often traumatic event for the woman, as it is sudden, unexpected and involves life-threatening complications and major intervention. It is usually followed by a period of immense grief at the sudden and irrevocable end to child-bearing.[49]

The most common indications for uncontrolled haemorrhage and subsequent emergency peripartum hysterectomy are abnormal placentation (placenta praevia/accreta) and uterine atony.[50] Other less common indications are uterine rupture, trauma and – infrequently – sepsis.[51] Risk factors for peripartum hysterectomy are advanced maternal age, abnormal placentation, higher parity[52] and caesarean delivery in a previous or current pregnancy.[53]

Globally, the average incidence of peripartum hysterectomy is reported to be approximately 1 in 1,000 births in developed countries, with higher rates in the developing world.[54, 55] A retrospective case analysis of peripartum hysterectomy at Christchurch Women's Hospital found an incidence rate of 0.4 per 1,000 deliveries.[56] The incidence rate is reported to be higher after caesarean deliveries than vaginal deliveries[57] (eg, 1.3 per 1,000 caesarean deliveries and 0.03 per 1,000 vaginal deliveries).[58]

Historically, uterine atony was the leading cause of postpartum haemorrhage and subsequent peripartum hysterectomy; however, abnormal placentation is now the most common indication, and the incidence of placenta accreta is believed to be increasing globally.[59, 60] Recent studies have shown that this increase in abnormal placentation likely reflects an increase in the number of pregnant women with a history of previous caesarean section delivery.[61, 62, 63]

47 Patalay K, Vijaya K, Ratna P. 2016. Incidence and causes of peripartum hysterectomy – a prospective study. *Asian Pacific Journal of Health Sciences* 3(2): 170–8.

48 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

49 de la Cruz C, Coulter M, O'Rourke K, et al. 2016. Post-traumatic stress disorder following emergency peripartum hysterectomy. *Archives of Gynecology and Obstetrics* 294: 681–8. DOI: 10.1007/s00404-016-4008-y (accessed January 2019).

50 Machado L. 2011. Emergency peripartum hysterectomy: Incidence, indications, risk factors and outcome. *North American Journal of Medical Sciences* 3(8): 358–61. DOI: 10.4297/najms.2011.358 (accessed January 2019).

51 Arulkumaran S, Karoshi M, Keith L, et al. *A Comprehensive Textbook of Postpartum Hemorrhage* (2nd edition). London: The Global Library of Women's Medicine. URL: www.glowm.com/resource_type/resource/textbook/title/a-comprehensive-textbook-of-postpartum-hemorrhage-2%3Csup%3End%3C-sup%3E-edition/resource_doc/1275 (accessed January 2019).

52 Parity is the number of pregnancies a woman has carried to a viable gestational age.

53 Huque S, Roberts I, Fawole B, et al. 2018. Risk factors for peripartum hysterectomy among women with postpartum haemorrhage: Analysis of data from the WOMAN trial. *BMC Pregnancy and Childbirth* 18: 186. URL: https://doi.org/10.1186/s12884-018-1829-7 (accessed January 2019).

54 Patalay K, Vijaya K, Ratna P. 2016. Incidence and causes of peripartum hysterectomy – a prospective study. *Asian Pacific Journal of Health Sciences* 3(2): 170–8.

55 Huque S, Roberts I, Fawole B, et al. 2018. Risk factors for peripartum hysterectomy among women with postpartum haemorrhage: Analysis of data from the WOMAN trial. *BMC Pregnancy and Childbirth* 18: 186. URL: https://doi.org/10.1186/s12884-018-1829-7 (accessed January 2019).

56 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

57 Machado L. 2011. Emergency peripartum hysterectomy: Incidence, indications, risk factors and outcome. *North American Journal of Medical Sciences* 3(8): 358–61. DOI: 10.4297/najms.2011.358 (accessed January 2019).

58 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

59 Machado L. 2011. Emergency peripartum hysterectomy: Incidence, indications, risk factors and outcome. *North American Journal of Medical Sciences* 3(8): 358–61. DOI: 10.4297/najms.2011.358 (accessed January 2019).

60 Patalay K, Vijaya K, Ratna P. 2016. Incidence and causes of peripartum hysterectomy – a prospective study. *Asian Pacific Journal of Health Sciences* 3(2): 170–8.

61 Farquhar C, Li Z, Lensen S, et al. 2017. Incidence, risk factors and perinatal outcomes for placenta accreta in Australia and New Zealand: A case-control study. *BMJ Open* 7: e017713. DOI: 10.1136/bmjopen-2017-017713 (accessed April 2019).

62 Machado L. 2011. Emergency peripartum hysterectomy: Incidence, indications, risk factors and outcome. *North American Journal of Medical Sciences* 3(8): 358–61. DOI: 10.4297/najms.2011.358 (accessed April 2019).

63 Bohiltea R, Dumitrache M, Ciontea B, et al. 2018. The application of the management protocol of invasive placenta. A case report. *Romanian Society of Ultrasonography in Obstetrics and Gynecology* 14: 67–71. DOI: 10.18643/gieu.2018.67 (accessed January 2019).

What is abnormal placentation?

'During pregnancy, the placenta develops in the uterus and attaches to the uterine wall. In some rare cases, the placenta can attach too deeply into the uterus and/or invade through it to surrounding organs. This condition is known as abnormal placentation and can make it difficult to remove the placenta from the uterus after birth – presenting a serious health risk for the mother.' [64]

The different types of abnormal placentation include **placenta praevia** and **morbidly adherent placenta.**

Placenta praevia is when the placenta sits in the lower part of the uterus and can cover part or all of the cervix.

Morbidly adherent placenta includes three specific disorders: placenta accreta, placenta increta, and placenta percreta.

- **Placenta accreta** is when the placenta attaches to the myometrium (the muscle layer of the uterus).
- **Placenta increta** is when the placenta invades partially through the myometrium.
- **Placenta percreta** is when the placenta invades through the myometrium and the serosa (the outer layer of the uterus) and may attach to surrounding organs (eg, the bladder).

Both placenta praevia and morbidly adherent placenta can co-exist in the same woman, though one can exist without the other.

The most common risk factor for abnormal placentation is a history of caesarean section or previous uterine surgery.[65] Uterine surgery and caesarean sections scar the uterus, which predisposes women to abnormal placentation in later pregnancies.[66, 67] Machado reports an incidence of previous caesarean section in 59.8 percent of women with morbidly adherent placenta (accreta, percreta, increta) and 75 percent of women with placenta praevia.[68] A study in Aotearoa New Zealand found that abnormal placentation (including invasive placental adhesion and placenta praevia) were present in more that 70 percent of all cases of peripartum hysterectomy.[69] Another study found that 68 percent of accreta cases in Aotearoa New Zealand and Australia had a previous caesarean section.[70] Furthermore, the risk of abnormal placentation increases proportionally with the number of caesarean deliveries or curettages a woman has had.[71]

Notifications: Unplanned peripartum hysterectomy

The MMWG focused on unplanned peripartum hysterectomy because of its severity and the life-changing event for the woman. The intention was to review unplanned/emergency peripartum hysterectomies; however, we were unable to clearly identify whether the hysterectomy was planned or unplanned until we received the clinical file and reviewed the case. Three of the cases we reviewed were planned caesarean hysterectomies in women with placenta praevia and suspected accreta/percreta. Two of these went according to plan, and one of these occurred as an emergency caesarean and hysterectomy when the woman presented with an antepartum haemorrhage. While the two cases

64 UChicagoMedicine. 2019. *Abnormal Placentation.* Chicago, IL: UChicagoMedicine. URL: www.uchicagomedicine.org/conditions-services/pregnancy-childbirth/high-risk-pregnancy-maternal-fetal-medicine/conditions/abnormal-placentation (accessed January 2019).

65 Patalay K, Vijaya K, Ratna P. 2016. Incidence and causes of peripartum hysterectomy – a prospective study. *Asian Pacific Journal of Health Sciences* 3(2): 170–8.

66 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

67 Bohiltea R, Dumitrache M, Ciontea B, et al. 2018. The application of the management protocol of invasive placenta. A case report. *Romanian Society of Ultrasonography in Obstetrics and Gynecology* 14: 67–71. DOI: 10.18643/gieu.2018.67 (accessed April 2019).

68 Machado L. 2011. Emergency peripartum hysterectomy: Incidence, indications, risk factors and outcome. *North American Journal of Medical Sciences* 3(8): 358–61. DOI: 10.4297/najms.2011.358 (accessed April 2019).

69 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

70 Farquhar C, Li Z, Lensen S, et al. 2017. Incidence, risk factors and perinatal outcomes for placenta accreta in Australia and New Zealand: A case-control study. *BMJ Open* 7: e017713. DOI: 10.1136/bmjopen-2017-017713 (accessed April 2019).

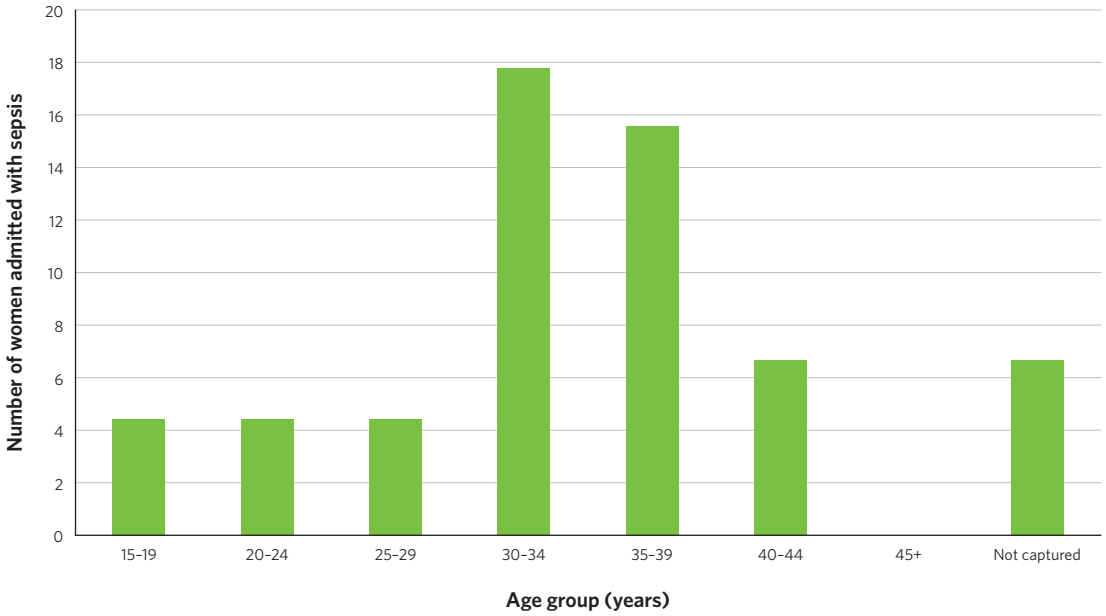
71 Wong TY. 2011. Emergency peripartum hysterectomy: A 10-year review in a tertiary obstetric hospital. *The New Zealand Medical Journal* 124(1345): 34–9.

of planned caesarean hysterectomies did not strictly meet the criteria for emergency peripartum hysterectomy, the review panels found that they presented valuable lessons and insights and showed areas for improvement in the care of all women with suspected abnormal placentation.

Because of the relatively small number of peripartum hysterectomy cases in Aotearoa New Zealand, the MMWG decided to review cases from a two-year period. Between 1 September 2016 and 31 August 2018, the MMWG received 27 notifications of peripartum hysterectomy cases. We recognise this number is an underestimate as not all peripartum hysterectomies end up in an HDU or ICU. Many women receive specialised care elsewhere, often in a delivery suite.

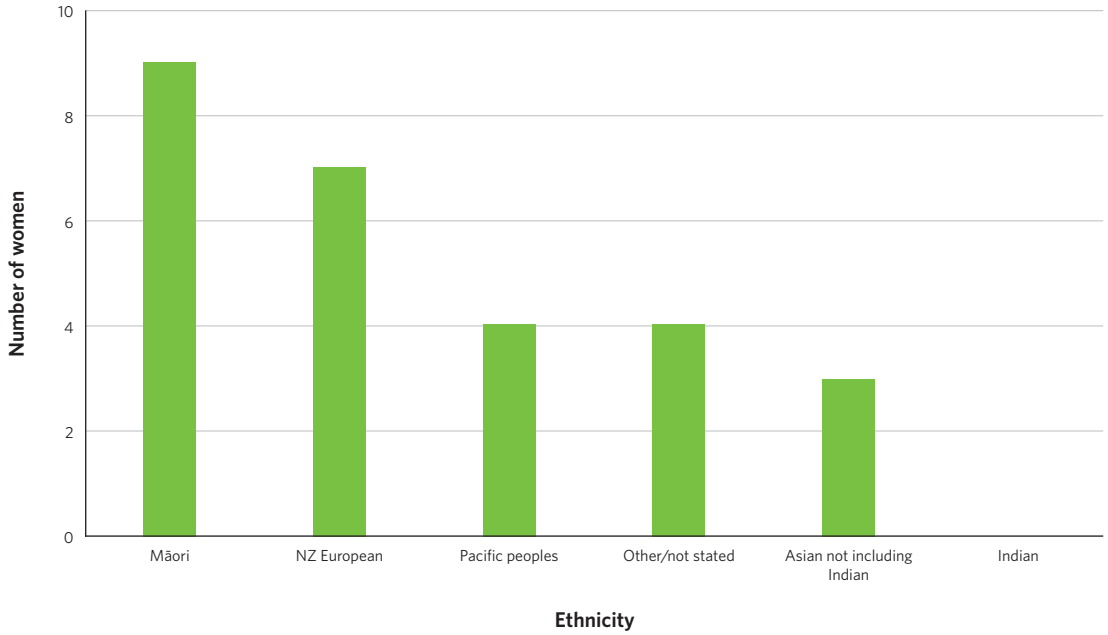
The highest number of admissions for unplanned peripartum hysterectomy were among women aged 30–34 and among Māori women, as shown in Figures 4 and 5. Because of the small numbers of peripartum hysterectomy notifications, we cannot calculate rates for different ethnicities or ages, nor perform statistical analysis to compare the rates between groups. Therefore, while we received more notifications for women aged 30–34 and for Māori women, we cannot say these groups were over-represented in the data, or that they have statistically significantly higher rates.

Figure 4: Number of cases of recently pregnant women admitted to an HDU or ICU after a peripartum hysterectomy, by age, Aotearoa New Zealand, 1 September 2016 to 31 August 2018



Data source: MMWG Notifications Database: Admissions to an HDU or ICU during or within 42 days of pregnancy, after undergoing a peripartum hysterectomy.

Figure 5: Number of cases of recently pregnant women admitted to an HDU or ICU after a peripartum hysterectomy, by ethnicity, Aotearoa New Zealand, 1 September 2016 to 31 August 2018



Data source: MMWG Notifications Database: Admissions to an HDU or ICU during or within 42 days of pregnancy, after undergoing a peripartum hysterectomy.

Case review findings: Emergency peripartum hysterectomy

The regional panels reviewed 22 cases of unplanned peripartum hysterectomy.

Out of the 22 women whose cases were reviewed, 10 women had abnormal placentation (eg, praevia, accreta). Nine women presented with postpartum haemorrhage and two with antepartum haemorrhage. One woman had adenomyosis.

Consistent with international research about risk factors, uterine surgery was a common factor in many of the cases. Fifteen of the 22 women had a recorded history of uterine surgery. Thirteen of the 22 women who underwent a peripartum hysterectomy had had a previous lower-segment caesarean section, and a further two women had documentation of evacuation of retained products of conception following a miscarriage.

Practice point for clinicians: Informed choice

All women who give birth through caesarean section should be informed of the associated short- and long-term risks, including the risk of abnormal placentation in subsequent pregnancies.[72, 73, 74]

72 Gupta M, Saini V. 2018. Caesarean section: Mortality and morbidity. *Journal of Clinical and Diagnostic Research* 12(9): QE01–6. DOI: 10.7860/JCDR/2018/37034.11994 (accessed November 2018).

73 Sandall J, Tribe RM, Avery L, et al. 2018. Short-term and long-term effects of caesarean section on the health of women and children. *The Lancet* 392: 1349–57.

74 Bohiltea R, Dumitrache M, Ciontea B, et al. 2018. The application of the management protocol of invasive placenta. A case report. *Romanian Society of Ultrasonography in Obstetrics and Gynecology* 14: 67–71. DOI: 10.18643/gieu.2018.67 (accessed January 2019).

All 10 of the women with abnormal placentation had a history of uterine surgery; either a previous caesarean section, evacuation of retained products of conception, surgical termination of pregnancy, or a combination of these. All 10 women with abnormal placentation also had a placenta praevia. Only five of these women had a suspected accreta antenatally, and all 10 had confirmation of accreta (6), percreta (3) or increta (1) confirmed on histology.

All 10 women with placenta praevia had a caesarean section planned, and the notes indicated the women were aware of the risk of hysterectomy.

Three of the 10 women with placenta praevia had planned hysterectomies. Two of these went according to the plan and occurred at the scheduled place and time. One of the three women had an emergency caesarean section and peripartum hysterectomy, because she presented with an antepartum haemorrhage.

Seven of the 10 women with placenta praevia had planned caesarean sections, which resulted in emergency peripartum hysterectomy. A review of the clinical files found that all women had been told about the risk associated with placenta praevia, and that they may need to undergo an emergency peripartum hysterectomy.

Practice point for clinicians: Psychological wellbeing

Women with suspected or confirmed morbidly adherent placenta should be referred to appropriate psychological counselling.

Practice point for clinicians: Understanding risk

The risk of peripartum hysterectomy should be discussed with all women with suspected or confirmed abnormal placentation. This should be done in a sensitive manner, and in a way that ensures the woman and her family and whānau understand.

Peripartum hysterectomy recommendations

1. The MMWG recommends that the National Maternity Monitoring Group prioritises the development and publication of a national guideline on the care of women with identified placental implantation abnormalities, within the next three years. The guideline should include information developed with women, for women, about these abnormalities and the associated risks, enabling women to be actively engaged in care planning.

➔ **Rationale:** The panel reviews identified variation in the care for women with both suspected and confirmed abnormally invasive placenta, including variation in the use of medical imaging. A national guideline would standardise the clinical management of abnormally invasive placenta and reduce the variation along the care pathway.

2. The MMWG recommends that, in the interim, DHBs consider establishing a clinical pathway for women with identified placental implantation abnormalities, who are at high risk for haemorrhage and peripartum hysterectomy. Depending on local resources, the pathway should include care from a multidisciplinary team comprising midwives, an experienced obstetrician, anaesthetist, neonatologist, allied health, urologist, vascular surgeon and interventional radiologist[75] (on an 'as needed' basis[76]). The pathway should also include:

   a) consideration by secondary hospital clinicians to seek specialist opinion from a tertiary centre

   b) access to appropriate counselling about risks and treatment options related to abnormal placentation to enable shared decision-making and proactive care for the woman.

➔ **Rationale:** Clinical pathways are pre-established processes that support clinical judgement and decision-making in complex environments. They help to reduce human error and expedite care and treatment in time-critical situations – for example, for a woman with abnormal placentation who presents acutely with excessive bleeding.

3. The MMWG recommends that when lead maternity carers identify any history of uterine surgery (eg, caesarean section, myomectomy, evacuation of retained products of conception or surgical termination of pregnancy) at pregnancy registration, this history should be included on ultrasound request forms to ensure detailed scanning to identify the position of the placenta (with the woman's informed consent). The corresponding ultrasound report should contain placental location and any features of abnormal placentation in the report.

➔ **Rationale:** Previous uterine surgery (not limited to caesarean section) can increase the likelihood of abnormal placentation, including accreta/percreta. Prenatal diagnosis through medical imaging allows for appropriate management of abnormal placentation, leading to better outcomes. In addition, prenatal diagnosis offers the opportunity to appropriately prepare and counsel the woman about potential risks and treatment options.

75 Patalay K, Vijaya K, Ratna P. 2016. Incidence and causes of peripartum hysterectomy – a prospective study. *Asian Pacific Journal of Health Sciences* 3(2): 170–8.

76 Shamshirsaz A, Fox K, Ergani H, et al. 2018. Outcomes of planned compared with urgent deliveries using a multidisciplinary team approach for morbidly adherent placenta. *The American College of Obstetricians and Gynecologists* 131(2): 234–41.

Hypertensive disorders in pregnancy (hypertension/pre-eclampsia/eclampsia/HELLP) | Ngā mate takawhita i te hapūtanga (hypertension/pre-eclampsia/eclampsia/HELLP)

Hypertensive disorders in pregnancy (HDPs) are characterised by high blood pressure and, often, proteinuria. There are five different classifications of HDP. The MMWG supports the Ministry of Health's classification of HDPs,[77] which is in line with the 2014 revised International Society for the Study of Hypertension in Pregnancy (ISSHP) statement.[78] HDPs include:

- chronic/pre-existing hypertension
- gestational hypertension
- pre-eclampsia
- eclampsia
- HELLP syndrome (a variant of severe pre-eclampsia; elements include **H**aemolysis, **E**levated **L**iver enzymes, and **L**ow **P**latelet count).

Box 1 on the following page presents a summary of the Ministry of Health's definitions and classifications.

HDPs are the most common medical problems encountered during pregnancy.[79] Hypertensive disorders affect approximately 5–10 percent of pregnancies in Aotearoa New Zealand. Pre-eclampsia complicates approximately 3–8 percent of pregnancies in Aotearoa New Zealand.[80]

Hypertensive disorders can be dangerous for both the mother and the baby. For example, mothers with high blood pressure are more likely to experience complications during pregnancy – for example, placental abruption (when the placenta separates from the wall of the uterus).[81] Mothers with hypertension also have a higher risk of poor birth outcomes – for example, preterm delivery, having a baby small for his/her gestational age, and infant death.[82]

The Ministry of Health's hypertension and pre-eclampsia in pregnancy guideline[83] includes an extensive list of the risk factors for developing pre-eclampsia. Major risk factors include previous history of pre-eclampsia, assisted reproductive technology (oocyte donation), renal disease, chronic hypertension, previous history of HELLP, pre-existing diabetes, antiphospholipid antibodies/systemic lupus erythematosus, and family history of pre-eclampsia in mother or sister.

77 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

78 Tranquilli AL, Dekker G, Magee L, et al. 2014. The classification, diagnosis and management of the hypertensive disorders of pregnancy: A revised statement from the ISSHP. *Pregnancy Hypertension* 4(2): 97–104.

79 Mammaro A, Carrara S, Cavaliere A, et al. 2009. Hypertensive disorders in pregnancy. *Journal of Prenatal Medicine* 3(1): 1–5.

80 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

81 Rankin J. 2017. *Physiology in Childbearing with Anatomy and Related Biosciences* (4th edition). Edinburgh: Elsevier.

82 MacDonald E, Lepin S, Pledger M, et al. 2019. Pre-eclampsia causing severe maternal morbidity. *Royal Australian and New Zealand College of Obstetricians and Gynaecologists.* URL: https://doi.org/10.1111/ajo.12971 (accessed April 2019).

83 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

Pre-eclampsia: A composite story[84]

My name is Jess. I was 37 years of age when I was pregnant and gave birth to my first baby, Zoe. My partner and I had been hoping for a baby for several years, so we were excited to be pregnant.

My pregnancy progressed smoothly up until I was about 7 months. I continued to work even when my body started to swell up. I knew to watch out for this because one of my friends had been sick when pregnant with lots of swelling and headaches. My feet and the bottom of my legs got puffy and I was starting to feel tired and lethargic. I phoned the midwife and she said it was all part of being pregnant. I accepted this; being pregnant isn't meant to be easy, you know, carrying a baby inside and looking after it in there must take a lot out of your body. I saw my midwife for a routine check and it was okay. She said there was some protein in my urine but that she wasn't concerned.

I did start to worry when my fingers got so puffy they hurt to bend, and my feet were all pins and needles. I called my midwife and she said I shouldn't worry but I asked if I could see her the next day. When we met I had more protein in my urine and my blood pressure was higher than normal. She gave me a form to go and have a blood test to reassure me that I was okay.

I went and had the blood test later that day and she called me in the evening to say that the results were not normal, that I had protein in my blood and other things that didn't make sense to me. She said she wanted me to go up to the hospital for a more detailed check-up and that she had phoned them.

I went to the delivery suite with my partner. I was 35 weeks pregnant and really worried about my baby. Everything that happened after arriving there seems surreal. I had a vague idea that having high blood pressure was not normal and that the swelling wasn't good. When I got there, they strapped a machine on my belly to monitor my baby's heartbeat and kept taking my blood pressure. They seemed to be really worried about my blood pressure and that baby's heart wasn't showing the right pattern on the machine, that the heartbeat was slowing down and then speeding up. There was a lot of chatting outside our room about my blood pressure and the baby. They decided to put a drip in and send some blood away to re-check the protein and other things. They also asked if I would be okay with having medicine in my drip to bring my blood pressure down, I said yes because I didn't think saying no would be good.

When the blood results came back they were worse than earlier that day, so they thought I should be induced and if things got worse that I might have to have a caesarean. I was so frightened, afraid for my baby and that something might happen to me. No one really took the time to sit with me and my partner to tell us how serious things were. I didn't realise I was so sick, but I did realise they were all panicking.

I know they kept discussing the options of different drugs because I could hear them and their concern for my blood pressure. This didn't help me to feel confident in what they were planning. They were worried that I might have a fit because they couldn't get my blood pressure down, so they started me on magnesium salts, which made me feel terrible, like my body was burning up. They were unable to start the induction and so they said that I needed an emergency caesarean section as they were worried about my blood pressure and baby's heartbeat. I was starting to shake because I was so frightened, I just wanted the baby we had waited for to be born and be safe. I was worried for my partner, he looked totally lost and struggling to understand what was happening.

It felt like there were lots of people in my room, rushing around getting me ready for my caesarean. My partner could come, which was great because we needed to be together. Going into the theatre was stressful, the environment smells strange, it was noisy with lots of chatter and there were lots of people milling around. I was lucky that they gave me a spinal for my caesarean, so I could be awake when Zoe was born. They held her up and she looked so perfect. I was overwhelmed with emotion and upset that they took her away without me being allowed to have skin-to-skin with her. She went to the neonatal unit with her daddy, so I was happy about that, but I felt lonely and frightened. I was worried that something would happen to me and I wouldn't be able to be her mother.

84 This composite story draws on the collective themes from narratives of women's experiences of being very unwell with pre-eclampsia. It does not represent one individual experience.

After the surgery, I had to go to the intensive care unit because of my blood pressure and the drugs I was on. I didn't realise how sick I was until they said I had to go to that unit. I didn't feel anyone really spent the time telling me how sick I was, to be honest. I was up there for four nights, it was the longest time of my life. I was isolated from my baby and kept crying because I felt confined and unable to be the mother I wanted to be to my daughter. I kept asking if they could bring her up, but they said she wasn't allowed. They wouldn't let my partner stay, he was only allowed to visit. I couldn't understand it. They were worried about my blood pressure and yet my anxiety at being isolated from Zoe wouldn't have helped my blood pressure.

Eventually they let me go back to the maternity ward. Zoe was still in neonates, so at least I could visit her and start being a mum. Two days later they transferred Zoe into the maternity ward. It was exciting to have her next to me where I could look after her myself. I had lots of challenges learning how to breastfeed her because I had missed all those early days. After a total of 14 days we were both discharged home.

My midwife visited me at home, which was good, and eventually I was weaned off the blood pressure tablets. I still have some questions that I haven't been able to resolve, but I hope next time I'm pregnant someone might be able to talk me through my pregnancy with Zoe, so I can understand more about what happened.

Box 1: Definitions and classifications of hypertensive disorders in pregnancy[85]

Hypertension: Systolic blood pressure (sBP) is greater than or equal to 140 mmHg or diastolic blood pressure (dBP) is greater than or equal to 90 mmHg, as measured on two or more consecutive occasions at least four hours apart.

Chronic/pre-existing hypertension: Hypertension is confirmed before conception or before 20 weeks gestation with or without a known cause, as measured on two or more consecutive occasions at least four hours apart.

Gestational hypertension: New onset hypertension occurs after 20 weeks gestation (in a woman who had normal blood pressure before 20 weeks gestation) and:

- diastolic blood pressure is ≥ 90 mmHg or systolic blood pressure is ≥ 140 mmHg
- the woman has none of the abnormalities that define pre-eclampsia
- her blood pressure returns to normal within three months after giving birth.

Pre-eclampsia: The new onset of hypertension occurs after 20 weeks gestation (in a woman who had normal blood pressure before 20 weeks gestation) or superimposed on pre-existing hypertension **and one or more** of the following also develop as new conditions:

- proteinuria
- other maternal organ dysfunction (eg, renal insufficiency, liver involvement, neurological complications, haematological complications)
- uteroplacental dysfunction (eg, fetal growth restriction, abruption).

85 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

Each of the following is a **severe feature of pre-eclampsia:**

- **severe hypertension** (diastolic blood pressure ≥ 110 mmHg or systolic blood pressure ≥ 160 mmHg)
- **thrombocytopenia** (platelet count less than 100 × 109/L)
- **impaired liver function:**
  - not responding to treatment and not accounted for by alternative diagnosis
  - elevated transaminases (alanine transaminase (ALT) and aspartate transaminase (AST))
  - at least twice the upper limit of normal +/− right upper quadrant or epigastric abdominal pain (may be referred to upper back)
- progressive renal insufficiency (serum creatinine > 90 mol/L or doubling of serum creatinine concentration in the absence of other renal disease, urine output of < 80 mL/4 hour)
- pulmonary oedema
- new onset of headaches and visual disturbances
- HELLP syndrome
- eclampsia.

Unstable pre-eclampsia: Women with pre-eclampsia have worsening pre-eclampsia blood results and severe hypertension not controlled by antihypertensives. Also known as fulminating pre-eclampsia.

Eclampsia: New onset of seizures occurs in association with pre-eclampsia. It is a severe manifestation of pre-eclampsia and can occur before, during or after birth. It can be the presenting feature of pre-eclampsia in some women.

HELLP syndrome: A variant of severe pre-eclampsia (elements include **H**aemolysis, **E**levated **L**iver enzymes and **L**ow **P**latelet count). In a woman with pre-eclampsia, the presence of any of the following is an indicator of HELLP:

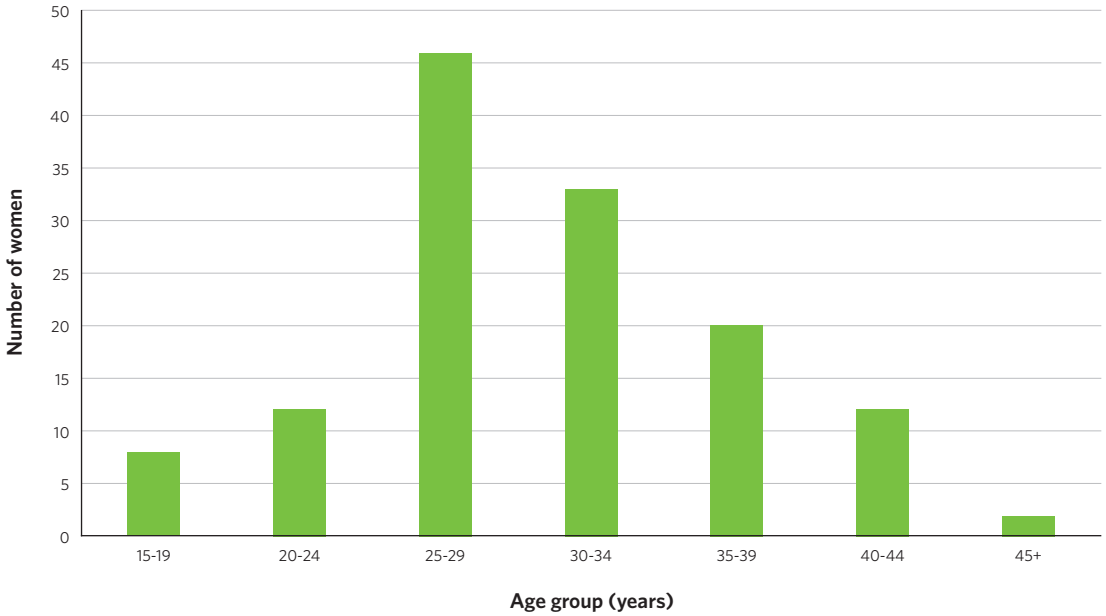
- maternal platelet count of less than 100 × 109/L
- elevated transaminases (elevated blood concentrations of liver enzymes to twice the normal concentration)
- microangiopathic haemolytic anaemia with red cell fragments on blood film.

Notifications: Hypertensive disorders in pregnancy

In the year between 1 September 2017 and 31 August 2018, the MMWG received 133 notifications of women admitted to an HDU or ICU with HDPs.

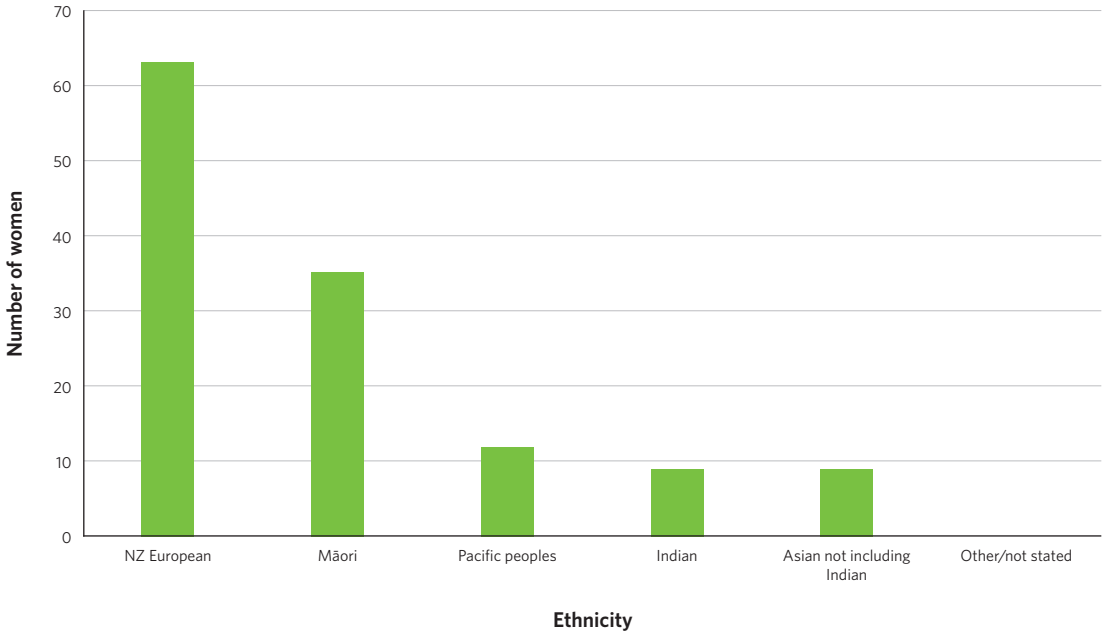
As shown in Figures 6 and 7, the highest number of admissions for HDPs were among women aged 25–29, and among New Zealand European women. Because of the small numbers of hypertensive disorder notifications, we cannot calculate rates for different ethnicities or ages, and are unable to perform statistical analysis to compare the rates between groups. Therefore, while we received more hypertensive disorder notifications for women aged 25–29 and for New Zealand European women, we cannot say these groups were over-represented in the data, or that they have statistically significantly higher rates.

Figure 6: Number of cases of pregnant or recently pregnant women admitted to an HDU or ICU with a hypertensive disorder, by age, Aotearoa New Zealand, 1 September 2017 to 31 August 2018



Data source: MMWG Notifications Database: Admissions to an HDU or ICU during or within 42 days of pregnancy, with a diagnosis of a hypertensive disorder.

Figure 7: Number of cases of pregnant or recently pregnant women admitted to an HDU or ICU with a hypertensive disorder, by ethnicity, Aotearoa New Zealand, 1 September 2017 to 31 August 2018



Data source: MMWG Notifications Database: Admissions to an HDU or ICU during or within 42 days of pregnancy, with a diagnosis of a hypertensive disorder.

Case review findings: hypertensive disorders in pregnancy

In the 19 cases of HDP that the panels reviewed, pre-eclampsia was the most frequent diagnosis (15 cases). There was one case of eclampsia, and three cases of other hypertension-related conditions.

What is pre-eclampsia?

Pre-eclampsia is a very serious medical condition that can occur any time during the second half of a woman's pregnancy and up to six weeks after delivery. Pre-eclampsia is characterised by high blood pressure, which can become dangerously high and can damage organ systems.

If pre-eclampsia progresses, which can happen very quickly, it can cause seizures, stroke and, potentially, death in the mother, and premature birth and/or death of the baby.[86]

Prophylactic low-dose aspirin and calcium supplementation are indicated for women with a major risk factor for pre-eclampsia (see the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) guideline[87] and the New Zealand College of Midwives (NZCOM) consensus statement).[88] The panel reviews found that five of the women with hypertensive disorders who had major risk factors for pre-eclampsia from early pregnancy, and should therefore have been treated with aspirin and calcium before 16 weeks gestation, did not receive this prophylaxis.

Practice point for clinicians: Evidence statement

All women with risk factors for pre-eclampsia should be offered information regarding the benefits of low-dose aspirin and calcium supplementation. This should be documented in their clinical records.

The panel reviews found that five of the women with hypertensive disorders did not have a specific clinical lead identified when transferred to specialist care. This resulted in fragmented care, frequent changes in the plan of care, and inadequate direct clinical leadership and decision-making. An example was where care was across specialist teams with the perception by the review team that the woman's care was 'organ focused' rather than involving a holistic approach coordinated by one clinical lead.

Further review findings for hypertensive disorders are available in the section 'Overall contributing factors from peripartum hysterectomy and hypertensive disorder panel reviews' on page 31.

Hypertensive disorders recommendations

1. The MMWG recommends that the National Maternity Monitoring Group continues to monitor DHBs' implementation of the Ministry of Health's hypertension and pre-eclampsia in pregnancy guideline.[89]

2. The MMWG recommends that the National Maternity Monitoring Group advises the Ministry of Health to develop resources for women and their families and whānau about the early signs and symptoms of HDPs, including pre-eclampsia. This should be developed in close partnership with women to ensure the information meets health literacy standards and addresses concerns from a consumer perspective.

86 UChicagoMedicine. 2018. *What you need to know about preeclampsia before – and after – pregnancy.* Chicago, IL: UChicagoMedicine. URL: www.uchicagomedicine.org/forefront/womens-health-articles/2018/august/what-you-need-to-know-about-preeclampsia (accessed April 2019).

87 Lose S, Bowyer L, Lust K, et al. 2014. *The SOMANZ Guideline for the Management of Hypertensive Disorders of Pregnancy.* Sydney: SOMANZ. URL: www.somanz.org/documents/HTPregnancyGuidelineJuly2014.pdf (accessed February 2019).

88 New Zealand College of Midwives. 2014. Consensus Statement: Reducing the risk of developing pre-eclampsia. Christchurch: New Zealand College of Midwives. URL: https://www.midwife.org.nz/wp-content/uploads/2018/08/Reducing-the-risk-of-developing-pre-eclampsia.pdf (accessed February 2019).

89 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

➔ **Rationale:** Failure to follow best practice (eg, the SOMANZ guideline and the NZCOM consensus statement)[90] was identified as a contributing factor in the woman's morbidity in 74 percent of reviewed hypertension cases. Following best practice and the newly released guideline should improve recognition, diagnosis and management of hypertension. Providing free resources through maternity care providers would help women in knowing when and how to seek help, and what to expect if a diagnosis of HDP occurs. This responds to the worries and uncertainties experienced by women, as highlighted in the women's narratives.

3. The MMWG recommends that the Ministry of Health reviews the obstetric and medical services referral guidelines[91] to align with the hypertension and pre-eclampsia in pregnancy guideline.[92] The review should consider the increased risk associated with cumulative comorbidities. The Ministry of Health should support the development of a standardised referral template to support information-sharing at the time of referral.

➔ **Rationale:** The current referral guidelines, which were published in 2012, do not align with the best practice recommendations in the hypertension and pre-eclampsia in pregnancy guideline.

4. The MMWG recommends that DHBs:
   a) include the Ministry of Health's new hypertension and pre-eclampsia in pregnancy guideline[93] as a component of the regular training and education sessions for multidisciplinary teams
   b) ensure continuity of care with one clinical lead when care is transferred
   c) establish timeframes for review by a senior medical officer when a woman is admitted to secondary care after transfer from a lead maternity carer.

➔ **Rationale:** Hypertensive disorders in pregnancy require early recognition and proactive management. Improved training and education would support clinical judgement, expertise and knowledge to enable earlier identification and treatment, appropriate referral, anticipation of deterioration and planning for emergencies. Continuity of care enables the woman to be confident in the plan of care and to understand and trust changes. It also promotes a more consistent team approach, as supported through the women's narratives.

5. The MMWG recommends that DHBs:
   a) review and restock medicines identified in the Ministry of Health's hypertension and pre-eclampsia in pregnancy guideline, and ensure these are readily available in birthing suites and acute care settings
   b) develop an algorithm with start times for hypertensive medicines, and minimum times between doses, to allow time for the medication to take effect.

➔ **Rationale:** A persistent theme in the reviews was the administration of hypertensive medication without sufficient time for the medicine to take effect and the variation in medicines prescribed (refer to page 31 for findings). This compromised the delivery of care and appropriate clinical decision-making. The women's narratives often included frequent changes in choice of medication and clinician debate, which resulted in women being isolated from and not involved in the decisions being made.

90 Lose S, Bowyer L, Lust K, et al. 2014. *The SOMANZ Guideline for the Management of Hypertensive Disorders of Pregnancy.* Sydney: SOMANZ. URL: www.somanz.org/documents/HTPregnancyGuidelineJuly2014.pdf (accessed February 2019).

New Zealand College of Midwives. 2014. *Consensus Statement: Reducing the risk of developing pre-eclampsia.* Christchurch: New Zealand College of Midwives. URL: www.midwife.org.nz/wp-content/uploads/2018/08/Reducing-the-risk-of-developing-pre-eclampsia.pdf (accessed February 2019).

91 Ministry of Health. 2012. *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines).* Wellington: Ministry of Health.

92 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

93 *Ibid.*

Panel reviews | Ngā arotake a te rōpū

Maternal morbidity reviews allow teams to identify ways to improve systems and processes to reduce maternal morbidity. Through reviews, maternity teams learn, share and understand issues to minimise future cases of maternal morbidity.

In 2016, the MMWG established four regional review panels to review a selection of cases of specific conditions from the notifications received. The panels are multidisciplinary and comprise midwives, obstetricians, intensivists, anaesthetists, general practitioners and consumers. Panels review cases using a modified version of the PMMRC's review tool, which is based on the London Protocol.[94]

Reviews are based on clinical files provided by DHBs, lead maternity carers and other primary care providers. In addition, the MMWG asks DHBs to provide contextual information, because there are many factors that influence the delivery of care – for example, acuity at the time and the availability of guidelines. Not all DHBs are able to provide this contextual information.

By reviewing clinical files, the review panels consider whether there were any factors **present** that may have **contributed** to the deterioration of a woman's condition or the severity of her morbidity, or whether there were any factors **absent** that may have **prevented** the deterioration of the woman's condition or severity.

The aim is not to attribute blame to individual clinicians, but rather to consider the range of systemic and procedural factors that may have affected care. Identifying and naming these factors allows the review team to develop recommendations that focus on reducing/eliminating the negative factors and promoting/ensuring the positive factors.

As well as looking at any factors that may have negatively impacted care, the MMWG encourages panels to look at positive factors. Both negative and positive experiences provide opportunities for learning, innovation and improving quality.

Including the woman's narrative in the review process

If a woman has shared her narrative it becomes an important part of the information available at the panel review meeting. Including the woman's perspective is useful to the review team because it provides an opportunity for the team to consider a range of factors that may have contributed to her morbidity across her whole pregnancy. Since women's narratives have been included in the review process, the MMWG has received feedback from panel members that they are able to better understand the depth of the morbidity experienced, and that the narratives provide valuable opportunities for learning and improvement.

One common theme through the narratives was that the women had questions they didn't have answers to. While most women were offered the opportunity to debrief, this was often too soon after the event. It became clear that a more appropriate time for debrief was between three and six months after the event. This was a time when women were reflecting and seeking answers.

Practice point for DHBs: Women's narratives

Women who are admitted to an HDU or ICU should be offered the opportunity to debrief and discuss their experience between three and six months following the maternal morbidity event. Maternity services should ensure this appointment is arranged through an appropriate clinical appointment (as close to the woman's residence as possible), such as gynaecology outpatient, prior to discharge from the maternity service, directing her to agencies to enable attendance.

94 Vincent C, Amalberti R. 2016. *Safer Healthcare.* Cham: Springer International Publishing. URL: http://link.springer.com/10.1007/978-3-319-25559-0 (accessed April 2017).

Overall contributing factors from peripartum hysterectomy and hypertensive disorder panel reviews | Ngā tino take e pā mai ai te poka i te kōpū i te whānautanga me ngā arotake a te rōpū i te mate takawhita

The factors most frequently found (ie, in more than 35 percent of cases) to have contributed to the severity of the morbidity were as follows:

- **Organisation and/or management factors** (76 percent)
  - Delay in treatment (39 percent)
- **Personnel factors** (90 percent)
  - Failure to follow recommended best practice (56 percent)
  - Lack of knowledge and skills of health care providers (54 percent)
  - Lack of recognition of severity (49 percent)
  - Documentation (44 percent)
  - Inadequate communication (37 percent)
- **Barriers to access and engagement with care** (71 percent)
  - Substance abuse (34 percent)
  - Obesity impacted the ability to deliver care (32 percent)

Organisation and/or management factors

The panels found that organisation and/or management factors were at play in 76 percent of the 41 hysterectomy and hypertensive disorder cases reviewed.

Delay in treatment

The biggest organisation/management factor identified was delay in treatment, which impacted 45 percent of hysterectomy cases and 32 percent of hypertensive disorder cases. Examples of treatment delays include caesarean sections (due to inappropriate categorisation of acuity, or theatre resource), antenatal steroid administration and activation of appropriate treatment of ongoing bleeding (eg, sufficient fluid resuscitation and massive transfusion protocol).

There were also delays related to clinical resource (eg, delayed surgery due to a wait for a relevant non-obstetric specialist) and due to equipment (eg, cell saver or scanning equipment).

Practice point for clinicians: Preventing delays

All caesarean sections should be categorised in a consistent manner to enable appropriate triage. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists' (RANZCOG's) *Categorisation of urgency for caesarean section*[95] should be the primary source for categorisation of case acuity.

95 RANZCOG. 2015. *Categorisation of urgency for caesarean section.* Melbourne: RANZCOG. URL: https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Categorisation-of-urgency-for-caesarean-section-(C-Obs-14)Review-July-2015.pdf?ext=.pdf (accessed January 2019).

Practice point for DHBs: Preventing delays

DHBs should ensure there are enough senior medical staff and resources available for both acute work and elective theatres or clinics. Reference should be made to RANZCOG's *Categorisation of urgency for caesarean section*[96] when planning staffing and equipment.

Personnel factors

Personnel factors were the most common contributory factors identified by the review panels. These factors impacted 82 percent of hysterectomy cases and 100 percent of hypertensive disorder cases.

Knowledge and skill

Health care providers' lack of knowledge and/or skill was identified as a factor in 41 percent of hysterectomy cases and 68 percent of hypertensive disorder cases. This was evident across a range of services and settings, including community and hospital settings, and in antenatal and postnatal periods.

Examples where knowledge and skill were lacking include in the use of assisted delivery techniques (eg, attempted rotation and extraction and surgical delivery leading to peripartum hysterectomy), the prescribing of non-steroidal medication in women with pre-eclampsia and associated renal impairment, and identification of risks of pre-eclampsia in the antenatal and/or postnatal period across a variety of care settings.

Panels noted that the lack of knowledge and skill was highlighted by the variation in timing, mode and dosage or antihypertensive medication; in particular, switching medicines before they had time to take effect.

Practice point for DHBs: Assisted birth techniques

DHBs should ensure they teach and maintain the obstetric skillset and proficiency to select and apply the most successful delivery technique to effect urgent delivery. In cases of severe maternal or fetal compromise, the choice of delivery mode or technique may be different to the options for the more common scenario of failure to progress.

Failure to follow best practice

Failure to follow best practice was identified in 56 percent of cases reviewed (41 percent of hysterectomy cases and 74 percent of hypertensive disorder cases).

Within the hysterectomy cases, examples of failure to follow best practice included prescribing practices (where the dosage of different medicines were not adjusted to reflect a woman's comorbidities or body mass index (BMI)), and in the treatment of postpartum haemorrhage. This was evident in the use or uterotonics, dosage of Syntocinon infusion, fluid resuscitation and antibiotic administration.

96 *Ibid.*

Practice point for clinicians: Antibiotics

Prescribing antibiotic medication should reflect a dosage appropriate to the woman's BMI, clinical indication, route, comorbidities and susceptibility of the organism. For example, re-dosing of cefazolin during prolonged surgery or where haemorrhage is extensive should occur after four hours' operating time or > 1,500 ml volume blood loss.[97]

Practice point for clinicians: Blood loss

Measurement of cumulative blood loss, rather than visual estimation, is essential to ensure adequate fluid resuscitation.

Practice point for clinicians: Postpartum haemorrhage

Maternity care providers should refamiliarise themselves with the national postpartum haemorrhage treatment guideline,[98] focusing on correct dosage for Syntocinon infusion, and when to activate the massive transfusion protocol.

Examples within the hypertensive disorder cases also included prescribing practices, the administration of excess intravenous fluid, and administering general anaesthesia in women with pre-eclampsia. There were cases of women being induced earlier than indicated by current guidelines.

Practice point for clinicians: General anaesthesia

Obstetric anaesthetic providers should consider carefully, and in discussion with the lead obstetrician, the appropriate use of general anaesthesia in women with pre-eclampsia. Anaesthetists should proactively obtund the pressor response to laryngoscopy in women with hypertensive disorders.[99]

Failure to follow best practice was evident in other clinical scenarios. For example, important and significant parts of the Ministry of Health's gestational diabetes guideline[100] were not followed, which the review panels felt contributed to the woman's outcome.

Failure to recognise complexity and severity

A lack of recognition of the complexity and/or severity of a woman's condition was a factor in 49 percent of cases reviewed, including 32 percent of hysterectomy cases and 68 percent of hypertensive disorder cases. A lack of recognition of severity led to missed opportunities for referrals.

97 Auckland DHB. 2017. *Antimicrobial Stewardship – Surgical Antimicrobial Prophylaxis.* Auckland: Auckland DHB. URL: www.adhb.health.nz/assets/Documents/Health-Professionals/Antimicrobial-stewardship/Appendix-1-Surgical-antimicrobial-prophylaxis-L48.pdf (accessed February 2019).

98 Ministry of Health. 2013. *National Consensus Guideline for Treatment of Postpartum Haemorrhage.* Wellington: Ministry of Health.

99 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

100 Ministry of Health. 2014. *Screening, Diagnosis and Management of Gestational Diabetes in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

The review panels found instances where practitioners didn't appropriately consider the complexity of cases during planning and treatment, and instances where acute primary assessments were not completed as requirements pursuant to section 88 of the New Zealand Public Health and Disability Act 2000.[101]

Practice point for clinicians: Recognising complexity and severity

The maternity vital signs chart includes an early warning score and escalation pathway to enable timely recognition and escalation of care for women with HDP. The maternity vital signs chart can also be used as a written reminder in the primary setting to prompt referral.

Documentation

The opportunity to improve documentation was demonstrated in 36 percent of the hysterectomy cases, and 53 percent of hypertensive disorder cases. There were many instances where the rationale for treatment decisions was not recorded (eg, rationale for changing hypertensive medication). The panels also noted that there were episodes where multiple clinicians were involved in a woman's care, but their specific role/input was not recorded.

Practice point for clinicians: Documentation

All clinical documentation should include the rationale for treatment decisions, and the clinician's name and role. All relevant parties delivering care in an emergency should document the care they themselves provided.

Communication

The panel reviews identified that poor communication was a factor in 37 percent of the cases reviewed (32 percent of hysterectomy cases, 42 percent of hypertensive disorder cases). Communication could be improved across the board, but particularly between specialties, between maternity providers, and with the women and their families and whānau.

Practice point for DHBs: ISBAR

The use of simulation multidisciplinary training and team-working helps to improve communication. The use of structured communication tools, such as ISBAR (Identify–Situation–Background–Assessment–Recommendation), also helps to establish a consistent communication approach.[102, 103] An example of ISBAR in maternity can be sourced within the maternity early warning resources (available via www.hqsc.govt.nz/assets/MEWS/PR/Factsheet_for_clinicians_clinical_communication_tools_Mar_2019.pdf).

101 'Maternity Services Notice Pursuant to Section 88 of the New Zealand Public Health and Disability Act 2000'. *New Zealand Gazette*, 13 April 2007, Issue No. 41.

102 Siassakos D, Draycott T, Montague I, et al. 2009. Content analysis of team communication in an obstetric emergency scenario. *Journal of Obstetrics and Gynaecology* 29(6): 499–503. DOI: 10.1080/01443610903039153 (accessed February 2019).

103 Draycott T, Sibanda T, Owen L, et al. 2006. Does training in obstetric emergencies improve neonatal outcome? *BJOG* 113(2): 177–82.

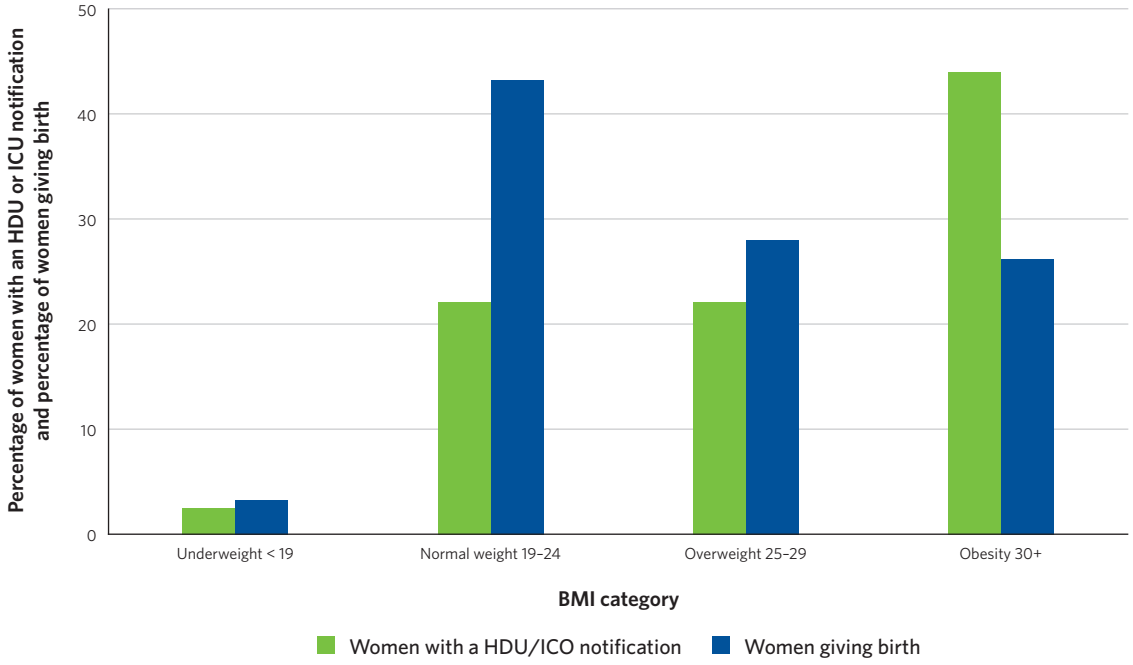
Barriers to access and engagement with care

As part of the review process the panels consider whether barriers to access and/or engagement with health services may have contributed to the maternal morbidity event. To consider and understand the potential barriers to access and engagement, the review panels take a systems approach, which emphasises 'the importance of social determinants, including the role of well-organised, high quality equitable health care'.[104]

The panels identified barriers to access/engagement in 77 percent of hysterectomy cases and 63 percent of hypertensive disorder cases.

The two most common factors the panels identified as impacting care were obesity and substance abuse. Eighteen of the women who had their cases reviewed were obese, which included 11 women who were categorised as extremely obese (BMI > 40), as shown in Figure 8. After reviewing the cases, the panels concluded that the woman's obesity impacted the delivery of care in 13 out of the 18 women who were obese. Examples of how obesity impacted the delivery of care, thereby increasing the severity of the morbidity, include impaired ability to use ultrasound, and difficulties with visualisation during surgery and IV cannula insertion.

Figure 8: Percentage of women with an HDU or ICU notification and percentage of women giving birth, in each BMI category, Aotearoa New Zealand



Numerator: Case notes supplied to the MMWG for review.
Denominator: *Report on Maternity 2015: Accompanying tables.*
BMI = body mass index. HDU = high dependency unit. ICU = intensive care unit.

Other barriers to access/engagement included infrequent care or late booking, the physical environment (eg, isolated, long transfer, delayed transport), and a lack of recognition of the complexity or severity of illness by the woman and her family and whānau. Case reviews identified that many of the women would have sought help earlier if they had known the symptoms of pre-eclampsia. Information would support women and their families and whānau to better identify symptoms of pre-eclampsia, seek help earlier and advocate in their care planning.

104 Scott N. 2014. A Māori cultural reluctance to present for care, or a systems and quality failure? How we pose the issue, informs our solutions. *New Zealand Medical Journal* 127(1393): 8–11. URL: www.nzma.org.nz/__data/assets/pdf_file/0014/35033/content.pdf (accessed April 2019).

Instead of looking at these barriers as 'the woman's fault', it is important to consider how the system can respond to women with different levels of need and support them to access and engage with care. Often, these are not barriers of the woman's making, but rather reflect systemic issues. For example, late booking does not necessarily indicate that women don't try to access care and may indicate a shortage in lead maternity carers. Failure to recognise the severity of illness could reflect a lack of appropriate information to support the woman's health literacy.

Practice point for clinicians: Health literacy

Lead maternity carers should discuss, explain and identify the early signs and symptoms of pre-eclampsia (and other hypertensive disorders) with all women regularly during pregnancy.

Potential avoidability

The panels deemed the severity of morbidity was potentially avoidable in 50 percent of hysterectomy cases and 63 percent of hypertensive disorder cases. They found that earlier recognition, response and treatment could have prevented the deterioration of the women to the point where they were admitted to an HDU or an ICU.

Positive findings from reviews

While both reviews identified many opportunities for improvement, positive themes were also noted. There were many examples of outstanding care by lead maternity carers, where it was deemed they went 'over and above' with provision of care, following up on antenatal and postnatal risks. There were examples of teams working collaboratively and planning care that was well orchestrated, where massive haemorrhages or maternal collapse were well managed. Proactive communication between anaesthetics and the maternity team enabled the provision of quality care. As one panel member stated following a hysterectomy review, 'Well managed, overall comment to the team giving care should be "well done".'

Other findings from reviews

During the reviews panel members took note of other information that may be indicative of best practice, access or engagement with care, but that did not necessarily contribute to the episode of morbidity. Some of these may be a result of late booking.

Out of the 41 cases reviewed:

- 22 women were screened for family violence. Two women were not screened and there was no documentation of screening for the remaining 17 women
- 15 women had a positive smoking status, and one woman stopped smoking during her pregnancy
- four women consumed alcohol during their pregnancies, and eight women consumed drugs (eg, marijuana and/or methamphetamine)
- 30 women were documented as taking folic acid supplements at the time of admission. Three women had no documentation of folic acid supplementation
- 34 women were documented as taking iodine supplements (all pregnant or recently pregnant women should be taking iodine).

Quality improvement activities | Ngā mahi hiki ake i te kounga

Maternal morbidity review toolkit for maternity services

Maternal morbidity reviews are quality improvement initiatives that allow teams to identify ways to improve systems and processes to reduce maternal morbidity. Through reviews, maternity teams learn, share and understand issues to minimise future cases of maternal morbidity.

The MMWG and the Health Quality & Safety Commission (the Commission) developed a toolkit to support DHBs to implement local maternal morbidity reviews. The toolkit provides maternity services with clear, easy-to-use, evidence-based guidance and resources for implementing a consistent process to review cases of significant maternal morbidity.

The maternal morbidity review toolkit was released in January 2019 and was met with enthusiasm from both DHBs and primary maternity services.

Severity Assessment Code (SAC) guidance

In 2018, the MMWG collaborated with the Commission's adverse events team to develop guidance for applying Severity Assessment Codes (SACs) in maternity settings. This was in response to inconsistencies in the reporting of adverse events in maternity services.

The Commission receives notifications of all pregnant or recently pregnant women who are admitted to an HDU or ICU, and notifications of adverse events.[105] We expected there to be a significant overlap in the notifications of maternal morbidity and of adverse events, but this has not been the case. There were several cases of maternal morbidity that should have been reported as adverse events but were not. For example, between 1 September 2016 and 31 August 2018 there were 27 cases of peripartum hysterectomy reported to the MMWG, many of which meet the criteria for SAC 1 or 2,[106] but only six of these were reported as adverse events.

Our observations are consistent with research that suggests instances of maternal morbidity are undercounted in adverse event reports. A study by Farquhar and colleagues found that fewer than 9 percent of maternal and perinatal adverse events were reported to the Commission's adverse events learning programme.[107]

The aim of the guidance is to help DHBs apply SAC ratings to improve reporting and learning. It follows a similar format to the SAC examples table 2017/18[108] currently in use. The guidance was finalised through collaboration with the sector and forwarded to maternity services in April 2019.[109] It will be reviewed annually as part of the adverse events learning programme.

Maternity early warning system

Background

Failure to recognise the early signs of illness in pregnant and recently pregnant women[110] has been a recurring theme in our review panels. The panels identified 'lack of recognition of severity' as a contributing factor in 49 percent of the cases reviewed. These findings are supported by a number of

105 All health and disability service providers must 'report all SAC 1 and 2 rated adverse events, plus events from the Always Report and Review List, to the Health Quality & Safety Commission'. Health Quality & Safety Commission. 2017. *National Adverse Events Reporting Policy 2017: New Zealand health and disability services.* Wellington: Health Quality & Safety Commission.

106 SAC 1 includes any adverse event that results in death or permanent severe loss of function. SAC 2 includes any adverse event that results in permanent major or temporary severe loss of function.

107 Farquhar C, Armstrong S, Kim B, et al. 2015. Under-reporting of maternal and perinatal adverse events in New Zealand. *BMJ Open* 5: e007970.

108 Health Quality & Safety Commission. 2017. *Severity Assessment Code (SAC) examples.* Wellington: Health Quality & Safety Commission. URL: www.hqsc.govt.nz/our-programmes/adverse-events/publications-and-resources/publication/2938

109 To access the SAC guidance, visit the Commission website (link tbc May 2019)

110 'Recently pregnant women' refers to women within 42 days of pregnancy end.

studies, which suggest that approximately half the cases of maternal morbidity are preventable, and that earlier recognition and response could have improved the care the women received.[111, 112]

To improve the recognition of and response to deteriorating pregnant women, we have developed with the Commission a national maternity early warning system (MEWS). The MEWS is designed to support recognition of the deteriorating pregnant or recently pregnant woman, and to link any abnormal score to an appropriate clinical response.[113] The MEWS aims to reduce harm, reduce maternity admissions to HDUs and ICUs, and reduce length of stay for women requiring HDU or ICU admissions or intensive one-to-one care within a maternity service. It will also reduce the risk of duplicating effort across multiple DHBs.

The MEWS involves a national maternity vital signs chart and resources for maternity services. These help DHBs to develop essential components of the system to be used in their hospitals' maternity and non-maternity services. The components include:

- a nationally standardised maternity vital signs chart with localised escalation pathway
- effective clinical governance and leadership
- education
- communication
- ongoing measurement for improvement (audits).

Testing and evaluation

In 2018, we tested the MEWS, including the maternity vital signs chart and associated resources, in three sites: Auckland DHB, Nelson Marlborough Health and Northland DHB. Nelson Marlborough implemented the MEWS across both its hospitals' maternity and non-maternity services. Auckland and Northland DHBs implemented in their main hospital's maternity services. The evaluation[114] found that there was a great degree of support for the MEWS. Positive feedback centred on the themes of consistency of process and language, support for clinical judgement and decision-making, and more responsive and appropriate escalation for pregnant women who were deteriorating.

National implementation

Due to the success of the MEWS at the three test sites, we endorsed the national implementation of the MEWS in Aotearoa New Zealand hospitals' maternity and non-maternity services. This means that any pregnant or recently pregnant woman admitted and requiring repeated observations will have her observations recorded on a vital signs chart that reflects the physiological changes of pregnancy.

The national MEWS team has been working with DHBs throughout the country to prepare for their MEWS implementation.[115] Many of these DHBs plan to implement the MEWS in their maternity services before spreading across all their hospitals' services. At the time of publication:

- one DHB has implemented the MEWS across all their hospitals' services
- two DHBs implemented the MEWS in maternity services and are now spreading the MEWS across all their hospitals' services
- 17 DHBs are preparing to implement or have recently implemented the MEWS.

When fully implemented across Aotearoa New Zealand hospitals, the MEWS should promote more equitable outcomes for women in that pregnant or recently pregnant women who become unwell will receive tailored hospital care in response to their individual clinical needs.

111 Sadler LC, Austin DM, Masson VL, et al. 2013. Review of contributory factors in maternity admissions to intensive care at a New Zealand tertiary hospital. *American Journal of Obstetrics and Gynecology* 209(6): 549.e1–7.

112 Lawton B, Macdonald EJ, Brown SA, et al. 2014. Preventability of severe acute maternal morbidity. *American Journal of Obstetrics and Gynecology* 201(6): 557e.1–6.

113 Royal College of Anaesthetists. 2018. *Care of the critically ill woman in childbirth; enhanced maternal care.* London: Royal College of Anaesthetists.

114 Health Quality & Safety Commission. 2019. *Evaluation of the early implementation of the national maternity early warning system.* Wellington: Health Quality & Safety Commission. URL: www.hqsc.govt.nz/our-programmes/other-topics/publications-and-resources/publication/3606 (accessed April 2019).

115 Visit www.hqsc.govt.nz/mews for more information about the MEWS.

Sustainability/next steps for the MMWG | Te ukaukatanga/ngā mahi whai ake mō te MMWG

The MMWG was established for a time-limited period under the umbrella of the PMMRC. While there was no expectation that funding would be extended, it is recognised that the MMWG's work has had a positive impact that warrants its continuation.

Impact of the MMWG

Independent external evaluation of the MMWG was undertaken by Malatest International Research in late 2018. The evaluation sought feedback from stakeholders via an online survey and phone-based interviews.

There were 153 responses to the online survey and 16 interviews completed. Most stakeholders participating in the online survey reported that our work resulted in more frequent national reviews. A small number thought our work also led to an increase in the frequency and number of local reviews.

Over two-thirds of survey participants felt we helped improve understanding of maternal morbidity. In interviews, participants discussed how the MMWG raised the profile and importance of morbidity reviews and helped educate people on how reviews could and should be done. Over half of survey participants 'agreed' or 'strongly agreed' that we contributed to quality improvement initiatives nationally (86 percent) and locally (58 percent).

Participants were positive about the quality of the information and resources released by the MMWG. They felt our regional reviews helped to highlight maternal morbidity issues and what could be done to recognise and respond to those issues. The evaluation also highlighted ideas for future improvement, such as how MMWG information and review findings are disseminated to frontline staff.

All interviewed stakeholders who had been a part of the review panels felt the panels were effective for their professional development, and shared learnings with their local teams. Most participants in the evaluation felt there was still a lot more to learn and more potential to improve the system. Participants generally reflected positively on our work and would like to see this continue.

Most felt that if the MMWG was unable to continue in its current format, it would be important that the capacity to report and analyse national data on maternal morbidity continues. Maintaining the collection of morbidity notifications and providing analysis, leadership and guidance at the national level is a core MMWG function. There was not a high level of confidence that reviews would continue without a national impetus. There was a strong suggestion from the survey participants that the PMMRC would be a logical place for a future maternal morbidity working group to be established.

Sustainability of MMWG functions

Over the tenure of the MMWG, we considered options for how our key functions could be sustained. This was informed by discussions within the Commission, the PMMRC and the Ministry of Health, and by the views of wider stakeholders participating in the evaluation. There were several options considered; the final decision was that the maternal morbidity work was best to become an enduring part of the PMMRC work plan.

The PMMRC was identified as the most obvious place for maternal morbidity work because:

- it has a legal standing and an established process for collecting and protecting information
- morbidity is recognised as part of its scope
- it is well respected and has high standing in the sector.

The current PMMRC terms of reference include morbidity as a function of its work. The PMMRC is expected to 'support the development and enhancement of systems to reduce mortality **and morbidity** [emphasis added]' by collecting data for national reporting, monitoring and analysing data, facilitating national and local review as appropriate, and facilitating quality improvement initiatives.

The PMMRC has acknowledged the work of the MMWG and its impact on the maternity sector. The PMMRC resolved in March 2019 to establish an enduring maternal morbidity sub-committee. It is envisaged this sub-committee will maintain the momentum of our previous work programme relating to maternal morbidity review. The PMMRC agreed this could include:

- monitoring HDU and ICU notifications
- ensuring linkages with the serious adverse event reporting system and reviews
- asking DHBs to submit maternal morbidity reviews carried out using the maternal morbidity review toolkit (released by us in January 2019) and a specific condition or theme, then collating the themes from the findings to develop system improvement.

It is not intended that regional reviews will be conducted under this new operating model. Examining local maternal morbidity reviews by specific conditions or themes to identify system improvements will provide some of the benefits of regional reviews, though not all.

The maternity morbidity sub-committee will take effect from 1 July 2019. The functions and membership will be confirmed as part of a transition process, with the sub-committee joining the two other PMMRC enduring sub-committees – the Neonatal Encephalopathy Working Group and the Maternal Mortality Review Working Group.

Quality improvements

The key quality improvement initiatives we identified over our tenure were the maternal morbidity review toolkit (released January 2019) and development/testing/implementation of a nationally consistent MEWS. The MEWS is being progressively implemented by DHBs over 2019–20, supported by the Commission's hospital improvement team.

Our quality improvements align well with wider quality improvement initiatives that are overseen by the Ministry of Health. The Ministry-led Maternity Quality and Safety Programme provides funding to DHBs for local improvement activities. The National Maternity Monitoring Group provides oversight of the Maternity Quality and Safety Programme, as well as review of national maternity standards, analysis and advice to the Ministry and DHBs on priorities for improvement in maternity services.

The National Maternity Monitoring Group has formally agreed to provide oversight of DHBs' uptake and use of the toolkit and MEWS over coming years. This continued focus will encourage sustainable and effective use of these tools and systems.

Appendix 1: Practice points for DHBs | Āpitihanga 1: Ngā take mahi mā ngā DHB

Principles of Te Tiriti

DHBs should partner with wāhine Māori (Māori women) and their whānau in meaningful, participatory ways to understand their maternity health priorities and work with them to design and implement solutions.[116] These solutions must recognise and respond to the authentic needs of Māori aspirations for self-determination in the health and wellbeing of themselves and their whānau, and must safeguard Māori cultural concepts, values and practices. We highly recommend using co-design[117] to best develop a service that is responsive to the needs and outcomes of wāhine Māori.

Addressing equity

DHBs should use the Health Equity Assessment Tool (the HEAT) to assess their services for the impact on health equity. The HEAT aims to promote equity in health in Aotearoa New Zealand. It comprises 10 questions for assessing policy, programme or service interventions for the current or future impact on health inequities. The HEAT is a flexible tool that can be used in its entirety or, alternatively, selected questions can be asked for specific purposes. The HEAT is available online at www.health.govt.nz/system/files/documents/publications/health-equity-assessment-tool-guide.pdf.

DHBs should increase their surveillance and monitoring of maternal morbidity, with a focus on identifying opportunities for achieving equitable outcomes for wāhine Māori and their whānau. The MMWG's maternal morbidity review toolkit for maternity services and the HEAT can be used to support this process, as well as Dr Jones' framework.[118]

When undertaking maternal morbidity reviews, panels should use the HEAT and Dr Jones' framework to apply an equity lens to the review process. They should consider whether inequities existed in relation to the maternal morbidity event, and if so, how the inequities occurred and how they will be addressed through the review and recommendation process. When possible, this should be done in partnership with the woman and her family and whānau. For more information on how to use the HEAT in maternal morbidity reviews, please see the maternal morbidity review toolkit for maternity services.[119]

When data on maternal morbidity reveals inequities, DHBs should initiate 'free, frank and fearless'[120] conversations about the causes of inequitable outcomes in maternity, and how they can be proactively addressed. In addressing these, DHBs should focus on the way they work, the environment they work in, and the systems and processes within which they deliver care, and should take action in all of these domains.[121]

Women's narratives

Women who are admitted to an HDU or ICU should be offered the opportunity to debrief and discuss their experience between three and six months following the event of maternal morbidity. Maternity services should ensure this appointment is arranged through an appropriate clinical appointment (as close to the woman's residence as possible), such as gynaecology outpatient, prior to discharge from the maternity service, directing her to agencies to enable attendance.

116 Chin MH, King PT, Jones RG, et al. 2018. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. *Health Policy* 122: 837–53.

117 Co-design is an approach that allows staff and consumers (or other people who use hospital and other care services) to share the designing of health services. It is sometimes called 'experience-based co-design'.

118 Jones CP. 2002. Confronting institutionalised racism. *Phylon* 50(1): 7–22. URL: https://sph.umd.edu/sites/default/files/files/Jones-Confronting-Institutionalized-Racism_Phylon%202003.pdf (accessed January 2019).

119 Health Quality & Safety Commission. 2018. *Maternal morbidity review toolkit for maternity services: A foundational document.* Wellington: Health Quality & Safety Commission.

120 Chin MH, King PT, Jones RG, et al. 2018. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. *Health Policy* 122: 837–53.

121 MidCentral DHB. 2018. *Achieving Health Equity Think Piece 2018.* Palmerston North: MidCentral DHB.

Preventing delays

DHBs should ensure there are enough senior medical staff and resources available for both acute work and elective theatres or clinics. Reference should be made to RANZCOG's *Categorisation of urgency for caesarean section*[122] when planning staffing and equipment.

Assisted birth techniques

DHBs should ensure they teach and maintain the obstetric skillset and proficiency to select and apply the most successful delivery technique to effect urgent delivery. In cases of severe maternal or fetal compromise, the choice of delivery mode or technique may be different to the options for the more common scenario of failure to progress.

ISBAR

The use of simulation multidisciplinary training and team-working helps to improve communication. The use of structured communication tools, such as ISBAR (Identify–Situation–Background–Assessment–Recommendation), also helps to establish a consistent communication approach.[123, 124] An example of ISBAR in maternity can be sourced within the maternity early warning system resources (available via www.hqsc.govt.nz/assets/MEWS/PR/Factsheet_for_clinicians_clinical_communication_tools_Mar_2019.pdf).

122 RANZCOG. 2015. *Categorisation of urgency for caesarean section.* Melbourne: RANZCOG. URL: https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Categorisation-of-urgency-for-caesarean-section-(C-Obs-14)Review-July-2015.pdf?ext=.pdf (accessed January 2019).

123 Siassakos D, Draycott T, Montague I, et al. 2009. Content analysis of team communication in an obstetric emergency scenario. *Journal of Obstetrics and Gynaecology* 29(6): 499–503. DOI: 10.1080/01443610903039153 (accessed February 2019).

124 Draycott T, Sibanda T, Owen L, et al. 2006. Does training in obstetric emergencies improve neonatal outcome? *BJOG* 113(2): 177–82.

Appendix 2: Practice points for clinicians | Āpitihanga 2: Ngā take mahi mā ngā rata motuhake

Informed choice

All women who give birth through caesarean section should be informed of the associated short- and long-term risks, including the risk of abnormal placentation in subsequent pregnancies.[125, 126, 127]

Psychological wellbeing

Women with suspected or confirmed morbidly adherent placenta should be referred to appropriate psychological counselling.

Understanding risk

The risk of peripartum hysterectomy should be discussed with all women with suspected or confirmed abnormal placentation. This should be done in a sensitive manner, and in a way that ensures the woman and her family and whānau understand.

Evidence statement

All women with risk factors for pre-eclampsia should be offered information regarding the benefits of low-dose aspirin and calcium supplementation. This should be documented in their clinical records.

Preventing delays

All caesarean sections should be categorised in a consistent manner to enable appropriate triage. RANZCOG's *Categorisation of urgency for caesarean section*[128] should be the primary source for categorisation of case acuity.

Antibiotics

Prescribing antibiotic medication should reflect a dosage appropriate to the woman's BMI, clinical indication, route, comorbidities and susceptibility of the organism. For example, re-dosing of cefazolin during prolonged surgery or where haemorrhage is extensive should occur after four hours' operating time or > 1,500 ml volume blood loss.[129]

Measurement of blood loss

Measurement of cumulative blood loss, rather than visual estimation, is essential to ensure adequate fluid resuscitation.

Postpartum haemorrhage

Maternity care providers should refamiliarise themselves with the national postpartum haemorrhage treatment guideline,[130] focusing on correct dosage for Syntocinon infusion, and when to activate the massive transfusion protocol.

125 Gupta M, Saini V. 2018. Caesarean section: Mortality and morbidity. *Journal of Clinical and Diagnostic Research* 12(9): QE01–6. DOI: 10.7860/JCDR/2018/37034.11994 (accessed November 2018).

126 Sandall J, Tribe RM, Avery L, et al. 2018. Short-term and long-term effects of caesarean section on the health of women and children. *The Lancet* 392: 1349–57.

127 Bohiltea R, Dumitrache M, Ciontea B, et al. 2018. The application of the management protocol of invasive placenta. A case report. *Romanian Society of Ultrasonography in Obstetrics and Gynecology* 14: 67–71. DOI: 10.18643/gieu.2018.67 (accessed January 2019).

128 RANZCOG. 2015. *Categorisation of urgency for caesarean section.* Melbourne: RANZCOG. URL: https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Categorisation-of-urgency-for-caesarean-section-(C-Obs-14)Review-July-2015.pdf?ext=.pdf (accessed January 2019).

129 Auckland DHB. 2017. *Antimicrobial Stewardship – Surgical Antimicrobial Prophylaxis.* Auckland: Auckland DHB. URL: http://nationalwomenshealth.adhb.govt.nz/Portals/0/Documents/Policies/Antimicrobial%20Stewardship%20-%20Surgical%20Antimicrobial%20Prophylaxis_.pdf (accessed February 2019).

130 Ministry of Health. 2013. *National Consensus Guideline for Treatment of Postpartum Haemorrhage.* Wellington: Ministry of Health.

General anaesthesia

Obstetric anaesthetic providers should consider carefully, and in discussion with the lead obstetrician, the appropriate use of general anaesthesia in women with pre-eclampsia. Anaesthetists should proactively obtund the pressor response to laryngoscopy in women with hypertensive disorders.[131]

Recognising complexity and severity

The maternity vital signs chart includes an early warning score and escalation pathway to enable timely recognition and escalation of care for women with HDP. The maternity vital signs chart can also be used as a written reminder in the primary setting to prompt referral.

Documentation

All clinical documentation should include the rationale for treatment decisions, and the clinician's name and role. All relevant parties delivering care in an emergency should document the care they themselves provided.

Health literacy

Lead maternity carers should discuss, explain and identify the early signs and symptoms of pre-eclampsia (and other hypertensive disorders) with all women regularly during pregnancy.

131 Ministry of Health. 2018. *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline.* Wellington: Ministry of Health.

Appendix 3: Methods and limitations | Āpitihanga 3: Ngā tikanga me ngā whāititanga

Numerator data

The Commission provides all HDUs and ICUs with a maternal morbidity notification form, which has the following instructions: 'Please fill in the details below for each woman admitted to HDU and/or ICU who was pregnant or had delivered within 42 days prior to admission'.

After a pregnant or recently pregnant woman is admitted to an HDU or ICU, organisations are responsible for returning the completed notification form to the Commission. All notifications data presented in this report came from the MMWG's Notification Database, which is managed by the Commission. Data reported for the reviewed peripartum hysterectomy cases and hypertensive disorder cases came from the panel review database, also managed by the Commission.

While reporting cases of maternal morbidity is recommended and requested, it is not required. This leads to variation in reporting practice across hospitals. Analysis and comparisons of specific numbers in this report may be of limited value due to these variations, although the trends they reveal are useful. However, this report provides valuable insights into specific cases of maternal morbidity.

Denominator data

Notifications data: Denominator data came from the National Maternity Collection (MAT) 2016/17. The MAT combines data collected by lead maternity carers, which is required to enable claims for payment, with hospital discharge data. For this report, the MMWG used the mean between 2016 and 2017 to form the comparator data.

BMI comparisons: BMI comparator data came from the *Report on Maternity 2015: Accompanying tables.*[132] More recent data was not available.

Limitations

Sample size: The review panels were unable to review all cases of maternal morbidity notified to the MMWG, thereby limiting the generalisability. However, the practice points remain valid.

Quality of the data: Notifications of HDU and ICU admissions is not a perfect proxy for the incidence of maternal morbidity. While notifications do have high specificity to capture cases of maternal morbidity, the sensitivity is lower because of women with significant morbidity being cared for outside the HDU and ICU environment. There is also variation in reporting practice across different hospitals. These factors mean cases of maternal morbidity are likely to be undercounted.

Ethnicity: The numerators and denominators were sourced from different data sets, which can result in numerator–denominator bias. Caution is advised when interpreting these results.

Ethnicities in the MMWG's Notification Database are derived from the ethnicity recorded on a patient's clinical file. Ethnicities in the MAT data set are derived from ethnic codes reported to National Minimum Dataset birth and postnatal events, lead maternity carer labour and birth claims, and National Health Index at the time of delivery. Ethnicity is reported as prioritised ethnicity.[133]

The possible undercounting of cases of maternal morbidity can lead to an underestimation of the incidence of maternal morbidity. This can have a relatively greater impact on the counts and hence observed rates of morbidity in smaller ethnic groups. Ethnicities lower on the priority list are also less likely to be captured when a single prioritised ethnicity is assigned.

132 Ministry of Health. 2017. *Report on Maternity 2015: Accompanying tables.* Wellington: Ministry of Health.
133 Ministry of Health. 2017. *HISO 10001:2017 Ethnicity Data Protocols.* Wellington: Ministry of Health.

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New Zealand Government

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