Strategies to reduce the global burden of direct maternal deaths

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Abstract

The leading direct causes of the estimated 196 maternal deaths per 100,000 live births globally are postpartum haemorrhage, the hypertensive disorders of pregnancy, obstructed labour, unsafe abortion and obstetric sepsis. Of the Sustainable Development Goals, one (Sustainable Development Goal 3.1) specifically addresses maternal mortality; by 2030, the goal is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births. Eleven other Sustainable Development Goals provide opportunities to intervene. Unapologetically, this review focusses the reader's attention on health advocacy and its central role in altering the risks that many of the world's women face from direct obstetric causes of mortality. Hard work to alter social determinants of health and health outcomes remains. That work needs to start today to improve the health and social equality of today's girls who will be the women delivering their babies in 2030.

Keywords

Cardiovascular, complications, drugs (medication), general medicine

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Direct maternal death is defined by the World Health Organization as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. The leading direct causes of the estimated 196 maternal deaths per 100,000 live births globally are postpartum haemorrhage, the hypertensive disorders of pregnancy (HDPs), obstructed labour, unsafe abortion and obstetric sepsis.¹ All of these pregnancy complications offer opportunities for those adept at addressing medical complications of pregnancy to intervene at many levels. It must be remembered that >99% of these 275,000 maternal deaths in 2015 occurred in less-developed countries, with >35% in just three countries, India, Pakistan and Nigeria.¹ In parallel, the global community has moved from the Millennium Development Goals era to that of the Sustainable Development Goals (SDGs), of which one, SDG 3.1 specifically addresses maternal mortality (by 2030, to reduce the global maternal mortality ratio to less than 70 per 100,000 live births).² However, SDGs 3.2 (improving perinatal survival) and 3.4 (reducing the burden of premature deaths related to non-communicable diseases (NCDs)) are also relevant to this discussion.²

How can those involved in obstetric medicine engage in this broad SDG agenda? We concur with Lassi and colleagues that engagement should be concerted and at many levels.³

Engaging with the SDGs

SDGs 2.2 (malnutrition), 3.7 (access to sexual and reproductive care), 3.8 (universal health coverage), 3c (health workforce strengthening), 4 (quality education), 5 (gender equality), 6 (clean water and sanitation), 9 (innovation and infrastructure), 10 (reduced inequalities), 11 (sustainable cities and communities) and 16 (peace and justice) all provide opportunities to intervene. Such interventions are as broad as ensuring that minimal standards of care are achieved and maintained, through to advocacy with governments to provide girls and adolescent women with optimal life trajectories.

SGD 2.2: Malnutrition

For women to be of adequate stature and be in good health prior to, and during, pregnancy they require food security from childhood in

order to achieve SDG 3.1 by 2030. Due to fetal programming, the importance of food security probably starts prior to conception and during fetal life.⁴

Differential girlhood food deprivation, related to the preferential feeding of boys and men, is prevalent in many less-developed countries.⁵ Such practices are associated with an excess among girls of short stature⁶ (<164 cm) that is associated with an approximate doubling of the risk for pregnancy complications such as pre-eclampsia, especially severe disease.^{7,8} Also, malnourished girls become malnourished and anaemic pregnant girls and women at increased risk of, and from, postpartum haemorrhage, pre-eclampsia, obstructed labour and septic shock.^{9–13}

In addition, women from food insecure households are 3 times more likely to be severely obese compared with women from food secure households, with consequent obstetric risks.^{13,14}

SGD 3.7: Access to sexual and reproductive care

Providing women with access to reproductive choice in terms of timing of and decisions to continue with pregnancy will improve maternal health outcomes, especially for women who enter pregnancy with pre-existing disease.¹⁵ In many less-developed country societies, marriage occurs early and is followed, in short order, by a first pregnancy. Both these events are modifiable through changes in civil societal expectations of girls and women.

In Finland (low teenage pregnancy rates and high gross domestic product), teenagers face increased risks of several obstetric complications. For example, 13-to-15 year-olds have almost 4 times the odds for developing pre-eclampsia compared with women

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aged 20–24 years old.¹⁶ This adverse influence of teenage pregnancy on maternal and perinatal outcomes is even stronger, compared with women in their 20s, in less-developed countries.

Most pregnant teenagers are primigravida (83.2% vs. 41.4%) with increased obstetric risks.¹⁷ In terms of perinatal risks, teenage mothers have pregnancies complicated more frequently by low birth weight (50.4% vs 32.3%), premature delivery (51.8% vs 17.5%), stillbirth (1.9% vs 0.3%), neonatal morbidities (e.g. perinatal asphyxia (11.7% vs 1.9%), jaundice (5.7% vs 1.2%) and respiratory distress (1.9% vs 0.3%)) and neonatal mortality (3.8% vs 0.5%). Relating back to the discussion about food insecurity and its contribution to obesity, the risks for a woman to develop either pre-eclampsia or eclampsia increase significantly with increasing BMI and decreasing age. Extremely obese teenagers are almost 4 times as likely to develop pre-eclampsia and eclampsia when compared with non-obese women aged 20–24.¹⁸

Sexual and reproductive practices that minimise maternal exposure to paternal seminal fluid prior to pregnancy have been associated with an increased risk of pre-eclampsia.¹⁹ Grand multiparity is associated with increased risks of malnutrition, PPH and obstructed labour.^{20–22}

Either too short (<2 years) or too long (>10 years) a birth interval increases a woman's risk for direct obstetric complications.^{23,24} In Bangladesh, women were less likely to experience short birth intervals if they were younger, deferred their fertility, were economically secure and achieved higher order parities; short birth interval was associated with elevated risk of stillbirth and newborn death.²⁵ Therefore, giving women reproductive choice is an important tool in reducing direct maternal burden of adverse maternal and perinatal events.

SDG 3.8: Universal health coverage

Providing quality and equitable health coverage to all pregnant women is a cornerstone of achieving SDG 3.1.²⁶ The failure of the United States to achieve this may underlie the increasing maternal mortality ratio in that country as the indigent poor with inadequate access to health care increasingly become the indigent obese.^{1,27} Any threat to affordable, accessible health care is likely to worsen this situation.

SDG 3c: Health workforce strengthening

To support women during and after pregnancy, as well as their newborns, there needs to be an adequate health human resources infrastructure available to women and their babies, wherever they reside. Of the leading causes of maternal and perinatal mortality, the HDPs are those most amenable to a community-oriented approach as there is usually a lead time between the onset of symptoms and signs of pre-eclampsia, and the evolution to life-threatening and life-ending complications.

One such approach to improve pregnancy outcomes is the CLIP (Community-Level Interventions for Pre-eclampsia) trial. In this study, we are taking the approach of task-shifting the screening, initial diagnosis and initiation of lifesaving therapies to mobile health (mHealth)-supported community health care providers in women's communities (<http://www.thelancet.com/protocol-reviews/13PRT-9313>). These workers are 'agentes polivalentes elementares', lady health workers and both accredited social health activists and auxiliary nurse midwives in Mozambique, Pakistan and India, respectively. An element of the mHealth-directed response to the detection of hypertension is either urgent (within 4 h) or non-urgent (within 24 h) transfer to referral facilities that provide comprehensive emergency obstetric care. The mHealth app, PIERS on the Move (POM), has specific thresholds to guide women to seek urgent rather than non-urgent, care.^{28,29} The POM app is based on the demographics-, symptom- and sign-based miniPIERS (Pre-eclampsia Integrated Estimate of RiSk) model that provides time-of-disease risk estimation for women with pregnancy hypertension in less-developed countries.³⁰

However, it is important to recognise the increasing burden being placed on such workers through task-shifting in many countries. If this cadre of workers is to remain effective and accept more tasks, there is a requirement for an expansion in numbers and adequate support through pre-deployment training and ongoing professional development and supervision.

Once women reach health posts, primary health centres and inpatient facilities, they require access to trained and effective nurses, midwives, physician assistants and doctors. For maternity care, the global call is for strengthening and expansion of the midwifery workforce.³¹ It is incumbent on whomever provides maternal and perinatal health care to do so respectfully, utilising the best evidence-based approach that local resources permit.^{32,33} Improving work environments will increase the likelihood of women receiving respectful care.³⁴

In all settings and at all levels, maternity care providers are obliged to undertake continuous professional development (CPD) tailored to their educational and skill levels – and national professional societies and ministries are obliged to provide CPD and the time to attend CPD courses.

SDG 4: Quality education

Education is a determinant of whether or not women access pregnancy care and have an understanding of pregnancy complications, whether their own education or that of their, often proxy decision maker, spouse.^{35–40} Education is a predictor of financial security, discussed below.

SDG 5: Gender equality

As stated above, preferential feeding of male children and men, compared with girls and women, is prevalent in many low-and-middle-income countries (LMICs).⁵ In addition, globally, the majority of women have either limited or absent autonomy of decision-making, even in the face of obstetric emergencies.^{26,41–45}

SDG 6: Clean water and sanitation

Clearly, maternal health entering pregnancy and childbirth will be enhanced if the burden of chronic infectious disease can be reduced by access to adequate sanitation at home, and, more importantly as facility birth rates increase, within facilities. Beyond the commodities required to modify disease-specific risks of stroke and eclampsia, facilities need to fulfil water, sanitation and hygiene (WASH) standards to provide safe care,⁴⁶ especially as the only definitive method to initiate recovery from pre-eclampsia is delivery of the placenta.²³ This requires either labour induction or Caesarean delivery, the safety of both of which are WASH-dependent. Campbell and colleagues have provided a carefully framed conceptual framework linking WASH to improved maternal and reproductive health outcomes.⁴⁷

SDG 9: Innovation and infrastructure

An important advance in the move toward offering every pregnant woman accurate BP measurement and detection of pregnancy hypertension has been the development of the semi-automated Microlife BP 3ASI-2 sphygmomanometer®, which has been validated in women with the hypertension of pre-eclampsia.⁴⁸ This device avoids the errors intrinsic in manual BP measurement in pregnancy (especially terminal digit preference⁴⁹), which can be used by minimally trained community-level health-care providers and costs less than \$25 USD per unit.

In the CLIP trials, we are testing the performance of miniPIERS, and other thresholds that mandate an urgent response, using country-specific versions of the POM app.^{28,29} The POM app provides

culturally sensitive, easy-to-use guidance for community health care providers. In rural Sindh, for example, a lady health worker is guided through antenatal screening, BP measurement and, if the pregnant woman is hypertensive, a range of responses that can include lady health worker-administered magnesium sulphate (for women at high risk) and, if the woman is severely hypertensive, oral methyldopa, prior to urgent referral for definitive facility-based care. If the woman is assessed as having less risk, then she is advised to seek facility-based care within 24 h. In addition, the POM app can be strengthened by the addition of the Kenek Edge phone oximeter[®] that improves the discriminatory performance of the miniPIERS model in separating those hypertensive women most at risk of life-threatening complications of pregnancy hypertension from those at least risk.^{28,29,50}

In parallel, it is important to improve general infrastructure. Access to care is determined by transport infrastructure.^{51,52} In addition, local facilities are often in poor condition. An example of how to mobilise funds for facility availability and enhancement is the experience of the Local Authority Transfer Fund in Kenya. This fund returns 5% of income tax to communities in a proportional manner that has improved both accountability and community autonomy. A consequence has been an improvement in government income tax-based revenues, as communities see the return on their taxation used to build such things as schools, health facilities and transport infrastructure.⁵³ Improvements across these infrastructures will lead to improved maternal and perinatal health outcomes.

SDG 10: Reduced inequalities

There is clear evidence that income disparities drive risks for adverse maternal events.^{3,54,55} This is particularly true in countries where the private sector delivery of health care dominates – whether the health industry of the United States or the under-resourced public sectors in many LMICs that drive women into often poorly regulated private clinics. Maternal mortality risks tend to be inversely proportional to national gross domestic product, with notable exceptions such as the United States.¹

SDG 11: Sustainable cities and communities

As health care access is determined by time and place,⁵² global warming will increase health vulnerabilities for both rural residents and the urban poor who often live in slums. Global warming will increase the risks that women enter pregnancy with health challenges as diverse as chronic kidney disease and malaria,^{56,57} and their consequent risks for pregnancy hypertension.

SDG 16: Peace and justice

An estimated 140,000 women die in conflict zones annually, of whom a proportion will be pregnant and recently pregnant women.⁵⁸ These women are not included in global estimates of maternal mortality.^{1,59} Women in conflict zones are at increased risk of sexual- and gender-based violence and have limited, or absent, access to that antenatal, intrapartum and postnatal care that has been shown to reduce maternal risks.^{60,61}

Condition-specific roles for obstetric medicine related to direct causes of maternal death

It is worth considering how obstetric medicine can contribute to reductions in direct causes of maternal death, for these efforts may be rewarded not only by improved outcomes for women, but also by

improved relationships and new collaborations with obstetricians and other maternity care providers. Such work may form the basis of new networks of care, particularly in settings where obstetric medicine is just emerging or there is interest in seeing it do so.

First, based on data from the UK, it must be emphasised that medical co-morbidities increase the risk of direct maternal death from the most common obstetric complications. Medical co-morbidities were the strongest risk factor for direct maternal death in multivariable modelling for the five leading causes of direct maternal death in the UK that include the global leading causes of the hypertensive disorders of pregnancy, sepsis and postpartum haemorrhage.⁶² It should follow that improved care of these conditions should lead to improved care and a reduction in direct maternal death.

Second, the obstetric internist can play a key role in the management of three specific direct obstetric complications.

Postpartum haemorrhage

Clearly, the primary role for obstetric medicine in the care of women suffering from a massive PPH is the management of coagulopathy.⁶³ However, it must be remembered that such women are at increased risk of rebound thrombocytosis and consequent thromboembolic disease and death.⁶⁴ Thromboprophylaxis with heparin will minimise that risk. The obstetric internist is ideally placed to discuss the balance of risks.

Pregnancy hypertension

Pregnancy hypertension provides an opportunity for the obstetric medicine practitioner to have an impact on reducing maternal mortality.^{1,61} This can be achieved through interventions at multiple points in the care pathways of women with pregnancy hypertension, such as accurate BP recording,⁴⁸ accurate estimation of proteinuria,⁶⁵ understanding the complexity of pre-eclampsia,^{66,67} time-of-disease risk estimation,^{30,68} management of non-severe and severe hypertension,^{69–71} use of magnesium sulphate for seizure prevention and treatment,^{72,73} fluid management,^{74,75} anaesthesia,⁷⁴ timing and management of delivery,^{66,67} postpartum care^{66,67} and long-term surveillance for NCDs.^{66,67}

Obstetric sepsis

Obstetric sepsis arises due to chorioamnionitis, infected retained products of conception and unsafe abortion, and responses require an understanding of the urgent nature of obstetric sepsis and the Sepsis Six bundle, including the need for fluids, appropriate antibiotics in appropriate doses and careful serial monitoring of organ function and serum lactate.^{76–80}

In summary

Unapologetically, this review has focussed the reader's attention on health advocacy and its central role in altering the risks that many of the world's women face from direct obstetric causes of mortality. Many of the easy fixes have been undertaken, and the hard work to alter social determinants of health and health outcomes remain. To achieve the SDGs, that work needs to start today to improve the health and social equality of today's girls – those girls who will be the women delivering their babies in 2030.

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