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REVIEW ARTICLE

Obstetrics

From fragmented levels of care to integrated health care: Framework toward improved maternal and newborn health

Eytan R. Barnea[1] | Wanda Nicholson[2] | Gerhard Theron[3] | Diana Ramasauskaite[4] | Michael Stark[5] | S. Mark Albini[6] | Anwar H. Nassar[7] | FIGO Safe Motherhood & Newborn Health Committee[†]

[1]The Society for the Investigation of Early Pregnancy, New York, NY, USA

[2]Department of Obstetrics and Gynecology, University of North Carolina, Chapel Hill, NC, USA

[3]Department of Obstetrics and Gynecology, Stellenbosch University, Stellenbosch, South Africa

[4]Center of Obstetrics and Gynecology, Vilnius University Medical Faculty, Vilnius, Lithuania

[5]The New European Surgical Academy, The Charite University Hospital, Berlin, Germany

[6]Department of Obstetrics and Gynecology, St Mary Hospital, Waterbury, CT, USA

[7]Department of Obstetrics and Gynecology, American University of Beirut Medical Center, Beirut, Lebanon

Correspondence
Eytan R. Barnea, FACOG New York, New York, NY, 10016, USA.
Email: eytan.barnea@gmail.com

Abstract

Worldwide, health systems and care approaches vary widely due to local reality, distance to facilities, cultural norms, resources, staff availability, geography, and politics. Consequently, globally maternal–newborn dyad care and outcomes are highly variable, leading to approximately 800 maternal deaths daily with a 100-fold difference among high- and low-resource countries. Irrespective of where care is received, maternal safety and wellbeing should be preserved. Despite ongoing efforts, however, this is not the case. Large gaps exist between spending and clinical outcomes. Segmented health care, coupled with poor planning and inadequate resource distribution, results in failure to provide essential life-saving treatment. The proposed solution is a regional integrated care model from midwife to advanced level III/IV care and the newborn unit, achieved through effective coordination by site, staff, and clinicians. This model has been successfully implemented in high- to low-resource countries in the past 20 years. In the large diverse population of the United States, constructive steps have been implemented to reduce high maternal mortality in black and rural communities. The COVID-19 pandemic demonstrates the feasibility of rapid resources coordination to provide effective advanced care. The proposed integration of resources will have a major positive impact on the maternal–newborn dyad.

KEYWORDS
COVID-19 road to change, level of care, maternal morbidity, maternal–newborn dyad, mortality, segmentation vs integration

1 | INTRODUCTION

On analyzing the standard of care, it becomes clear that improved maternal health and newborn outcomes are not strictly or exclusively resource-driven. Prima facie, this is surprising because resource availability is the accepted dogma; traditionally, the more resources, staff, and equipment, the better is the expected outcome.

A country's gross national product spending on health care varies greatly. The United States, for example, spends 17.8% on health care, followed by European countries (12.2%–10.3%), Canada (10.7%), and Japan (10.9%).[1] Another revealing statistic is public versus private healthcare spending in high-income countries: the US budget is approximately three times higher than that of Sweden, Norway,

[†]FIGO Safe Motherhood and Newborn Health Committee members are listed at the end of the paper.

France, and Japan.[2] However, examining the effect of spending on maternal–newborn dyad (MND) outcomes shows that, at present, the more that is spent, the worse the outcomes seem to be.

Thus, a rational approach should be devised to distribute healthcare funds or resources to improve specific areas where gaps remain. This is achievable, as observed over the past 20 years in many countries where such a tailored adaptation to local reality clearly improved MND outcomes. Based on the latest worldwide statistics, this positive trend continues.[3] Figure 1 from the World Bank shows the maternal mortality rate (MMR) per 100 000 live births versus gross domestic product (GDP) based on the annual change per capita.[4] In many countries, GDP expenditure decreased, while MMR declined at the same time. In contrast, the opposite trend is observed in the United States, where both GDP and MMR increased.[4]

Nevertheless, for further progress to be made worldwide, changing the approach is urgent because the global MMR remains high at approximately 800 deaths per day, with up to a 100-fold difference among high-, medium-, and low-resource countries. In low-resource countries, for example, MMR is as high as 462 per 100 000 live births, whereas in high-resource countries it may be less than 10 per 100 000 live births.[5] This unacceptably high disparity in maternal mortality has substantial implications for society, families worldwide, cultural norms, and financial resources. Neonatal morbidity and mortality further result in emotional loss and potential family stigmatization.

The United States is the only "high-resource" country where, despite ongoing efforts, MMR has not decreased in the past decade. Recognition of this negative trend has had an impact and led to reduced MMR in some states, while other states need to follow and implement such effective policies. In 2018, the average MMR was 17.4 per 100 000 live births nationally.[6] A sobering fact is that, among black women, MMR was more than double at 37.1 per 100 000 live births as compared with 14.7 and 12 per 100 000 live births among non-Hispanic white women and Hispanic women, respectively. Another major difference is in rural communities, where MMR is approximately 50% higher than that in many urban areas where several healthcare facilities operate.[7]

In high-income countries, the four most serious conditions leading to maternal death are postpartum hemorrhage (PPH), severe pre-eclampsia, and cardiovascular and non-cardiovascular pathologies; recently, sepsis has also become prominent.[3] Prompt diagnosis and treatment of PPH even with rather limited resources can greatly minimize morbidity and mortality. This is applicable to both medium- and low-resource settings, and those where access to life-saving medications remains an important goal. This is especially true if there is no need for subsequent surgical intervention. In many

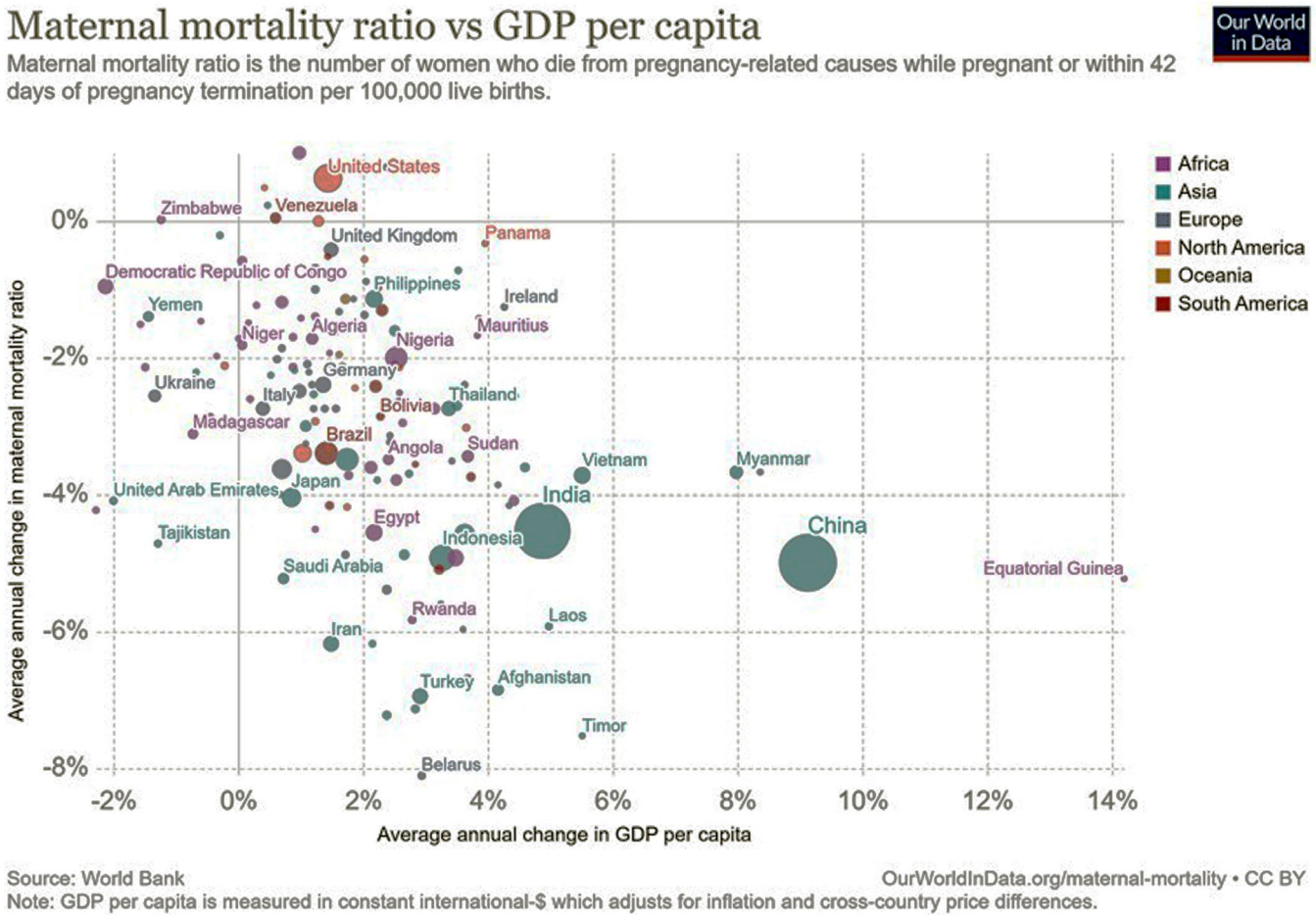


FIGURE 1 Maternal mortality rate per capita and correlation with gross domestic product worldwide. Data/figure from [4]

countries, access to blood transfusion is complex because it requires a blood bank and an adequate blood supply available for transfusion. Furthermore, if surgical intervention is required, specialized staff, operating room, anesthesia, and generally a higher level of care (LOC) is needed. Compounding this need are treatments for severe pre-eclampsia, cardiovascular disease, and other major pathologies, which all require more advanced resources. As recently reported,[8] sepsis is an important cause of MMR in low- and middle-income countries (LMIC), where infection prevention is limited by poor sanitation on site, inadequate monitoring of vital signs, poor availability of antibiotics or intravenous line access, and delayed or lack of early intervention to prevent severe clinical deterioration. Examining data from 52 countries worldwide, the rate of severe maternal outcome ranges from 12.5 to 15 per 1000 births in LMIC, but is markedly lower at 0.6 per 1000 births in high-income countries.[8] Does this imply that any facility that takes care of a pregnant woman will need to have a readily available operating room and advanced management staff and tools at all times?

Based on successful programs implemented in several high-, medium-, and low-resource countries, the aim of the present review is to propose an integrated tiered model of care that leverages a multidisciplinary team, including midwives, primary obstetricians, maternal–fetal medicine (MFM) specialists, anesthetists, and other subspecialty clinicians, to deliver a coordinated set of perinatal healthcare services based on the mother's associated co-morbidities and level of risk. Use of an integrated framework blends the expertise of different providers and creates a team-based approach where multiple services are available in one setting.

Parallel to the integrated team-based approach is a tiered LOC approach, where the site of prenatal care and delivery is based on both identification of maternal risk in early pregnancy and interval risk assessment during pregnancy. As soon as a woman is deemed to be at risk, she is immediately transferred from a birthing center to a level I to a level II and, if needed, to a level III/IV hospital. Although such an approach is optimal, the local reality may be different; therefore, individual adaptation to need must be made in many cases. For example, level I with combined level II/III care may be economical and is being successfully implemented in several countries. Coupled with the availability of appropriate newborn facilities, such seamless integration will reduce the burden on health systems and minimize current gaps in patient care.

Examples of success stories in high-, medium-, and low-resource countries are described, as well as current limitations to the objective of reducing high MMR in the United States, which are partly due to the large territory size, diverse geography, multi-ethnicity, and the multiple and diverse healthcare systems in place in different states. Concrete steps that have been taken to improve the situation are also described. The current COVID-19 pandemic demonstrates that barriers of care can be rapidly minimized through increased cooperation between private and public facilities, and across states, combined with telemedicine and peer-to-peer clinical consultation. Learning from this epidemic demonstrates such integration of care is possible and should be pursued to reduce current high risk to the MND.

2 | INTEGRATED COLLABORATIVE CARE

Effective and realistic integrated LOCs in countries where morbidity and/or mortality remains high would be a major step forward. Therefore, the focus should be, at patient enrollment for care, to identify whether the pregnancy is at risk, to define the risk profile, and to plan where to promptly transfer the patient if needed. If the risk criteria are clearly defined and documented as being low, then on-site care is advisable. The goal is to keep most women on-site, allowing them to remain with their family and surrounding community.

This approach also preserves the patient volume and consequently provides financial stability to the local hospital, coupled with improved local staff and resource availability. It has been shown that even minor changes in the decision to transfer a patient at risk can have a major impact in improving the MND.[9] The advent of telemedicine (i.e., care by phone), which can further define who to transfer or keep as advised by MFM specialists, is also being widely implemented in medium- and low-resource settings. This requires mutual trust and seamless communication.

3 | LEVELS OF CARE TO IMPROVE MATERNAL AND NEONATAL OUTCOMES

Definitions of LOCs vary widely in different parts of the world and are highly dependent on whether the country has high, medium, or low resources. But clearly, as stated above, resources are is not the only criterion to improve care. Consequently, the expectations from such different definitions of LOC are unavoidably different. The ultimate measure of the validity and quality of a health center is outcome associated, which is only partly dependent on the resources available at that specific site. The LOC measure not only relates to maternal management but also includes care of the newborn because one is heavily dependent on the other. The outcome is also dependent on the available staff at a site who can make decisions that are critical for the MND.

In terms of country-based statistics, there are major differences related to the MND outcome that seem to be partly independent from the availability of resources.[4] It must be recognized that 90% of MMR occurs in LMIC countries. In other countries, continuous efforts must be made to minimize MMR; the leading example is the United States, where the current trend is not favorable with an approximately 50% increase mostly in black women as well as in rural communities.[10] It is necessary to ask why this is the case and how such discrepancies can be addressed. The key term that we advocate is patient-centered care—in other words, integration of services including postpartum care. A healthcare center or hospital should provide services cognizant of its capabilities but equally of its own limitations, and know when it is imperative that a more advanced center should take over the care.

No pride, financial incentive, or overconfidence should be involved, instead the priority should be to recognize when patient transfer is the right step and should be strictly followed to assure

an optimal outcome for the patient. Awareness of local limitations is also critical for patient well-being. Unfortunately, however, this approach is not always followed. It also assumes that a more advanced LOC is available to address complex patient management in a timely manner. In current medical reality, however, a higher LOC is frequently not available. Thus, a balance should be struck to provide minimal but essential care at any site where care is given. For example, oxytocin, prostaglandins, and methergine should be readily available for rapid PPH management, and blood pressure machines and essential antibiotics should be available at any LOC. These fundamental means are achievable at low cost, and expertise can markedly improve outcome.

4 | INTEGRATED MATERNAL–NEWBORN CARE IS EFFECTIVE

This section reviews information on different but successful approaches to integrated care that effectively use a well-ingrained model of LOC based on local reality and employ accepted national policies to achieve the goal of improved MND. In many northern European countries such as Sweden, Norway, Denmark, and the Netherlands, integration and regionalization of care has been successfully achieved, recognizing and providing the necessary resources at each care level that are needed for optimization.[11] This applies not only to obstetrics but also to other aspects of medical care. Therefore, health care functions in a setting where LOCs are clearly defined and the transfer to a higher intensity of management is ingrained in both provider and patient culture.[11] Of note, in those countries, such regionalization of care has been implemented for several years through the national health insurance system. In rather small and relatively homogenous patient populations, this approach is practical, and the clear result is low maternal and newborn mortality.

4.1 | The experience of Lithuania

Lithuania, in northern Europe, is a post-Soviet country. Since the restoration of Lithuanian independence in 1990, it has been possible to develop a perinatal and neonatal healthcare system adapted to the situation in the country that follows international standards. In 1992, a Health Ministry directive approved the Program for Perinatology. Because the country has a fairly homogenous population, implementation of such a program has been shown to be feasible.

To implement the program on a regional basis, the following three-stage perinatology system was created: inpatient obstetric and neonatal care units were equipped with the necessary facilities, and two centralized perinatology centers were established. Figure 2 shows the declining rate of perinatal and neonatal mortality in Lithuania from 1995 to 2017,[12] while Figure 3 shows the overall decline in MMR per 100 000 live births from 1997 to 2018.[13] Overall,

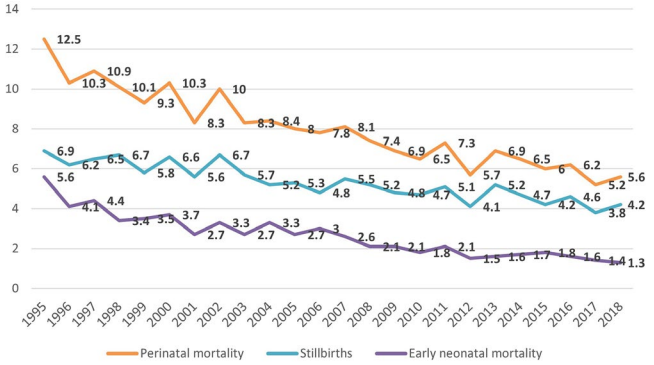


FIGURE 2 Decreasing perinatal and neonatal death rate per thousand births in Lithuania, 1995–2018. Data from [12]

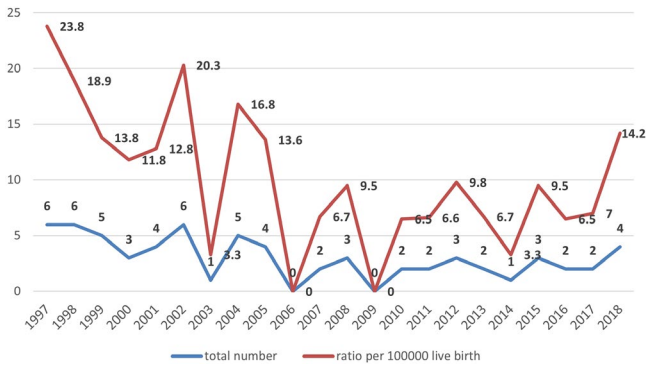


FIGURE 3 Declining trend in maternal mortality in Lithuania, 1997–2018. Data from [13]

the right policy decision for integration of care in a small homogenous country is beneficial for MND.

4.2 | The UK approach

In the United Kingdom, resources are directly intertwined between maternal and newborn care; therefore, the availability of one resource combined with the other provides an integrated and regionalized, instead of segmented, care system. Here also there is a national health insurance system; therefore, payment for services is clearly defined at any care level.

The Royal College of Obstetricians and Gynaecologists (RCOG) guidelines,[14] which are strictly followed for LOCs, are comprehensive, ranging from home birth (seldom practiced in the United States) to midwifery at a healthcare facility or independent midwife service, to a full-fledged obstetric unit. This midwife care has been ingrained in the medical management for a long time; therefore, such integration with an obstetric unit in terms of the rules and what to do and when to transfer the patient has been defined also for a long time. In addition, the definition of an obstetric unit is restricted to those with more than 3500 deliveries per year; other facilities are labeled as small hospitals. Such a large facility will have staff at all LOCs (I, II, III, and IV) integrated on one site and covered by a large attendant staff providing all that is

needed. Therefore, it seems that each facility should know its advantages and limitations, and act accordingly to maximize care efficiency.

Of note, in other countries, it is rarely possible for such a high volume of patients to access one hospital. The case in point is the United States, where such a large volume of patients are generally served only at level-III hospitals, which are available only in selected urban areas. Therefore, the resources and LOCs described by the RCOG document are also implementable in low-resource countries, where large obstetric units are much more centralized. The RCOG approach seems to be much more economical and implementable than care in a small hospital or level I facility, as described by the American College of Obstetricians and Gynecologists (ACOG) below.[15] The RCOG document[14] is integrative and bundled together for maternal and fetal care, including the essential newborn component. In addition, due to the geography of the United Kingdom, the distances among healthcare facilities are generally short; therefore, such integration of services may be more easily applied as compared with the large territory of the United States.

4.3 | Integrated level I–IV care: the South African experience

The South African model follows a similar path as the RCOG guidelines, where risks are defined early and transfer to level II or level III/IV is fully integrated. The Metro East region of the Cape Town metropolitan area provides a clearly defined healthcare model that has four LOCs and describes in detail which women to keep in a primary setting and which to transfer to a higher LOC and when.[16] Over time, the proportion of women requiring different LOCs has been specified: approximately 35% require only midwifery care in a midwife-led obstetric unit throughout pregnancy, labor, and delivery; approximately 40% require care mainly by medical officers or nonspecialist doctors in a district hospital; approximately 20% require specialized care in a regional hospital; and only 5% require care in a central hospital providing MFM subspecialist care. In the Metro East region, the central hospital provides both specialized and MFM subspecialist care, as well as neonatal care. The maternal and neonatal conditions requiring subspecialist care have been determined by a Delphi process and are defined as those requiring care by a perinatal specialist or a physician with critical care experience and skills, and neonates requiring neonatal intensive care.

Confined budgets based on historic needs require careful planning to manage patients at the lowest LOC with the health professional able to provide effective care. Such regionalized and integrated (rather than segmented) care has led to reduced MMR and improved MND in LMICs. Table 1 summarizes data on perinatal death rates and Table 2 on institutionalized MMR from the Western Cape Province over a 9-year period, sourced from saving mothers and babies reports.[16-18] Reasonable iMMRs could be maintained for a LMIC from 1999 to 2018 (Table 2). This marker of obstetric outcome has been maintained at an acceptable level despite increased demands on the public health service due to rapid urbanization and the prevailing high prevalence of HIV infection. Overall, based on such an integrated system, only in 5% of cases are MFM intervention and level IV facilities required to improve MND sequentially.

[Correction added on 13-March 2021 after first online and print publication: The incorrect sentence in the preceding paragraph have been corrected.]

TABLE 1 Perinatal and neonatal mortality in the Western Cape Province, South Africa

Outcome[a]	2010–1011	2014–2016	2017	2018
Early neonatal death	3.4	3.2	4.2	3.1
Stillbirth	13.3	10.9	12.5	11.2
Perinatal mortality rate	16.6	14.1	16.6	14.2

[a]Per 1000 births.

5 | INTEGRATED CARE IN HOMOGENOUS VERSUS DIVERSE POPULATIONS

In several countries, despite a paucity of resources, an integration of multilevel care has been implemented—more specifically, it has been implemented on a regional basis in some African countries where a rather homogenous population is present. According to the Maternity Worldwide organization website covering Malawi, Uganda, and Ethiopia,[19] the aim is to reduce three critical delays leading to increased maternal mortality: the decision to seek care; reaching the care facility on time; and accessing the care. Frequently, by the time the woman reaches a care facility, her morbidity is high, requiring high acuity intervention despite the modest resources that are locally available.

Consequently, the current approach is based on (1) local patient education to identify early warning signs and symptoms affecting the decision to promptly seek care; (2) improvement of patient transportation to a facility; and (3) increasing the availability of qualified staff at the site of care. Thereby, the risk profile of women

TABLE 2 Institutional maternal mortality rate in the Western Cape Province, South Africa

Outcome	1999–2001	2002–2004	2005–2007	2008–2010	2011–2013	2014–2016	2017	2018
iMMR[a]	56.4	86.2	67.6	77.6	76.0	68.3	76.7	75.1
No. of live births	223 420	240 651	276 808	292 632	281 602	240 170		

Abbreviation: iMMR, institutional maternal mortality rate.

[a]Per 100 000 births.

[Correction added on 13-March 2021 after first online and print publication: In Table 2, the significance 'a' have been corrected in this version.]

being treated may be similar and their treatment by staff can improve. In contrast, such delays in accessing initial care are minimal in high-resource countries, where awareness is high and access to basic care is readily available; instead, what is still required is adequate triaging.

5.1 | Levels of maternal care and progress in integration: the US example

Resources and expenditure for health care in the United States are among the highest in the world based on GDP.[1,2] Nevertheless, the resultant outcome remains modest at present, indicating that perhaps success is not solely resource-dependent. The wide geographic distribution, diversity of the prenatal population, and the state-based healthcare system add significant challenges. Thus, irrespective of the resources available, better distribution and integration of these resources would lead to major progress.

As per the Center for Disease Control (CDC) report,[20] across the 50 US states, MMR among black women is more than double that among white and Hispanic women.[21] Therefore, significant efforts should be directed to address black women's specific needs and associated pathologies similar, for example, to breast cancer rates, which are more than double those of white women. The causes of such disparity are limited access to care, lack of standard of care, bias, and racism. A report on pregnancy-related mortality confirmed an overall increase in case fatalities from 2003 to 2016.[22] When stratified, one-third of deaths occurred outside hospital and many occurred at home, where the rate doubled over the time period. By contrast, deaths at inpatient and outpatient facilities significantly decreased by 20% and 24%, respectively. Thus, timely access to care is critical, especially for non-Hispanic black women and the youngest and oldest women.[21] In addition, in the past several years, MMR during and after delivery in rural regions has increased by approximately 50%. Moreover, preterm delivery and fetal growth retardation in these areas are 20% and 25%, respectively, both higher than levels in the rest of the country.[21] Therefore, the data clearly show that access to advanced care is the problem in geographically remote areas with sparse populations. This contrasts to most other nations, where the overall trend shows a 50%–60% decrease in MMR in the past 18 years.[4]

BOX 1 Summary of levels of obstetric care[a]

Accredited birth center
Care for both mother and fetus in uncomplicated pregnancy
Fetus in vertex position
Expected vaginal delivery
Level I
Low-risk uncomplicated pregnancy
Women at low risk (previous uncomplicated cesarean delivery)
Well-controlled gestational diabetes, mild pre-eclampsia, twins
Level II
Level I plus additional risk factors
Complex cesarean delivery
Medical complications requiring close monitoring (i.e., asthma, chronic hypertension, diabetes)
Level III
Level II plus additional factors
Maternal complications (cardiac, coagulation disorders)
Immune disorders
Placental pathologies (accreta, previa, bleeding)
Severe preterm pre-eclampsia
Level IV
Level III plus additional factors
Severe maternal disease (cardiac, pulmonary)
Maternal disease requiring complex surgery
Unstable maternal condition
[a]Refer to the SMFM special report for complete information.[24]

In acknowledgement of the upward trend in MMR, several aggressive steps are being implemented to reduce this rate in the United States.[22,23] However, it must be recognized that there are major practical limitations; for example, the United States is a country as large as Europe with a comparable size population distributed across 50 states with local multiple governments (each state has its own governor, congress, or senate) and laws. Moreover, healthcare facilities are highly diverse, including public, state, private, religious, non-profit, and tribal facilities; therefore, the present fragmentation of care is expected to remain a long-term reality.

To improve MND, it has been recently instituted that each hospital must provide PPH management kits including blood and tools for treating severe hypertension and pre-eclampsia.[23] In addition, hospitals must conduct periodic local drills and educational programs for staff to maintain certification by the Joint Commission, the prime accreditation institute.[23] Thus, the current problems are fully recognized, and practical short- and long-term solutions are being offered and implemented at many levels. Two recent documents by ACOG[24] and the Society of Maternal Fetal Medicine (SMFM)[25] provide clear guidance for definition of LOCs and implementation at all levels. What is clearly encouraging is that these documents have been reviewed by several societies, ACOG, MFM specialists, midwives, anesthetists, pediatricians/neonatologists, family physicians, and general health authorities.[24]

The ACOG document has high value and provides guidance for individual hospitals on how to self-identify the LOCs that they provide and how to identify in a timely manner at-risk patients who should be transferred[24]—an arrangement that was already formally established. In remote regions, facilitating critical patient cross-state access and management should also be implemented irrespective of whether the healthcare facility is public or private, or belongs to a

healthcare network. The SMFM document further emphasizes that a given facility that provides care should coordinate with regional and state facilities where advanced perinatal centers are available.[25] This should be based on the local reality and geographic location of the individual hospital. The financial input required for such an integrated system should support facilities at all levels because they are a critical part of the care system. Based on those guidelines, each LOC is better defined.

A birth center is defined as providing "care for low-risk women with uncomplicated singleton term vertex pregnancies who are expected to have an uncomplicated birth." Currently, the Commission for the Accreditation of Birth Centers (CABC) is responsible for these low-intensity centers, which are few and far between because their current utilization rate is rather modest at <20 000 births per year, accounting for 0.5% of total annual deliveries. In many countries, by contrast, this type of birth center is the norm and care is widely and successfully implemented. Placing such centers near the hospital might lower the burden on level I centers, especially in rural areas.

The need to provide adequate care progressing from a non-complicated low risk patient to those who require more advanced care can happen at any moment; therefore, intervention must be prompt and without delay. Based on the current clinical reality, however, this is not achievable in several countries with medium or low resources or even in some regions of the United States. Therefore, a birth center where urgent cases occur despite the low-risk population being treated there should have prompt access to blood or be close to a center where blood is available. In addition, the resources required to perform a cesarean delivery promptly, even if it is expected in less than 10% of cases, should also be available. Better coordination between CABC and ACOG might make such a process seamless.

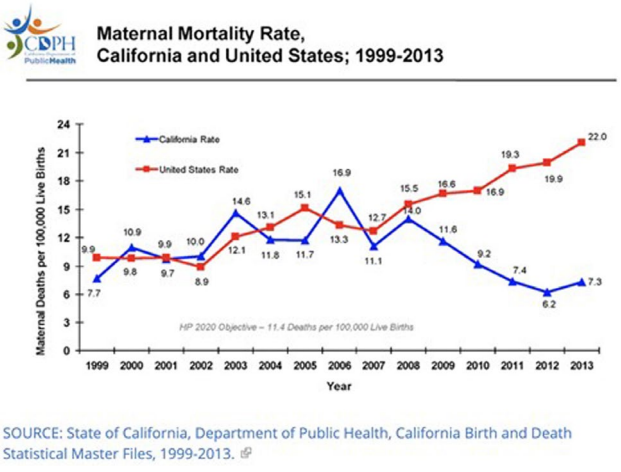
Based on the ACOG document,[24] the requirements for a level I hospital are relatively extensive. Qualified physicians, nurses, and anesthesiologists who can perform an emergency cesarean must be available to assure care. In addition, access to laboratory testing and a blood bank must be available to facilitate initiation of a massive blood transfusion protocol. Optimally, a level I hospital should be in reasonable proximity to a level II/III specialized care center to allow rapid transfer if the need arises. Obviously, care at levels II–IV requires stepwise increased sophistication of both staff and facilities to provide acute care for the mother and/or newborn. The more recent SMFM document goes beyond the ACOG document and helps to define the specific resources required at a level I hospital that are well-adjusted to the current reality.[25]

Box 1 summarizes the requirements at each LOC. The massive transfusion protocol is maintained as an essential requirement for certification of level I of health care. However, several other requirements and added resources are shifted to the level II/III setting, where advanced high-cost diagnostics, interventions, and MFM consultation are available. Two elements are highlighted as important in the SMFM document: risk identification, and where to promptly transfer the patient at need. Introduction of newborn care facilities into the SMFM document commensurate with LOCs should further help in such integration.

5.2 | US steps to improve maternal care: regional and targeted management

The potential positive impact of regionalization of maternal care has been recently reported.[26] Among 845 545 deliveries, the lack of transfer to a higher care facility (level III) led to major complications in 20 396 (2.4%) cases; this lack of transfer was noted in 68.2% of the 20 396 cases. Thus, overall, more than 97% of deliveries took place in an appropriate LOC I or II facility. It is important to note, however, that in many cases only level I hospitals are available in sparsely populated areas. In the analysis, in seven states many (50.4%) hospitals with fewer than 500 deliveries per year had no newborn intensive care unit (NICU) available, similar to level II hospitals where there is no NICU. Thus, correct patient triage may make a major difference by identifying those at highest risk; for example, cardiac disease should be known if chronic (but it may develop acutely) and placenta accreta with previous uterine surgery should be known from patient history, although a previa may also develop during the present pregnancy. In most cases, by taking a careful history, both conditions should be identified, and early triaging and patient transfer to next available LOC when access is realistic should be pursued. This is reassuring because the required rate of patient transfer is low at approximately 2%–3% but is highly targeted.

Another regional approach based on the individual state is identification of a specific problem leading to increased MMR. A few years ago, local efforts in California led to a decrease in MMR against the opposite trend nationwide (Figure 4).[27] Poor PPH management was identified as a specific major cause of increased MMR. Adequate training was provided to staff to reduce the mostly preventable occurrences of PPH. The California Maternal Quality Care Collaborative (CMQCC)



SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2013.

FIGURE 4 Trend in reduced maternal mortality in California as compared to national US rates. Data/figure from [27]. Reproduced with permission

implemented a standardized PPH method of management in 126 hospitals in the state. By mentoring staff and conducting drills in different hospitals, a more than 20% decrease in PPH rates was noted versus only a 1.2% decline in control non-participating facilities.[28]

Such initiatives are also being implemented both in Washington state and Oregon.[27] Several other programs to improve maternal care have been instituted in hospitals statewide and are expanding elsewhere. General safety programs that can be adopted across the different states are advocated by The Council of Patient Safety AIM program.[29] Their stated mission is to understand the causes of morbidity and, through education, to generate several patient safety bundles aiming to reduce risk of PPH, thromboembolism, and severe hypertension, and thereby decrease primary cesarean rates. Therefore, by early identification of major pathologies and targeted intervention, the MMR rate may be decreased in any state or facility.

5.3 | Improved healthcare provider utilization for maternal care

This paper presents a plan for improving maternity care that focuses on major morbidities and resource optimization by the available healthcare staff.[25] D'alton et al.[25] evaluated the progress made by the SMFM over 5 years and suggested a corrective plan to reduce MMR. Their key recommendations focused on PPH, pre-eclampsia, and cardiovascular conditions. Although PPH is frequently preventable, it may require hysterectomy, blood transfusion, and experienced surgical staff when severe. Severe pre-eclampsia, cardiovascular, and non-cardiovascular medical conditions are life-threatening disorders that require specialist care for adequate management. This complicates requirements for the limited staff resources available at a primary level I site. Early recognition of such a risk and using a regionalized integrated approach through a multilevel health setting might reduce and resolve such unfortunate but rather common complications.[22]

The first observation in D'Alton et al.'s[25] document is that the mother ("M") must be placed at the center of care. The key is early risk identification so that the woman is promptly transferred to a high-risk care environment. The second is the need to increase the number of MFM specialists (which is currently low) who can minimize the risk through timely access to advice, which in many areas in the country is rather limited. The third step is conducting clinical research studies to fill the existing gaps. This would be highly beneficial because root analysis aims to identify what went wrong and offer solutions on how complications might have been avoided.

An important suggestion is that the MFM physician should become part of the obstetric team. The current segmentation to subspecialty created a clear distance and/or distinction between providers of care (i.e., labor and delivery staff) and those who advise for the care. Thus, reliance on Doppler, ultrasound, and more invasive advanced tools have unfortunately mainly created an undue distance from the treating physician who works hands on. As stated, integration where the specialist is also a caretaker of the team can create a clear, seamless interaction between advice and practice. In addition, the specialist advice consequently may evolve and will improve the clinical observation and outcome. In LMIC, by contrast, such a distinction almost never exists; therefore, advice and practice are mostly integrated and may contribute to the observed lower MMR. It was surprising to note that a high number of MFM specialists in a certain state is not necessarily linked to decreased MMR. Frequently, the distribution of specialists is uneven and they are concentrated mostly in highly specialized urban centers. Obviously, clinical medicine must progress, and thus better distribution of MFM specialists, who provide highly valuable advice and advance the field toward newer diagnostics and therapies, are central to improved care and outcomes.

5.4 | Maximize care based on local reality

The balance between optimal care, as described in the ACOG[24] and SMFM[25] LOC documents, and the reality of patient access in some regions of the United States should be reconciled. Level I facilities, as defined in the United States, would be viewed as Level II or III in low-resource countries. In an emergency where patient transfer is not feasible owing to distance or limited access to an advanced care facility, a general practitioner may have to deliver the neonate, or a general surgeon will perform a cesarean delivery with or without an anesthesiologist, sometimes even using local anesthesia. Consequently, care that is administered for patient benefit in an urgent setting should follow an adjusted standard of care based on locally available staff and/or facilities and tools at that time point. In addition, the neonatal outcome evaluation should be tailored to the newborn facility available on site. It is part of the current reality that will be better addressed once the planned regionalized care integration is successfully implemented.

Progress may be further made by viewing each state in the United States potentially as a functional unit; however, interstate contact and/or communication is currently limited. Budgets are mostly in-state funding, and cross licensing (each state has a different licensing board) limits such regionalized integrated care nationwide. In many countries, central government and central budgetary control limits the uneven distribution of resources. It is encouraging that recently the MMR declined in both inpatient and outpatient facilities and during emergency management in the United States. The remaining challenges include community-based, social, cultural, racial, and fiscal issues.[30] Thus, the recent information will help us to focus further on these remaining gaps that need to be addressed to improve MND outcome.

6 | LEVEL OF CARE IN THE ERA OF COVID-19

COVID-19 provides another view of how the 20-year maternal healthcare integration effort can be resolved because it was instituted within 2 months for emergency management of the pandemic. From such a dire and rapid onset situation, we can learn how to avoid or lessen the severity of future pandemics.

Until the COVID-19 pandemic occurred, each healthcare system functioned in a traditional way. Consider, for example, the previous H1N1 epidemic, which led to a significant number of maternal deaths. The current global COVID-19 pandemic has made it imperative to collaborate and integrate resources among different organizations (e.g., public, private, parochial, federally qualified centers) to address the viral infection. Thus, if there is a will (or if there is no choice), boundaries of state jurisdiction become flexible, cross licensing is enabled, cross-hospital features are integrated and federal/military agencies are involved to provide ventilators, masks, and/or testing sites and promptly set-up field hospitals as needed. This can make an important dent in the spread of infection and decrease the mortality and morbidity rates. If it had not been implemented in a timely and decisive manner, the COVID-19 pandemic outcome would have been even more severe. Recognizing a problem and acting in a concerted manner is critical.

In the United States, awareness of the high MMR due to inadequacy of LOCs in many places remains a painful reality that has led to modest improvement despite ongoing efforts. The lessons learnt from COVID-19 pandemic emergency management should be the basis for implementing, both in the United States and worldwide, a more integrated approach to healthcare, especially for the MND. This is particularly true for maternal care, a critical field where, when minutes are lost, two lives may also be lost. In a sense the coronavirus, despite its virulence, with early identification and institution of effective interventions led progressively to reduced morbidity and even mortality. On the other hand, with emergent obstetrical events, if PPH occurs and intervention is not immediate, death can follow within a few minutes. The hope is that, because the high MMR now is recognized, the need for the necessary tools for effective MND management will be better met.

Determining when to transfer a pregnant woman at risk to an appropriate facility with available expertise is the key to optimal outcomes. This was the case during the current pandemic. Women arriving at hospitals where there was no intensive care unit were sent to those facilities that had ventilators and qualified staff. Where resources were limited, nurses, physicians, and other healthcare workers joined out of state from other healthcare facilities across the country to take care of patients. In a similar manner, effective integration of care of the MND might make a major difference in improving outcomes. The awareness of what is possible should certainly lead policymakers to think and act in a "new normal," where critical care of the pregnant woman and her fetus, and successful neonatal outcomes will become an essential part of an advanced and effective healthcare system. Overall, managing critical LOCs in an integrated manner based on national standards and policies, as opposed to a segmented manner, will help to resolve or at least alleviate the current MMR crisis.

7 | CONCLUSION

Maternal morbidity poses a major health problem, where both mother and fetus/neonate may die. It is a unique situation relative to other medical emergencies, where only one individual is at risk. The vulnerability of the mother and a small delay in delivery or postpartum management may have serious consequences. Therefore, MND care should be viewed as critical medicine. We propose that regionalized integrated health care is part of the solution. What has become apparent is that budgets and facilities available are not the only key determinants. Rather, successful outcomes depend on sharing the burden of care at any level based on the judicious use of local resources to maximize their utility.

In the United States, a country with high income but segmented care, the high maternal morbidity and care disparity have been documented and acknowledged, and aggressive steps are now being taken to change this situation. Other countries where high mortality still exists might also benefit by such critical self-evaluation. Progression to an improved regionalized integrated and optimized use of healthcare staff for MND is needed, and advocating a lack of resources as a cause for high MMR should change. These steps in the right direction may exert a long-term positive impact. The solutions offered in countries where a regionalized multilevel chain of command system has been already successfully instituted should serve as a framework for global implementation adapted to local reality.

In countries where the MND outcome remains poor, assessment of their own requirements on a more individualized basis should be performed. The most important component is the political will to change. In some cases, providing minimal resources such as drugs for PPH prevention or management can make a major difference. In other countries such as Malawi, educating women to seek care early and enabling them to reach a facility in an expeditious manner have improved outcome. In other countries, reaching midwife and level I care facilities is not the impediment, but prompt triage and ease of transfer of at-risk women to the closest and most qualified center irrespective of costs or other barriers remain poorly implemented. Therefore, the steps required are more individualized, but the overall aim of an optimal outcome should be the same.

Specifically, in the United States, we propose that a national non-biased taskforce should be set up to help delineate the following

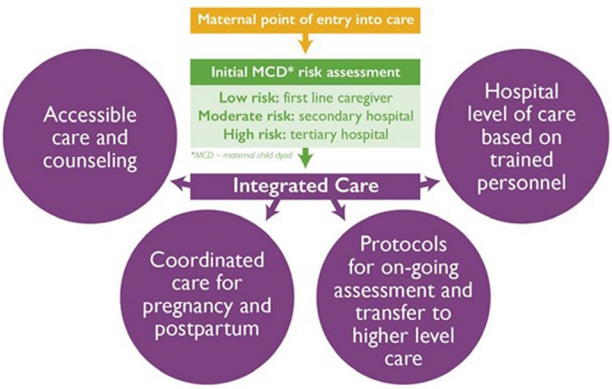


FIGURE 5 Maternal care starting at entry enables a plan for integrated care to begin straight away. Timely risk assessment minimizes maternal–newborn dyad outcome

requirements for effective MND management in each state. First, to define objectively at each facility the LOCs that can be effectively provided. Second, to identify at each facility the next higher acuity center where feasible coordinated advanced care can be provided. Third, to ensure as far as possible that this multilevel coordination is independent of financial considerations and involves public, private, or other healthcare facilities, even if they are out of state. Figure 5 shows our suggested framework for an effective integrated LOC system that should already be in place on admission of a pregnant woman. The current reality observed during the COVID-19 pandemic makes these recommendations actual and implementable.

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Anwar H. Nassar (Chair), Gerard H. A. Visser, Eytan R. Barnea, Maria Fernanda Escobar, Yoon Ha Kim, Wanda Kay Nicholson, Rodolfo Pacagnella, Diana Ramasauskaite, Gerhard Theron, Alison Wright.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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