

## Tracking perioperative mortality and maternal mortality: challenges and opportunities



Access to surgery remains inequitable worldwide, with 5 billion people lacking safe and affordable surgical and anaesthesia care when needed.<sup>1</sup> *The Lancet* Commission on Global Surgery was convened in 2013 to assess the state of surgery around the world, provide recommendations for improving access, and propose indicators for assessing national surgical systems. A key safety indicator is the perioperative mortality rate (POMR). This is defined by the Commission as the number of all-cause deaths before discharge in patients who have undergone a procedure in an operating theatre, divided by the total number of procedures, and presented as a percentage.<sup>1</sup> While the surgical literature is replete with mortality data at a health facility level, the collection of nationally representative data is more challenging and is less frequently reported.<sup>2</sup> However, recent work has shown that many countries already collect national data on deaths after surgery, including several middle-income countries.<sup>3</sup> Whereas POMR is just emerging, the maternal mortality ratio (MMR) is an established population health indicator. Both are ratio indicators with numerators and denominators that are commonly recorded, making them seemingly straightforward to monitor. Yet MMR has faced numerous challenges through its evolution, creating a cautionary tale and revealing what is needed for POMR to succeed.

In particular, problems with MMR have included underreported and misclassified maternal deaths, unreliable civil registration systems, use of different data sources in various settings over time, and changes in definition of maternal mortality.<sup>4,5</sup> Broadly, the challenges in measuring MMR have been categorised as the definitional challenge and the challenge of finding deaths.<sup>6</sup> Variable data availability and reporting errors have made medical cause and time of death difficult to establish, especially in regions where most deaths occur outside of hospital due to women's lack of access to care. Methodological concerns have resulted in at least 18 empirical measurement tools to use depending on country and facility context.<sup>6</sup>

Despite the challenges, since the Safe Motherhood Initiative was launched almost 30 years ago, international institutions such as the World Bank and WHO, and

independent groups such as the Institute for Health Metrics and Evaluation, have developed, published, and continually refined estimates of maternal mortality. Indirect and sampled methods of estimation for MMR such as verbal autopsy studies, the sisterhood method, and the reproductive age mortality survey (RAMOS) as well as systematic analyses of vital registration data undertaken by the Global Burden of Disease study have all contributed to improvements in our understanding of maternal mortality.<sup>4,7</sup> Maternal death reporting has evolved into an essential country-level indicator, providing critical evidence for policy formulation, priority setting, monitoring and evaluation, and accountability.<sup>7,8</sup>

Policymakers using POMR can draw on lessons from the MMR. First, POMR requires a clear and standard definition that is feasible to measure.<sup>9</sup> In-hospital deaths are more feasible to count than the often-used definition of deaths within 30 days following a procedure, as post-discharge records may not be available.<sup>9</sup> Yet POMR faces a unique definitional challenge: the types of procedures present in the denominator will vary with context, and thus for robust comparative analysis, a clear accounting of the types of procedures performed must be made.

Second, reliable and accessible data sources must be identified and harnessed. Research has shown that low-cost, locally developed, facility-based databases in low-income and middle-income countries can provide accurate death statistics.<sup>10</sup> The denominator of POMR is purely clinical (surgical procedure) rather than natural (pregnancy) and so facility-based records are sufficient for its calculation. For both POMR and MMR, institutional resistance to provide accurate but potentially self-damaging information may be a significant challenge; governments and regulatory bodies must be clear that they intend to use POMR to identify problems and allocate resources accordingly rather than for castigating the conscientious surgeons and institutions who care for the sickest patients with the highest POMR.

It is important for all countries to have a common baseline for data: this is the POMR definition supported by the Commission and others.<sup>9,11</sup> However, beyond the collection of this datum, the evidence does not yet exist on how countries can further evaluate trends

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in mortality and use this information to improve surgical safety. As with MMR, case studies may be used to illustrate successful approaches towards data collection and outcome improvement.<sup>12</sup> Countries can propose feasible data collection systems to evaluate surgical deaths. The WHO and other UN organisations, academic institutions, and other technical partners can in turn provide guidelines and methodological support for governments wishing to engage in such analysis. In the early stages, aggregate POMR may be used to provide crude information on system performance in facilities where case mix information is not provided. Over time, a standardised approach to reporting and risk stratification can be adopted to allow for comparison of outcomes between countries and regions over time.

With surgery gaining acceptance as an essential and cost-effective public health measure across all levels of economic development, there is increasing interest in interventions to improve surgical outcomes. Without a clear strategy for measuring nationally representative perioperative mortality rates, governments cannot assess how investments in health systems affect the safety of surgical care provided. Learning from history in related fields can help ease the growing pains of POMR as a new health indicator.

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We declare no competing interests.

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- 1 Meara JG, Leather AJ, Hagander L, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet* 2015; **386**: 569–624.
- 2 Ng-Kamstra JS, Greenberg SLM, Kotagal M, et al. Use and definitions of perioperative mortality rates in low-income and middle-income countries: a systematic review. *Lancet* 2015; **385** (suppl): S29.
- 3 Lancet Commission on Global Surgery. Data for the sustainable development of surgical systems: a global collaboration. <http://www.lancetglobalsurgery.org/#indicators/o217z> (accessed Dec 27, 2015).
- 4 Graham WJ, Ahmed S, Stanton C, Abou-Zahr C, Campbell OM. Measuring maternal mortality: an overview of opportunities and options for developing countries. *BMC Med* 2008; **6**: 12.
- 5 Ronsmans C, Graham WJ, Lancet Maternal Survival Series steering group. Maternal mortality: who, when, where, and why. *Lancet* 2006; **368**: 1189–200.
- 6 Graham WJ, Foster LB, Davidson L, Hauke E, Campbell OM. Measuring progress in reducing maternal mortality. *Best Pract Res Clin Obstet Gynaecol* 2008; **22**: 425–45.
- 7 Kassebaum NJ, Bertozzi-Villa A, Coggeshall MS, et al. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; **384**: 980–1004.
- 8 Langer A, Meleis A, Knaul FM, et al. Women and Health: the key for sustainable development. *Lancet* 2015; **386**: 1165–210.
- 9 Watters DA, Hollands MJ, Gruen RL, et al. Perioperative mortality rate (POMR): a global indicator of access to safe surgery and anaesthesia. *World J Surg* 2014; **39**: 856–64.
- 10 Ariyaratnam R, Palmqvist CL, Hider P, et al. Toward a standard approach to measurement and reporting of perioperative mortality rate as a global indicator for surgery. *Surgery* 2015; **158**: 17–26.
- 11 Weiser TG, Makary MA, Haynes AB, et al. Standardised metrics for global surgical surveillance. *Lancet* 2009; **374**: 1113–17.
- 12 Quinn JW, McKone-Sweet K, Greenberg SLM, Riesel J, Meara JG. SQUAD in Uganda: Surgical Quality Assurance Database. Lancet Commission on Global Surgery Teaching Cases. Boston: Babson College, 2015. <http://www.globalsurgery.info/wp-content/uploads/2015/08/LCoGS-Teaching-Case-2.pdf> (accessed May 9, 2016).