Establishing Obstetric Anesthesiology Practice Guidelines in the Republic of Armenia

A Global Health Collaboration

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ABSTRACT

Background: Disparity exists in anesthesia practices between high- and low-to-middle income countries, and awareness has been raised within the global health community to improve the standards of anesthesia care and patient safety. The establishment of international collaborations and appropriate practice guidelines may help address clinical care deficiencies. This report's aim was to assess the impact of a multiyear collaboration on obstetric anesthesia practices in the Republic of Armenia.
Methods: An invited multinational team of physicians conducted six visits to Armenia between 2006 and 2015 to observe current practice and establish standards of obstetric anesthesia care. The Armenian Society of Anaesthesiologists and Intensive Care specialists collected data on the numbers of vaginal delivery, cesarean delivery, and neuraxial anesthesia use in maternity units during the period. Data were analyzed with the Fisher exact or chi-square test, as appropriate.
Results: Neuraxial anesthesia use for cesarean delivery increased significantly ($P < 0.0001$) in all 10 maternity hospitals within the capital city of Yerevan. For epidural labor analgesia, there was sustained or increased use in only two hospitals. For hospitals located outside the capital city, there was a similar increase in the use of neuraxial anesthesia for cesarean delivery that was greater in hospitals that were visited by an external team ($P < 0.0001$); however, use of epidural labor analgesia was not increased significantly. Over the course of the collaboration, guidelines for obstetric anesthesia were drafted and approved by the Armenian Ministry of Health.
Conclusions: Collaboration between Armenian anesthesiologists and dedicated visiting physicians to update and standardize obstetric anesthesia practices led to national practice guidelines and sustained improvements in clinical care in the Republic of Armenia. **(Anesthesiology 2017; 127:220-6)**

THE global provision of safe anesthesia and surgery recently has become a priority.[1] In 2015, the World Bank and the Lancet Commission on Global Surgery launched an appeal to address disparity in the availability and safety of surgery and anesthesia care between high- and low-to-middle income countries.[2,3] This has led to enhanced efforts to increase education and service initiatives to improve anesthesia safety and availability in high- and low-to-middle income countries.[1,3]

High-income countries have promoted a culture of patient safety in part through the development of clinical practice guidelines. Practice guidelines are systematically developed recommendations to assist the practitioner in providing care. They are supported by analysis of the current literature or by expert opinion of practitioners in that field and modified as knowledge, technology, and practice evolve. The purpose of guidelines is to enhance quality, safety, and patient satisfaction.[4] In the 1990s, interest in practice guidelines increased in the United States based on wide variations in clinical practice.[5] The American Society of Anesthesiologists Practice Parameters Committee developed and published a series of guidelines. The tenth set of guidelines, on obstetric anesthesia, was published in 1999 and updated in 2007 and 2016.[5] Similarly, practice guidelines for obstetric anesthesia have been published in other high-income countries and by the American College of Obstetricians and Gynecologists.[6–9]

Guidelines should provide a framework for the advancement of care after thorough review of the available evidence and practices within each local environment, be it in high-income countries or low-to-middle income countries. Guidelines developed by and for high-income countries may

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not be applicable to low-to-middle income countries settings due to differences in provider availability, training, infrastructure, and resources. Rather, guidelines for low-to-middle income countries settings are best developed or adapted for the local environment, led by local practitioners based on that environment's culture, clinical needs, and constraints. In many low-to-middle income countries, there are no practice guidelines and little focus on developing a culture of patient safety.[10] This report chronicles a partnership that evolved after an invited exploratory site visit to the Republic of Armenia in 2006. Initially, the aim was to understand and update obstetric anesthesia practices; however, the partnership culminated in the development of national obstetric anesthesia practice guidelines, the first guidelines in any field of medicine in Armenia, with the potential to serve as a guide to other low-to-middle income countries.

Materials and Methods

In September 2006, members of the Armenian Society of Anaesthesiologists and Intensive Care Specialists invited physicians representing Kybele, Inc. (Lewisville, North Carolina) to conduct training in the use of neuraxial anesthesia techniques for obstetric patients. Kybele is a 501(c)(3) humanitarian organization dedicated to improving childbirth standards worldwide through collaborative partnerships (http://www.kybeleworldwide.org). The Armenian Society of Anaesthesiologists and Intensive Care Specialists organized a 2-day national conference for 150 local anesthesiologists, neonatologists, and obstetricians in the capital city of Yerevan. This was followed by Kybele team members visiting seven hospitals in Yerevan to observe obstetric anesthesia practices and to demonstrate neuraxial anesthesia techniques. Yerevan is the capital and largest city of Armenia, accounting for approximately one third of the country's three million inhabitants. A survey was conducted in 2006 to determine baseline obstetric anesthesia practices among the 10 maternity hospitals in Yerevan.

In 2007, a local anesthesiologist was sponsored by Kybele to attend the thirty-ninth annual meeting of the Society for Obstetric Anesthesia and Perinatology in Banff, Canada, followed by a 2-week observational visit to BC Women's Hospital in Vancouver, British Columbia. In November 2007, a member of Kybele revisited Armenia, and in 2009 the sponsored Armenian anesthesiologist organized a local course for the obstetric anesthesiologists in Yerevan on obstetric neuraxial anesthesia techniques. In addition, in 2009, the Armenian Society of Anaesthesiologists and Intensive Care Specialists submitted a proposal to Kybele requesting assistance with the development and execution of national protocols and guidelines for obstetric anesthesia. Their goal was to have all maternity hospitals in Armenia practicing to the same minimum standard. Kybele thus committed to conducting additional annual training visits throughout the country from 2010 to 2015 to gain an understanding of the local conditions and to enhance guideline development and execution through visitation, coaching, and mentoring.

The structure for each training visit included a 1- to 2-day national conference in Yerevan and 2- to 5-day site visits by the Kybele team to participating hospitals. Lecture topics for the conference were determined mutually, and slide sets were sent in advance for translation into the local language. Topics included neuraxial analgesia for labor, anesthesia for cesarean delivery, complications of neuraxial anesthesia, safety in obstetric anesthesia, treatment of sepsis, simulation training, management of obstetric emergencies, trauma in the obstetric patient, and newborn resuscitation. Local anesthesiologists arranged television and newspaper interviews regarding the collaboration to coincide with each visit to generate public interest. The site visits initially focused on Yerevan hospitals to further promote obstetric neuraxial anesthesia use and to ensure safe standards of care. Anesthesiologists in Yerevan then targeted colleagues working in hospitals across other regions of the country and themselves became part of the visiting team. Visiting teams consisted of a local anesthesiologist, a Kybele team leader, and two to three multidisciplinary Kybele team members, ideally an anesthesiologist, obstetrician, and a neonatologist. Within each host institution, visiting Kybele physicians observed and discussed local practices, provided didactic and bedside education, and conducted demonstrations of desired techniques. Demonstrations on labor analgesia were not conducted outside the capital city because most of the hospitals visited had only one anesthesiologist, making the sustained use of neuraxial labor analgesia impractical. This was done with permission from the Ministry of Health, the Armenian Society of Anaesthesiologists and Intensive Care Specialists, and the host institutions. Before anesthesia, patients were informed of the risks and benefits of neuraxial and/or general anesthesia in their native language, and verbal consent was obtained. These discussions were based on the generally accepted risks in standard anesthesia textbooks as there were no data available specific to Armenia.

Each Armenian hospital recorded data on the annual number of deliveries, cesarean deliveries, the number of neuraxial and general anesthetics, and the number of epidural catheters for labor analgesia. These data, collated by the Armenian Society of Anaesthesiologists and Intensive Care Specialists, were analyzed with the Fisher exact or chi-square test (Excel; Microsoft Corporation, USA) to assess differences in the patterns of general and neuraxial anesthesia use for cesarean delivery and labor analgesia over time in concurrence with the program. $P < 0.05$ was considered statistically significant. No patient-level data were collected, so the initiative was exempt from institutional review board approval. The Armenian Health Ministry (Yerevan, Armenia) granted permission for training and assessment.

Results

From 2006 to 2015, Kybele made six visits to Armenia involving 51 multinational trainers, 10 of whom made multiple

trips. Figure 1 shows a map of the country indicating the regions visited. Overall, 21 hospitals were assessed in 14 cities. Table 1 provides details of each trip and locations visited.

Yerevan

Ten hospitals in the capital city provide obstetric care, accounting for approximately 50% of the country's annual registered births.[11] The annual number of deliveries and cesarean delivery rates for these hospitals are shown in table 2. In the initial 2006 survey, eight responding hospitals accounted for 14,172 deliveries, or 41% of all deliveries registered in Armenia.[12] These hospitals reported that general anesthesia was used for nearly 80% of cesarean deliveries. Only one center used neuraxial anesthesia to a significant degree (greater than 50%) (fig. 2). For labor analgesia, only 3% of laboring patients received neuraxial analgesia, 1% intravenous opioids, and 96% received no analgesia.[12]

In Yerevan, there has been a significant increase in the use of neuraxial anesthesia for cesarean delivery in every hospital when 2015 is compared with the 2006 baseline year ($P < 0.0001$) (fig. 2). By 2015, all 10 maternity hospitals in the capital city were using neuraxial anesthesia at rates greater than 50%. Averaging neuraxial anesthesia rates for cesarean delivery across Yerevan each year reveals increased and sustained neuraxial anesthesia use overall, although use declined in one hospital: 2006 (20%), 2007 (26%), 2010 (56%), 2011 (68%), 2012 (76%), 2013 (84%), 2014 (82%), 2015 (92%); data for 2008 and 2009 were unavailable. There was also an increase in the use of neuraxial labor analgesia, but to a limited extent. Neuraxial analgesia use for labor increased in seven hospitals from 2006 to 2012 ($P < 0.0001$) but by 2015, use declined to less than 5% in all but two hospitals. Only Shengavit and Erebuni sustained or increased the use of epidural labor analgesia. The annual number and percentage of labor epidurals performed in the capital city were in 2006, 366 (3%); 2010, 982 (5%); 2011, 1,259 (6%); 2012, 1,782 (8%); 2013, 1,615 (8%); 2014, 1,605 (6%); and 2015, 1,713 (7%).

Armenian Regions

In 2012, the focus of the program shifted outward from the capital city to encompass various regions across Armenia and the Nagorno-Karabakh Republic (table 1; fig. 1). Hospitals outside the capital city generally conduct fewer than 1,500 deliveries per year and have lower rates of cesarean delivery. From 2012 to 2015, external teams visited 13 hospitals

Fig. 1. Map of Armenia. *Circled areas* denote locations of educational programs across the country. Source: History of Armenia (http://www.armenica.org).

Table 1. Timetable and Location of Educational Program in Armenia

Year	National Conference	Yerevan Hospitals Visited	Armenian Regions Visited
2006	2-day	Erebuni, National Research Institute Obstetrics and Gynecology, Republican, Shengavit, Saint Astvatsatsin, Saint Grigor Lusavorich, University Maternity	None
2010	1-day	Erebuni, Kanaker-Zeytun, Malatya, National Research Institute Obstetrics and Gynecology, Republican, Shengavit, Saint Astvatsatsin, University Maternity	None
2012	2-day	Erebuni, Malatya, National Research Institute Obstetrics and Gynecology, Saint Astvatsatsin	Akhuryan, Dilijan, Gyumri, Ijevan, Noyemberyan
2013	1-day	None	Akhuryan, Gyumri, Martakert (Nagorno-Karabakh Republic), Stepanakert (Nagorno-Karabakh Republic)
2014	2-day	None	Akhuryan, Gyumri, Artik, Austrian, Hrazdan, Sevan, Martuni, Gavar
2015	1-day	None	Dilijan, Ijevan, Gyumri

Table 2. Number of Deliveries and Cesarean Delivery Rates in Yerevan Hospitals

Hospital	2006	2010	2011	2012	2013	2014	2015
Saint Narekatsi	1,402 (14)	936 (25)	895 (33)	830 (33)	750 (34)	736 (35)	746 (36)
University Maternity	1,599 (13)	879 (35)	1,043 (43)	1,054 (40)	1,122 (40)	1,129 (41)	1,244 (32)
Shengavit	1,926 (17)	2,960 (25)	3,161 (26)	3,163 (28)	2,876 (31)	2,993 (31)	2,900 (32)
Saint Grigor Lusavorich	1,504 (14)	2,471 (25)	2,646 (31)	2,827 (32)	3,100 (32)	3,178 (38)	3,105 (40)
Saint Astvatsatsin	1,601 (13)	1,596 (19)	1,361 (21)	1,036 (22)	761 (22)	564 (23)	411 (23)
National Research Institute Obstetrics and Gynecology	1,998 (16)	3,062 (24)	3,184 (25)	3,018 (26)	2,734 (28)	2,931 (29)	2,834 (33)
Erebuni	2,031 (17)	3,199 (30)	3,592 (32)	3,586 (33)	3,616 (33)	4,018 (26)	4,325 (35)
Republican	2,111 (17)	3,841 (35)	3,581 (35)	3,497 (38)	3,957 (38)	3,999 (40)	3,995 (38)
Malatya		1,086 (23)	1,109 (30)	1,202 (26)	1,235 (26)	1,359 (27)	1,346 (29)
Kanaker-Zeytun		760 (27)	740 (28)	550 (28)	462 (27)	394 (29)	228 (31)
Total	14,172 (15)	20,790 (27)	21,312 (30)	20,763 (31)	20,613 (31)	21,301 (32)	21,134 (33)

Data are presented as number of deliveries (% cesarean deliveries). All hospitals in Yerevan except Saint Narekatsi were visited by the external medical team.

outside the capital city, four of which had multiple visits (Akhuryan [three], Dilijan [two], Gyumri [four], Ijevan [two]). Data were collected for five hospitals that had one or more visits by the external mentoring team compared with five hospitals that were not visited. Hospitals visited conducted more deliveries per year on average (700 *vs.* 400) and had greater cesarean delivery rates (24 *vs.* 16%) than hospitals that were not visited. Neuraxial anesthesia use increased in all 10 hospitals over time; however, it was greater in hospitals visited compared with those not visited ($P < 0.0001$). Hospitals that were visited had lower initial average rates of neuraxial anesthesia use (2011; 2 *vs.* 23%); however, this increased the most over time (2015; 94 *vs.* 84%). Epidural labor analgesia was not used outside the capital city.

National Practice Guidelines

During the intervention period, Kybele assisted Armenian anesthesiologists in drafting national guidelines on the standards of obstetric anesthesia care. The process took several years to complete. Initially, published international guidelines and protocols of obstetric anesthesia were obtained, translated, and reviewed. An eight-member working group was organized among members of the Armenian Society of Anaesthesiologists and Intensive Care Specialists and chairs of various anesthesia departments. Committee meetings were held weekly or biweekly to develop evidence-based guidelines specific to local practices and needs. In March 2014, an initial draft was distributed to 100 members within the society, requesting comments and suggestions to be reviewed by the committee. The completed guidelines were then presented at the September 2014 Armenian Society of Anaesthesiologists and Intensive Care Specialists national obstetric anesthesia conference for discussion and implementation. Although some anesthesiologists were reluctant to incorporate the guidelines, others expressed gratitude for having prescriptive protocols. Consensus of the necessity of the guidelines was achieved by the end of the conference.

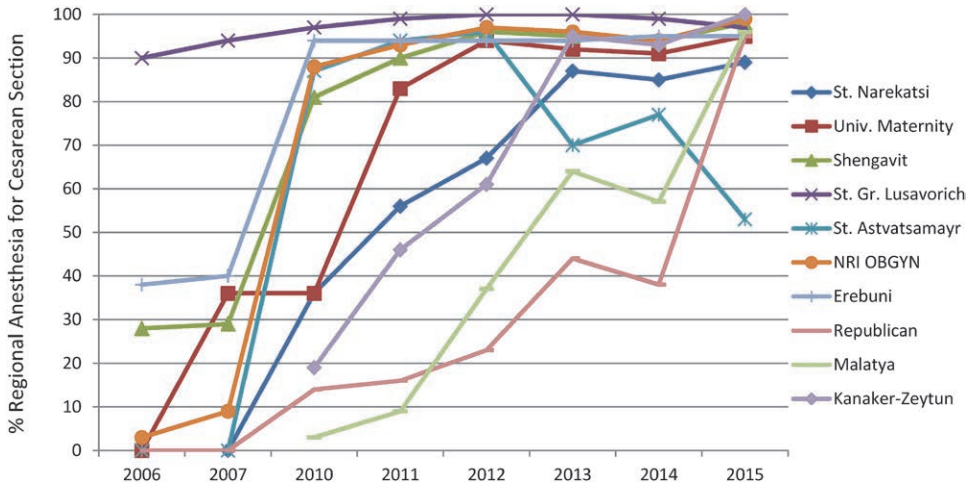

Fig. 2. Neuraxial anesthesia use for cesarean delivery in Yerevan Hospitals. The rate of neuraxial anesthesia use for cesarean delivery was sustained or increased in all but one hospital from 2006 to 2015 ($P < 0.0001$). For Malatya and Kanaker-Zeytun hospitals, 2010 was used as the baseline year. Hospitals in the capital city were not revisited after 2012. NRI OBGYN = National Research Institute Obstetrics and Gynecology.

Members of the Armenian Society of Anaesthesiologists and Intensive Care Specialists met with key members of the Health Ministry for consideration of approval. Kybele representatives were present at some of the meetings. A series of five sessions were held and included the Health Minister, Vice Minister, and Head of Foreign Affairs. The approval process was expedited by working directly with the top officials. After negotiation and revision, the Ministry of Health approved these in February 2015, signifying the first national guidelines in Armenia for any field of medicine. Two hundred sets of guidelines have been printed in booklet form and distributed across Armenia. The Ministry of Health has recommended that every obstetric unit in Armenia should follow the guidelines and is encouraging the development of guidelines in other fields of medicine.[13]

Discussion

General anesthesia was the most commonly used anesthetic for cesarean delivery in Armenia before this obstetric anesthesia training program. Over the course of a multiyear educational collaboration, Armenian anesthesiologists increased the use of neuraxial anesthesia for cesarean delivery, both within and outside the capital city, increased the use of epidural labor analgesia within Yerevan, and established national obstetric anesthesia practice guidelines.

These results underscore the impact a partnership between anesthesiologists from high-income countries and low-to-middle income countries can have in providing education, training, and staff development to address service delivery and health system gaps. This view is corroborated by several recent publications showing that high-level international partnerships can have an impact in improving medical practices and supply chain resources and reducing mortality.[14–17] Yet, a recent editorial indicated a lack of publications addressing the needs and realities of providing safe anesthesia care in low-resource settings.[1] It postulated that the work is either not being done or few high-income countries' anesthesiologists are analyzing their programs and publishing their results.[1]

Anesthesia care in low-to-middle income countries is associated with greater than expected perioperative mortality rates, especially with general anesthesia and intubation, in both obstetric and nonobstetric procedures.[18–20] In many settings, not only are there insufficient anesthesia providers but also a shocking lack of resources such as oxygen, pulse oximeters, and other resuscitation equipment.[3] A report by Médecins Sans Frontières spanning 6 yr and more than 75,000 surgeries in 12 low-resource countries found that spinal anesthesia was the most commonly used anesthetic technique and was associated with a significantly lower risk of death than was general anesthesia with intubation.[20] In this study, obstetrics, gynecology, and urology comprised 45% of the surgeries conducted. The authors concluded that the popularity of spinal anesthesia was likely due to its safety profile, efficacy in providing surgical anesthesia, and fewer equipment requirements as patients don't need airway manipulation or ventilator support.[19] Similarly, a recent meta-analysis including 632,556 pregnancies found that general anesthesia tripled the odds of maternal death during obstetric surgery compared with neuraxial anesthesia in low-to-middle income countries.[20]

Unlike many high-income countries, many low-to-middle income countries have not made the transition from general to spinal anesthesia for cesarean delivery.[21] Anesthesia practices in Armenia have not been reported previously; however, observations made by the visiting medical team support the notion of greater risk with the use of general anesthesia for cesarean delivery. Patients undergoing cesarean delivery with general anesthesia were observed to be insufficiently anesthetized, and Armenian anesthesiologists corroborated

occurrences of patient awareness. Local providers did not consistently confirm tracheal tube placement, secure the tracheal tube to the patient's mandible, or use monitors that were available. Not infrequently, providers left the operating room with the patient unattended under general anesthesia. Certainly, under these conditions, arguments can be made that neuraxial anesthesia could confer a greater margin of safety. At least a patient could generally serve as her own monitor by verbalizing discomfort and alertness that would support hemodynamic stability. Notwithstanding, however, lapses with neuraxial techniques also were observed, such as central nerve blockade conducted without the use of gloves or at inappropriately high interspace levels. Unfortunately, data on anesthesia-related complications and the impact on maternal outcomes over the course of the program are not available.

Much of the knowledge regarding medical practices in former Soviet countries is derived from the accounts of visitors.[16,22,23] Scientific methodology and access to medical journals were limited, and rigid policies often were dictated from central authorities, contributing to the delivery of outdated or unsupported medical care.[22,24] There are published reports of other unfounded medical practices placing patients at unnecessary risk, such as the use of cesarean delivery for myopia.[16,24] Evidence-based medicine is a new concept in many low-to-middle income countries, and awareness of these factors is important in conducting educational programs. Global health partnerships should reinforce contemporary evidence-based maternal and newborn care standards that can be implemented and sustained by local physicians. After a multiyear program that had contact with anesthesiologists serving more than half the population of Armenia, through the arena of conferences and hospital visits, and visibility in local media, significant increases in the rates of neuraxial techniques for cesarean delivery have been shown in the capital city and across several regions of the country. It is encouraging that when the focus of the program shifted outside the capital city in 2012, neuraxial anesthesia in Yerevan continued to increase despite no further visits to those hospitals. The program empowered local physicians to review the literature and develop appropriate evidence-based protocols that fit the local context and available resources. The Armenian Society of Anaesthesiologists and Intensive Care Specialists drafted national practice guidelines on the standards of obstetric anesthesia care with approval by the Ministry of Health. This signifies the first national guidelines in medicine in Armenia.

Finally, this project extends knowledge of obstetric anesthesia practices in a country that was unavailable previously. The network established across the country also led to collaboration with Lifebox (London, United Kingdom) to introduce the World Health Organization safe surgical checklist and increase the availability of pulse oximetry. It also demonstrates how the opportunity now exists to expand the role of the anesthesiologist in providing global patient safety during surgery.[10] Although many anesthesia providers in high-income countries would say we should strive to improve anesthesia standards of care in low-to-middle income countries, such that every patient can receive care similar to patients in high-income countries,[1] each country ultimately must decide how to instill patient safety into the practice of anesthesiology. Although partnerships may provide guidance, practitioners and health ministries within each country must determine patient safety solutions that fit within their own realm of resources and culture.

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Competing Interests

Dr. Owen is founder and president of Kybele, Inc. (Lewisville, North Carolina) but received no financial compensation for activities undertaken with this project. The other authors declare no competing interests.

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