Editorial

Submitting author: Associate Professor Alicia Dennis

Department of Anaesthesia

Royal Women's Hospital

20 Flemington Rd, Parkville, Melbourne, Australia

Sex, suffering and silence – why peri-operative medicine must prioritise pregnant women

A.T. Dennis,[1] N. Sheridan[2]

1 Consultant, Department of Anaesthesia, Royal Women's Hospital, Parkville, Australia, and the Departments of Pharmacology, Obstetrics and Gynaecology, and Radiology and Medicine, University of Melbourne, Parkville, VIC, Australia

2 Consultant, Department of Anaesthesia, Western Health, Joan Kirner Women's and Children's Hospital, Furlong Rd, St Albans, VIC, Australia

nicole.sheridan@wh.org.au

Correspondence to: A/Prof Alicia Dennis

Department of Anaesthesia, The Royal Women's Hospital, Locked Bag 300, Corner Grattan St & Flemington Rd, Parkville, Australia 3052

P: +61 3 8345 2381

F: +61 3 8345 2379

Email: alicia.dennis@thewomens.org.au

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Twitter: @aliciatdennis

Peri-operative medicine, defined as the medical care of patients from the time of

contemplation of surgery through the operative period to full recovery, is being formally integrated into the care of surgical patients internationally, with large collaborative groups developing clinical and research agendas focusing on peri-operative outcomes [1,2]. This integration follows recognition by the Lancet Commission on Global Surgery that five billion people globally do not have access to safe anesthesia and surgery, which are essential to reducing the global burden of disease [3-5]. An acknowledgement of this problem, which was neglected in health systems for over 50 years, was made in 2015 when the World Health Organization Sixty-Eighth World Health Assembly passed a resolution to make safe surgery and anesthesia an essential requirement of universal health coverage. This means that emergency and essential surgical care and anesthesia are now embedded into the post-2015 global agenda and the sustainable development goals (SDG) [6]. Recognising the multidisciplinary, collaborative approach of peri-operative medicine and matching this with global agendas and goals will assist in enabling access to safe surgery to all.

Caesarean section surgery is an essential surgical operation

This procedure makes up approximately 30% of all operations in low middle-income countries each year [7-9]. Despite this, the 131 million pregnant women who might require this major abdominal surgery each year are rarely specifically highlighted in discourse on peri-operative medicine [7]. This is of concern as caesarean section surgery often occurs in an emergency setting, always involves bleeding and often a high risk of significant haemorrhage (> 500 ml) and is associated with the well-recognised postoperative complications of bleeding, infection, deep vein thrombosis and pulmonary embolism. These peri-operative problems often occur on the background of comorbid conditions of hypertension (10% of pregnant women), obesity, diabetes and anaemia.

Caesarean section surgery has been identified as a Bellwether procedure by Global Surgery 2030 [4] meaning that it is an essential surgical procedure and one that should be able to be offered in all hospitals. Raising the profile of the caesarean section surgery in pregnant women is necessary to enable the provision of safe peri-operative care to this often-forgotten group of surgical patients.

Pregnant women are an integral peri-operative medicine population

The antenatal and postnatal period is also the peri-operative period for 23 million young women globally who have caesarean section surgery each year (18.6% of pregnant women

globally) [9]. The global maternal mortality ratio in 2015 was 385 deaths per 100,000 women giving birth [10]. Given the number of women who undergo caesarean section surgery, the global problem of maternal mortality is intimately linked with a solution offered by the framework of peri-operative medicine. In the African Surgical Outcomes Study, maternal mortality after caesarean section surgery in Africa was 50 times higher than in high income countries with the main causes being peri-operative haemorrhage and anaesthesia complications [11]. Optimisation of maternal health is essential to reduce both maternal and neonatal morbidity and mortality, particularly in areas where access to caesarean section surgery is limited. In these areas key focuses for improvement are the education of women regarding the importance of seeking help for pregnancy problems early, developing transport routes that are easily accessed to travel to hospital, and once in hospital prioritisation of pregnant women in the healthcare facility.

Global mortality data suggest that the overall rate of caesarean section surgery is too low and aiming for a 20% caesarean section surgical rate is ideal [7]. Suboptimal utilisation of caesarean section surgery results in increased maternal and perinatal mortality and morbidity, predominantly in low middle-income countries, while liberal use, in high income countries, has not shown benefits and may lead to harm [12]. These disparities in global rates of caesarean section surgery reflect inconsistent care in the peri-operative period.
In high income countries maternal mortality is low; 10 deaths per 100,000 women giving birth. Morbidity, however, is still high in these settings and improvements in care are needed, especially in the management of haemorrhage, where almost 90% of women may have benefitted from better care [13]. Therefore, in both high and low middle-income countries, morbidity and mortality from peri-operative haemorrhage remains a serious and neglected area [14,15]. This is due in part to a lack of defined optimal pre-operative haemoglobin levels in pregnant women, sex based negative biases in determining haemoglobin reference ranges in women in general, and the longstanding global problem of normalising anaemia in women [14].

In countries with strong health systems, a woman having cesarean section surgery is 30% more likely to die than a woman having a vaginal birth [16]. Women having caesarean section surgery are also at a greater risk of complications including postpartum haemorrhage, chronic anaemia, infection, anaesthetic complications, embolism and longer-term complications such placental adhesion disorders, ectopic pregnancy, preterm birth and uterine rupture [12]. There are also emerging data to suggest that postoperative mental health problems are significant in this patient group with these including postpartum

depression, post-traumatic stress disorder, and anxiety [13]. In high income countries the median maternal age is increasing with the data from the National Health Service UK Hospital Maternity Activity, 2015-2016 showing the number of births in women aged 40 years and older growing by nearly 22% in the last decade. Pre-existing comorbid conditions are also increasing in pregnant women. These include increased body mass index of greater than 35 $kg.m^{-2}$, hypertensive disorders of pregnancy, endocrine disorders and cardiovascular disease , with cardiac disease now the leading cause of maternal death[17]. Assuming that mortality is the tip of the iceberg of maternal morbidity, a formalized approach to maternal peri-operative cardiovascular research, then clinical evaluation and management is needed to improve outcomes after caesarean section surgery [18].

The growth of peri-operative medicine within other surgical fields has enabled recognition and risk stratification of the high-risk patients; development of peri-operative risk scoring systems; collaborative decision making; pre-operative optimization; standardisation of in-hospital care; and enhanced recovery and rehabilitation [2]. It has also facilitated research and data collection to increase the evidence base for peri-operative medicine and the implementation of protocols which ultimately improve patient outcome. Application and expansion of peri-operative medicine principles to pregnant women, including the development of specific peri-operative scoring systems for pregnant women to compliment the neonatal Apgar score, is needed so that this group of patients also benefit from advances in this field [19].

The PARRCEL approach to maternal peri-operative medicine

Maternal peri-operative principles include : pre-pregnancy counselling (including contraception and family planning) [20]; antenatal care; recognition of higher risk pregnant women, risk stratification and modification [18]; resuscitation; collaborative decision making; enhanced recovery and rehabilitation [21]; and linkage to community support networks. The acronym of PARRCEL, developed by the authors, can be used as an approach to peri-operative care of pregnant women (Table 1).

The Lancet Commission of safe surgery and anaesthesia recommends that to achieve the goal of safe surgery and anaesthesia six indicators for surgery need to be adopted: timely access to essential surgery; specialist surgical workforce density; surgical volume; peri-operative mortality; protection against impoverishing expenditure and protection against catastrophic expenditure [4]. Maternal programs based on the aforementioned multi-pronged solution approach should include these indicators so that assessment of the

interventions to solve the problem of the lack of safe surgery and anaesthesia for pregnant women can be made [22] (Table 2). Adoption of these indicators for pregnant women also allows benchmarking and comparison with other countries in the region and internationally, which can be fed back into the health programs leading to further refinements or improvements, as well as collaboration between countries. The importance of integrating the principles of peri-operative medicine into the care of pregnant women cannot be overstated. We propose that adoption of the PARRCEL approach to peri-operative medicine for the care of pregnant women, which can also inform peri-operative data sets and outcome measures, will reduce maternal mortality and significantly contribute to the achievement of the SDG 3 – to achieve a global MMR of less 70 deaths per 100,000.

Goldkind et al., in the wake of the H1N1 influenza pandemic where pregnant women were disproportionately affected, wrote that pregnant women are a marginalised population and need to be included in clinical studies of drugs used in pregnancy [23]. Nine years later, in 2019, there is again an urgent need to advocate for the inclusion of pregnant women and gender equity in peri-operative medicine research and clinical practice [24]. As a collaborative team with obstetricians, midwives and physicians, anaesthetists need to change our thinking from the antenatal period being one of passive bystanding, to it being a crucial peri-operative period in which we are active participants in the peri-operative management of pregnant women [25]. As a collaborative group we also need to change our approach to childbirth in the light of caesarean section surgery being an essential surgical operation. A caesarean section should not simply be viewed as an alternative, lesser mode of birth or a lesser form for surgery. It instead needs to be considered a significant abdominal surgical procedure where clinical advances in peri-operative medicine, anaesthesia and surgery, pain medicine, research, quantity and safety, need to be routinely embedded so that pregnant women and their babies are not left behind. There is an urgent need to standardise endpoints in peri-operative trials specifically involving pregnant women undergoing caesarean section surgery so that a core and extended outcome set can be developed. In peri-operative medicine, pregnant women should not be a silent population and caesarean section surgery should not be a forgotten operation.

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Table 1 PARRCEL approach to maternal perioperative medicine

Peri-operative medicine component	Key concepts for pregnant women
Pre-pregnancy counselling	Contraception and family planning Management of vaccine preventable diseases, HIV, environmental health problems, nutritional deficiencies (iron deficiency), mental health issues and substance abuse Management of infertility, genetic testing, cessation of tobacco and alcohol use, and uptake of healthy lifestyle choices including weight loss and increased exercise
Antenatal care	Standardised care and early treatment of correctable conditions (anaemia, infection) Childbirth, breastfeeding and early parenting education including perioperative education about analgesia in labour, anaesthesia for caesarean section and postoperative analgesia Optimise chronic and newly diagnosed maternal diseases, monitor the growth and wellbeing of the fetus
Risk stratification and modification	Development of maternal risk stratification strategies and surgical risk calculators to rationalise preoperative testing and estimate likelihood of postoperative complications, including bleeding risk, cardiovascular morbidity (including hypertension), mental health complications
Resuscitation	Recognition of the critically ill pregnant and recently pregnant woman to ensure adequate resuscitation prior to caesarean section
Collaborative decision making	Early multidisciplinary involvement for high risk pregnant women centred on and involving the pregnant woman Decisions recorded for optimal location, type and timing of birth
Enhanced recovery and rehabilitation	Standardised postoperative care and enhanced recovery after surgery (ERAS) Development of standardised endpoints for women undergoing caesarean section using established frameworks and prioritising the major causes of morbidity in pregnant women – bleeding and transfusion events, anaemia, cardiovascular disease including hypertension, cognition and stroke, mental health issues, patient comfort, respiratory complications, sepsis, effects of early hospital

	discharge, breastfeeding rates and maternal fetal bonding
Linkage to community support	Counselling regarding future pregnancy Breastfeeding initiation and support Community support networks – maternal and child health nurses/community nurses Ongoing primary care and secondary prevention of long-term complications of childbirth including anaemia, hypertension, and mental health issues

Table 2 Sustainable Development Goal universal health coverage and peri-operative medicine

Indictors	Definition	Target by 2030	Requirements for success and assumptions
Access to timely caesarean section	Proportion of the population that can access, within two hours, a facility that can perform a caesarean section	At least 80% of the pregnant women can access a hospital within two hours	Improvements in road infrastructure, improvements in public transport, prioritization of women and gender equity as Engagement with local community to encourage hospital presentation rather than seeking alternative traditional healers Hospitals can perform caesarean section once pregnant women arrive and pregnant women know that hospitals are safe (integrated programs are necessary after full WHO situational analysis tool to identify gaps in surgical care)
Specialist surgical workforce density	Number of specialist anaesthetists and obstetricians who are working, per 100,000 population	At least 20 anaesthetic and obstetricians per 100,000 population	Training exists and is sustainable, support structures exists for physicians (ongoing education, maintenance of standards program), remuneration is acceptable - integrated programs are necessary and development of

Indictors	Definition	Target by 2030	Requirements for success and assumptions
			centres of excellence
Surgical volume	Procedures performed in an operating theatre per 100,000 population per year	At least 5000 procedures per 100,000 population per year	Tracking of surgical volume needs to be undertaken with a system put in place by 2030
Peri-operative mortality	All-cause death rate before discharge in patients who have undergone a procedure in an operating theatre, divided by the total number of procedures, presented as a percentage	Less than 100 direct anaesthetic deaths per million population Less than 2250 total perioperative deaths per million population 15 blood donations per 1000 population	Safe surgical infrastructure needs to be established – staffing, equipment, medications, blood transfusion, radiology and pathology services Tracking of surgical perioperative mortality needs to be undertaken and a system put in place by 2030 Advocacy for anaesthesia infrastructure/supplies and essential emergency equipment for resource planning Quality and safety tools such as the WHO tools including protocol and monitoring and evaluation are incorporated into hospital practice
*Protection against impoverishing expenditure and catastrophic expenditure**	Proportion of households protected against impoverishment and catastrophic expenditure from direct out-of-pocket payments for surgical and anaesthesia care	100% protection of population for both impoverished and catastrophic expenditure	Ongoing strong government leadership, and political commitment A reduction in poverty over time to facilitate sustainability in cost

WHO = World Health Organization

*Impoverishing expenditure is defined as entering into poverty or progressing further into poverty by out-of-pocket payments.

Catastrophic expenditure is defined as direct out-of-pocket payments that are greater than 40% of annual household income