Developing obstetric medicine training in Latin America

José Rojas-Suarez^{1,2,3}, Niza Suarez^{1,2} and Oier Ateka-Barrutia²

Abstract

Maternal mortality is an important indicator of health in populations around the world. The distribution of maternal mortality ratio globally shows that middle- and low-income countries have ~99% of the mortality burden. Most countries of Latin America are considered to be middle- or low-income countries, as well as areas of major inequities among the different social classes. Medical problems in pregnancy remain an important cause of morbidity and mortality in this region. Previous data indicate the need for a call to action for adequate diagnosis and care of medical diseases in obstetric care. The impact of nonobstetric and medical pathologies on maternal mortality in Latin America is largely unknown. In Latin America, two educational initiatives have been proposed to improve skills in maternity care. The Advanced Life Support in Obstetrics (ALSO[®]) was first started to address obstetric emergencies, and subsequently adapted for low-middle-income country settings as the Global ALSO[®]. In parallel, the Latin American obstetric anesthesia community has progressively focused on improvement of several intrapartum/intraoperative issues, which has secondarily taken them to embrace the obstetric medicine area on interest and join the former initiatives. In the present review, we summarize the available data regarding medical morbidity and mortality in pregnancy in Latin America, as well as the challenges, achievements, issues, initiatives, and future directions encouraging maternal health educators, health care trainers, and physicians in middle- and low-income countries, such as many Latin American ones, to improve and/or change attitudes, if needed, on current clinical practice.

Keywords

Medical education, pregnancy complications, Latin America

Date received: 27 December 2015; accepted: 10 November 2016

Causes of maternal mortality in middle and low resource settings

An estimated of 303,000 maternal deaths occurred worldwide in 2015, of which 99% took place in low-middle-income countries (LMIC) and were considered avoidable.¹ Based on the International Classification of Diseases ICD-10, the World Health Organization (WHO) defines maternal death as death of a woman while pregnant or within 42 days after delivery, irrespective of the duration of, related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.²

In developed countries, maternal mortality can be as low as three deaths per 100,000 live births (Finland), compared to developing countries where it can be as high as 1360 deaths per 100,000 live births (Sierra Leone).¹ The causes of maternal mortality are classified as direct and indirect. Direct maternal deaths are those resulting from obstetric complications of the pregnancy itself, interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above. Indirect deaths are those resulting from previously existing diseases, or from diseases developed during pregnancy and were not due to direct obstetric causes but aggravated by physiological effects of pregnancy.²

According to the most recent data, globally direct causes are responsible for approximately 70–75% of maternal deaths and indirect for 25–30% of them.¹ Indirect causes include the effects of many pre-existing disorders such as HIV, anemia, heart disease, mental illness, respiratory diseases, and diabetes. Unfortunately, indirect causes of maternal deaths remain a growing problem all over the world.³

WHO also defines severe maternal morbidity (SMM) as those cases in which a woman almost died but survives a complication during pregnancy, childbirth, or within 42 days of termination of pregnancy. The analysis of this parameter is considered a more reliable measure of maternity care and health services than maternal mortality⁴ as well as an indicator of quality. Moreover, SMM is a subject of great interest in public health because it is considered a strategy that helps both in diagnosis and early treatment of threatening living conditions as well as to clarify the causes and delays of

maternal deaths.⁴ Thus, the WHO has recommended the monitoring and control of SMM as a priority to contribute to reduce the maternal mortality trends.

Maternal morbidity and mortality in Latin American countries

Latin America (LA) is considered one of the most diverse regions of the world, with 14 of the 20 countries recognized as the most unequal in the globe.⁵ Some countries have had a breakthrough in reducing maternal and child mortality, whereas others' rates remain high despite their efforts.¹

Maternal morbidity and mortality embeds in a social scenario where women's basic rights, education, and opportunities are continuously dismissed and where social inequities are deliberately perpetuated. In addition, these progressively urbanized societies facilitate the arousal of large, out-of-census moving populations into endless slums with lack of appropriate attention (including prenatal care), and under-resourced health systems, facilities, and personnel.⁶ In this context, maternal wellbeing before, during, and after pregnancy poses paramount importance in stillbirth, premature birth, neonatal morbidity, and mortality rates.^{7,8} Hence, a broad approach is urgently needed to tackle the maternal and newborn health in this region.

¹Department of Obstetrics and Gynecology, Universidad de Cartagena, Cartagena, Colombia

²Grupo de Investigación en Cuidado Intensivo y Obstetricia (GRICIO), Cartagena, Colombia

³Unidad de Cuidados Intensivos Gestión Salud, Cartagena, Colombia

Corresponding author:

Jose Rojas-Suarez, Department of Obstetrics and Gynecology, Universidad de Cartagena, Cartagena, Colombia.

Email: joseantonio.rojas.suarez@gmail.com

Table 1. Global main causes of SMM and MM (adapted from Lumbiganon et al.⁷).

CAUSES	Severe maternal morbidity, n (%)	Maternal mortality, n (%)
Total	2365	457
Indirect causes, n (%; 95% CI)	467 (19.8; 18.9–20.6)	122 (26.7; 24.6–28.8)
Other complications	381 (81.6)	105 (86.1)
Anemia	234 (50.1)	61 (50.0)
Malaria / Dengue	79 (16.9)	19 (15.6)
Lung disease	47 (10.1)	17 (13.9)
Liver disease	35 (7.5)	14 (11.5)
Heart disease	38 (8.1)	12 (9.8)
HIV / AIDS	9 (1.9)	14 (11.5)
Renal disease	16 (3.4)	4 (3.3)
Cancer	3 (0.6)	3 (2.5)
Infection	133 (28.5)	51 (41.8)
Sepsis and other systemic infections	71 (15.2)	50 (41.0)
Pyelonephritis	49 (10.5)	4 (3.3)
Influenza	21 (4.5)	2 (1.6)
Hypertensive disorders		
Chronic hypertension	38 (8.1)	5 (4.1)

In 2015, the maternal mortality ratio estimated in LA was 60 per 100,000 live births (total of 7400 deaths) and 175 in the Caribbean (1300 deaths).¹ Recently, WHO conducted a systematic review of the causes of maternal death that included data of 115 countries and 60,799 maternal deaths.⁴ The main causes of death were direct diseases (81.4%), of which the most important was hemorrhage (23.1%) followed by hypertensive disorders (22.1%). Interestingly, LA was the region where more women died because of hypertensive disorders, compared to all the other regions of the world. Indirect causes of maternal death occurred in 18.5%, a lower percentage than developed countries, such as Austria where maternal deaths are largely secondary to indirect causes (81%).⁴ Prevention and strict control of women with these pathologies is of cardinal relevance, as evidenced in a recent report of the WHO Multicountry Survey on Maternal and Newborn Health Research Network, where analysis of 314,623 pregnant women's data of four continents has shown that women with underlying indirect causes have significantly increased risks of severe maternal and perinatal outcomes.⁷ Therefore, indirect causes of mortality cannot be ignored and efforts must focus on their reduction.⁹

In Latin American countries, the real incidence of maternal deaths secondary to medical conditions associated to pregnancy is unknown. According to a WHO report, which included these countries, the main indirect causes of maternal mortality (MM) and SMM are: anemia in 50%, followed by malaria and dengue (17%), lung disease (10%), and infections (31%) (Table 1).⁷

The current evidence suggests a number of factors contributing to these high levels of maternal mortality in LA. Most patients get inadequate services because of malfunctioning systems, lack of accessibility, and lack of referral facilities. On the other hand, the lack of appropriate diagnosis and treatment made by underqualified personnel affects the overall results increasing the risks and not decreasing the costs. Hence, institutional quality of care and training of health care personnel become key strategies in reducing morbidity and mortality in pregnant women.¹⁰ Recognition of obstetric medicine (OM), a medical subspecialty focused on the care of women with medical conditions during pregnancy, has been proposed as a critical approach to

reduce maternal morbidity and mortality in high-income and LMIC.^{11,12} Given the changes in maternal mortality trends, academic programs in this subspecialty have been created in developed countries to train obstetricians and Internal Medicine specialists.^{13–16} However, there are no formal programs on Obstetrics Medicine currently available in LA.

Medical scenarios in Latin American obstetric medicine education

Some possible scenarios of interest are (see Tables 2 and 3):

• Acute medical diseases

These are medical illnesses that may arise in the obstetric scenario, for which early treatment is usually vital for successful outcomes and prevention of sequelae.¹⁷

• Preexisting medical conditions

This refers to pathologies that, diagnosed or not, started before conception, are superimposed on pregnancy, and in some patients could be further complicated by the gravid state. This situation is often under-diagnosed in LA.¹⁷

• Severe diseases (critical care conditions) and “near misses”

Cases of severe clinical deterioration in the obstetric scenario with respiratory, cardiovascular, renal, neurological, and/or hematological failure call for the attention of different clinical specialties, which requires knowledge or expertise in OM. By evaluating these cases with severe maternal outcomes, much can be learnt about the local processes in place for the care of pregnant women.¹⁸

What is currently available in terms of medical education in obstetric medicine in Latin America?

To the best of our knowledge, OM does not exist as a clinical subspecialty in any country in LA, nor is it part of any academic postgraduate program in any surgical or medical specialty. Thus, the development of educational activities and training in this field is limited to a few clinicians and lectures or workshops that may be organized within other meetings, where some topics or chapters of OM are included.

Educational programs and obstetric medicine

Global ALSO©

In 1991, the American Academy of Family Physicians (AAFP) created the Advanced Life Support in Obstetrics (ALSO©) course.¹⁹ This course is a two-day program, which focuses on management of the most important obstetric emergencies, with simulation workshops that allow communication skills and teamwork learning in an obstetric crisis. Within this course, there are some areas of interest in OM, such as hypertensive disorders of pregnancy and venous thromboembolic disease.

This course is currently present in many of the countries of South America such as Brazil, Ecuador, Argentina, Colombia, Uruguay, Chile, Venezuela, and Central America including Mexico, Nicaragua, Costa Rica, Honduras, and Guatemala.¹⁹ Although the real impact of this course in these countries has to be thoroughly analyzed, recent data have shown that ALSO training was associated with decreased in-hospital maternal mortality, episiotomy use, and PPH.²⁰

Table 2. Comparison of obstetric medicine topics within the Latin American Global ALSO© and Maternal Collapse© courses.

Topics of interest	Global ALSO©	Maternal Collapse©
General principles		
Physiological changes of pregnancy	✓	X
Radiation in pregnancy	X	✓
Acute care and maternal resuscitation: Teamwork and safety in maternity care.	✓	✓
Surgical and anesthetic considerations in pregnancy	✓	✓
Acute medical diseases and severe diseases (critical care conditions) or “near misses”		
Direct causes		
Cardiovascular diseases:		
• Hypertensive disorders (severe preeclampsia / eclampsia/HELLP syndrome)	✓	✓
Hematologic diseases:		
• Complications after severe obstetric complications such as postpartum hemorrhage (multiple organ dysfunction, disseminated intravascular coagulation)	✓	✓
Indirect causes		
Cardiac diseases:		
• Acute cardiac failure	X	✓
Respiratory diseases:		
• Acute respiratory failure	X	✓
• Venous thromboembolism	✓	✓
Infectious diseases:		
• Acute pyelonephritis	✓	✓
• Severe sepsis and septic shock	✓	✓
• Tropical fevers	✓	X
Preexisting medical conditions		
Indirect causes		
Cardiac diseases:		
• Congenital and acquired heart defects	X	✓

The original curriculum of this course was considered insufficient for LMIC countries, and by 2008 a first edition of a handbook was released, which included topics of relevance for these countries.¹⁹ This manual was named Global ALSO© and is now part of the course content since 2010, which includes not only emergencies scenarios but also other medical chapters:

- Hepatitis and pregnancy
- HIV and pregnancy
- Malaria in pregnancy
- Puerperal infections
- Tuberculosis in pregnant women
- Nutrition facts in obstetrics

With these new medical chapters, Global ALSO© acquired a more global scope and, by adapting this to the local epidemiology, it has become relevant for LMIC countries around the globe.

Maternal collapse (Colapso Materno©)

In 2011, Vasco-Ramirez from the Obstetric Anaesthesia Committee of the Colombian Society of Anesthesiology and Resuscitation (SCARE) designed a one-day course (Maternal Collapse©), which initially focused only on perioperative situations in obstetric settings and only for anesthesiologists and obstetricians. Over the years, this course has included other workshops of national and international relevance, including important components of OM such as: heart disease in pregnancy, severe sepsis and septic shock, and acute respiratory failure in pregnancy. Currently, “Maternal Collapse” is taught in almost all the countries of LA

including Argentina, Chile, Colombia, Uruguay, Paraguay, Nicaragua, El Salvador, Costa Rica, Honduras, Guatemala, and Panama.²¹

What teaching models are used in these courses?

Both Global ALSO© and Maternal Collapse© use similar teaching strategies. For every topic of OM included in these courses, it is of major relevance to address the local context. Thus, it is not possible to completely standardize the courses, because in each country the frequency of the most important causes of maternal morbidity and mortality are very diverse.⁵ Likewise, different resources are available at each setting, thus each country makes necessary adaptations to the concepts, recommendations, and scope, taking into account their cultural beliefs and religion, but still based on the best available evidence.

All course scenarios are based on an ideal of safety in maternity care, and propose an interdisciplinary work model. Thus, participation of various specialties within them is crucial, and this is reflected in the instructors' profile (anesthesiologist, obstetricians, and internists) and the teaching model itself. The educational strategy is primarily based on two methodologies:

- **Problem-based learning:** A clinical case is proposed and discussed with the group of attendees, where opinions about correct diagnosis and management are subsequently analyzed. A critical review of available evidence is finally discussed and, depending on each case, it also includes how feasible implementing this evidence to the local or national context would be.

Table 3. Obstetric medicine topics not included in the Latin American Global ALSO© and Maternal Collapse© courses.

Topics of interest
General principles
Pharmacology of pregnancy and lactation
Acute medical diseases and severe diseases (critical care conditions) or “near misses”
Direct causes
Gastrointestinal diseases:
• Acute fatty liver of pregnancy (AFLP)
• Cholestasis of pregnancy
Endocrine diseases:
• Gestational diabetes
Indirect causes
Endocrine diseases:
• Type 1 and 2 diabetes (hyperglycemic crises)
• Thyroid disease (thyrotoxicosis and thyroid storm)
Hematologic diseases:
• Thrombotic microangiopathies
Respiratory diseases:
• Asthma (status asthmaticus)
Kidney diseases:
• Acute kidney injury
Gastrointestinal diseases:
• Acute liver failure (non-AFLP)
Neurological diseases:
• Acute flaccid paralysis
• Status epilepticus
Infectious diseases:
• Herpes gestationis
Immunological disorders
• Lupus flare
• Catastrophic antiphospholipid syndrome
Preexisting medical conditions
Indirect causes
Respiratory diseases:
• Asthma
Endocrine diseases:
• Type 1 and 2 diabetes
• Thyroid disease
Hematologic diseases:
• Anemia
Kidney diseases:
• Chronic kidney disease (CKD)
Neurological diseases:
• Epilepsy
Gastrointestinal diseases:
• Inflammatory bowel disease
Immunological disorders:
• Connective tissue diseases
Dermatology
Cancer
Psychiatry
Transplantation medicine

- **Simulation-based learning:** In these workshops, a clinical scenario arises using easily transportable low-fidelity mannequins, aimed to assess not only theoretical concepts but also the ability to develop some non technical skills, especially teamwork, shared mental models, communication skills, and crisis management.

The chapters of major interest in OM programs that are included and not included are outlined in Tables 2 and 3, respectively.

Barriers, achievements, and future directions

For many years, one of the main barriers at educational level in OM was lack of awareness, in part, because attention and efforts to improve obstetric care in LA were focused on direct causes of maternal mortality. In addition, traditionally, OM topics have not been included in Internal Medicine training curriculums. Thus, in order to improve knowledge in these medical pathologies, a major effort is required by trainees and participants during the educational programs. Similarly, there is limited information about how medical pathologies affect maternal morbidity and mortality in LMIC.⁴ This is particularly true in LA because of the lack of local epidemiology which, in consequence, has generated little educational interest towards medical pathologies among maternal care providers compared with the direct causes, considered more prevalent.

However, at an educational level, one of the most important achievements in LA in the last 5 years is the acceptance that current educational strategies need changes and should focus on the importance of medical pathologies during pregnancy, previously considered not relevant.

The lack of resources in terms of diagnosis (imaging and laboratory techniques: magnetic resonance imaging and some biomarkers, for instance) and treatment supplies (broadly available medications such as labetalol, hydralazine, and tranexamic acid are not easy to find in many countries in LA) of medical conditions in pregnancy is another major issue, which limits the correct approach and understanding of some medical diseases.

Technology enhanced simulation training has been shown to be consistently associated with better outcomes for health professionals and patients.²² Bearing this in mind, members of the Colombian Society of Internal Medicine and the University of Cartagena (Colombia) have recently approached two institutes of medical simulation in Cartagena and Bogotá (Colombia) to lead a collaborative pilot training program in OM which could potentially start in 2017.

Taking into account all mentioned above, the future of this program is promising and involves progress in both educational and institutional initiatives.

On the one hand, there is a need to raise awareness about this concept, because for most of the obstetricians, internists, and nurses/midwives in LA, OM is an unknown subspecialty and perspective. However, health professionals that have come to know it have expressed their interest.¹² Thus, initiatives in this direction will include promoting links between current OM societies and national and regional societies of Obstetrics, Internal Medicine, Critical Care Medicine, Anesthesia, and Nursing in LA.

The future direction of medical education should include initiatives, which consider the content and experience of educational programs currently available in high-income countries such as Canada,^{13,14} United States,¹⁵ and Australia–New Zealand¹⁶ as well as the detailed curriculum of the International Society of OM (ISOM).²³ Besides these sources, importance should be given to include medical conditions and scenarios that are of relevance to these countries,⁶ such as dengue fever, anemia, chronic kidney disease, preexisting and gestational diabetes, and malignant diseases (including solid tumors and hematologic cancer).

Additionally, as an example of supportive educational strategies, currently the translation of one of the most relevant textbooks of OM¹⁷ into Spanish is in progress, and should be available in the market by mid 2017.

Finally, since the last ISOM meeting in 2014 (New Orleans, USA), a Global Obstetric Medicine (GOM) initiative has been fostered inside that society,¹² which has led to the creation of the Global Health joint group between ISOM and the International Society for the Study of Hypertension in Pregnancy (ISSHP). Within this group, members from LA have been included, and are taking part in its aim of promoting best clinical, research and advocacy practices in under-resourced settings.²⁴

An international initiative in education definitely should be guided with a previous judicious consensus defining critical and hot topics that must be a priority in an “OM workshop” or educational strategy. In our experience, several tools might help at this point: an international GOM needs survey results or a focused Delphi method for agreement and consensus. Nevertheless, this should not overlap with other educational strategies in order to prevent conflicting scenarios with local competitors.

In conclusion, medical problems in pregnancy remain an important cause of morbidity and mortality in LA. Despite this fact, OM is not recognized as an obstetric or medical subspecialty, and very few doctors are aware of it. We have presented a few OM-related educational initiatives that have been developed in the last few years thanks to the collaboration of Colombian obstetricians, internists, and anesthesiologists which have had (and will continue to have) impact in most of the other countries in LA. However, we understand that there is a need for further and broader initiatives to improve care of medical conditions in pregnancy in LA.

Given all this, we advocate for a balanced proposal led by the scientific society with major competence and knowledge on these pathologies, i.e. ISOM, which should be part of the process of education in these countries that still need major adjustment, legitimacy, and evaluation of its effectiveness and impact.

Acknowledgements

The authors are thankful to Mauricio Vasco-Ramirez for his guidance in Maternal Collapse© course information and to Aura Gonzalez for her support in data collection.

Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: JA Suarez-Rojas provides instructor services to the Colombian Society of Anesthesiology and Reanimation for the Maternal Collapse© and ALSO courses.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Guarantor

JA Suarez-Rojas

Contributorship

All the three authors were involved in writing the submitted manuscript and JA Suarez-Rojas and O Ateka-Barrutia reviewed it and made the appropriate corrections before submission.

References

1. Alkema L, Chou D, Hogan D, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. *Lancet* 2015.
2. World Health Organization. International classification of diseases (ICD), <http://www.who.int/classifications/icd/en/> (accessed 21 December 2015).
3. Say L, Souza JP and Pattinson RC. Maternal near miss—towards a standard tool for monitoring quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol* 2009; 23: 287–296.
4. Say L, Chou D, Gemmill A, et al. Global causes of maternal death: A WHO systematic analysis. *Lancet Glob Health* 2014; 2(6): e323–333.
5. UNICEF. Strategic orientation of UNICEF in Latin America and the Caribbean for contributing to the reduction of maternal, neonatal and child morbidity and mortality, [http://www.unicef.org/lac/Estrategia_Mortalidad_Materna_Neonatal_\(english\).pdf](http://www.unicef.org/lac/Estrategia_Mortalidad_Materna_Neonatal_(english).pdf) (accessed 21 December 2015).
6. Langer A, Meleis A, Knaul FM, et al. Women and Health: The key for sustainable development. *Lancet* 2015; 386: 1165–1210.
7. Lumbiganon P, Laopaiboon M, Intarut N, et al. Indirect causes of severe adverse maternal outcomes: A secondary analysis of the WHO Multicountry Survey on Maternal and Newborn Health. *BJOG* 2014; 121: 32–39.
8. Bhutta ZA, Das JK, Bahl R, et al. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? *Lancet* 2014; 384: 347–370.
9. 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.
10. Acosta AA, Cabezas E and Chaparro JC. Present and future of maternal mortality in Latin America. *Int J Gynaecol Obstet* 2000; 70: 125–131.
11. Rosene-Montella K, Lowe S and Nelson-Piercy C. The growing importance of medical problems in pregnancy. *Obstet Med* 2010; 3: 1.
12. Firoz T, Ateka-Barrutia O, Rojas-Suarez J, et al. Global obstetric medicine: Collaborating towards global progress in maternal health. *Obstet Med* 2015; 8: 138–145.
13. Cumyn A, Gandhi S, Gibson P, et al. Defining competencies for training in obstetric medicine. *Obstet Med* 2014; 7: 137–138.
14. Cumyn A and Gibson PS. CanCOM Obstetric Medicine curriculum, <http://gemoq.ca/wp-content/uploads/2011/08/CanCOM-competencies-for-Obstetric-Medicine.pdf> (accessed 21 December 2015).
15. North American Society of Obstetric Medicine, <http://www.isomnet.org/nasom/home.cfm> (accessed 21 December 2015).
16. The Royal Australasian College of Physicians. Specialist Advisory Committee in General and Acute Care Medicine. Recommended training experiences for Advanced Trainees with an interest in obstetric medicine, http://somanz.org/downloads/ObstetricMedicineRecommendedTrainingAugust2012_000.pdf (accessed 21 December 2015).
17. Nelson-Piercy C. *Handbook of obstetric medicine*, 5th ed. London: CRC Press, 2015.
18. World Health Organization. *Evaluating the quality of care for severe pregnancy complications: The WHO near-miss approach for maternal health*. Geneva: World Health Organization, 2011. http://apps.who.int/iris/bitstream/10665/44692/1/9789241502221_eng.pdf.
19. American Academy of Family Physicians. Advanced Life Support in Obstetrics. ALSO International and Global ALSO, <http://www.aafp.org/cme/cme-topic/maternity/also/courses/international.html> (accessed 21 December 2015).
20. Dresang LT, Gonzalez MM, Beasley J, et al. The impact of Advanced Life Support in Obstetrics (ALSO) training in low-resource countries. *Int J Gynaecol Obstet* 2015; 131: 209–215.
21. Sociedad Colombiana de Anestesiología y Reanimación. Cursos de la SCARE traspasan fronteras, <http://www.scare.org.co/Scare-Gremial/Noticias/Cursos-de-la-SCARE-traspasan-fronteras.aspx> (accessed 21 December 2015).
22. Cook DA, Hatala R, Brydges R, et al. Technology-enhanced simulation for health professions education: A systematic review and meta-analysis. *JAMA* 2011; 306: 978–988.
23. International Society of Obstetric Medicine. Educational resources detail, http://www.isomnet.org/Obmed_01/default.cfm?sect=EdResource&id=2&ERID=81 (accessed 21 December 2015).
24. Pre-eclampsia and eclampsia monitoring, prevention & treatment. Joint ISSHP/ISOM Global Health Committee, <https://pre-empt.cfri.ca/joint-isshpisom-global-health-committee> (accessed 21 December 2015).