There are no set standards for nurse anesthesia education in developing countries, yet one of the keys to the standards in global professional practice is competency assurance for individuals. Nurse anesthetists in developing countries have difficulty obtaining educational materials. These difficulties include, but are not limited to, financial constraints, lack of anesthesia textbooks, and distance from educational sites.

There is increasing evidence that the application of knowledge in developing countries is failing. One reason is that many anesthetists in developing countries are trained for considerably less than acceptable time periods and are often supervised by poorly trained practitioners, who then pass on less-than-desirable practice skills, thus exacerbating difficulties. Sustainability of development can come only through anesthetists who are both well trained and able to pass on their training to others.

Another reason for the poor application of knowledge in developing countries is the woeful shortage of healthcare workers; however, as this is rectified, it is also crucial that we have an evidence base of what works in developing countries to minimize the “know-do gap.”

One of the keys to the standards in global professional practice is competency assurance for individuals. There is, however, no worldwide minimum standard for continuing education (CE) in nurse anesthesia.

The International Council of Nurses has recognized the current variability in the educational preparation of nurse specialists throughout the world, which includes nurse anesthetists. Although the US system of nurse anesthesia education adheres to strict oversight, many nurse anesthesia programs in developing countries are not accredited by any recognized authority other than the government. The International Federation of Nurse Anesthetists (IFNA) has recently developed international nurse anesthesia program guidelines, but individual schools can choose whether or not to abide by such standards. This results in a wide variance of training from country to country, making CE that much more of

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a challenge, but one that needs to be addressed.

Barriers exist that may limit nurse anesthesia programs in developing countries from abiding by the accreditation standards of the IFNA. These include, but are not limited to, governmental regulation, language barriers, and cultural norms.

History and Review of Literature
Staff shortages and the extreme pressure of clinical work in the developing world have made it impossible for many anesthetists even to obtain supervised basic training, let alone become involved in continuing professional development. Their workload is usually unremitting, with limited outside help to replace practitioners during educational leave. Books and journals may not be readily available, and much of the material written by or for practitioners in developed countries may not be very useful to those in developing countries. This can be attributed to language and translation barriers as well as limited access to the same equipment and drugs described in the literature.

An example of the lack of access to educational materials in developing countries is found in a survey conducted by Hodges et al, which showed that only 44% of the nurse anesthetists in Uganda owned an anesthesia textbook. Limited access to educational resources, meager formal training, and lack of CE are barriers to overcoming ineffective care that drain the finite resources of health systems in developing countries. Siddiqi and Newell suggest that these barriers can be overcome if educators use traditional approaches to CE, such as seminars, refresher courses, unit rounds, and lectures. Furthermore, continuous quality improvement is an accepted mandate in the delivery of healthcare services, and quality of healthcare depends on the competence of practitioners and the system that supports their work. Because of the poor access to educational materials, the use of CE may play a much greater role in patient safety.

The use of an electronic means of publication and distribution, combined with the concepts of distance learning, can lead to better levels of knowledge and clinical practice. Distance learning technology is growing rapidly, and more students are studying abroad. Access to distance learning is no longer restricted to developed countries. With the rapid proliferation of the Internet, nurse anesthetists in developing countries have the opportunity for professional growth through online CE.

From an international perspective, one must be careful to meet the needs of the local population while not offending their cultural mores. Care should be taken to ensure that training programs are relevant to the problems that are encountered in everyday practice. Continuing education and formal training that focus on local educational needs are likely to be effective in influencing clinical practice.

According to Chandrasekhar and Ghosh, the development of information and communication technologies such as the Internet can bring about improvements in health in developing countries in at least 3 ways. First, as an instrument for CE, these technologies enable health workers to be informed of and trained in advances in knowledge. Second, they can improve the delivery of health and disaster management services to poor and remote locations. Third, they can increase the efficiency of governance, which should, in turn, improve the availability and delivery of publicly provided health services.

Sehri asserts that despite worldwide economic slowdowns, Internet usage worldwide increased from 200 million users in the year 2000 to more than 600 million in 2002 and was expected to reach 2 billion at the end of 2005. Internet usage has exponentially increased over the last decade in developing countries. In the Cambodia pilot program that will be discussed in a later section, anesthetists had access to 2 Internet-connected computers in the operating room.

By developing a reproducible infrastructure to provide CE for nurse anesthetists in developing countries, curriculum could be made available to others through the Internet, thus centralizing access. To reinforce what the participant nurse anesthetists learn from the curriculum, volunteer nurse anesthetists can deliver the CE modules in a face-to-face format. Although many obstacles, such as language differences, still exist with the face-to-face format in developing countries, anesthetists in developing countries are required in most instances to speak some English.

A reproducible curriculum contributes toward the improvement of nurse anesthesia expertise and education throughout the world. Eventually, this could lead to an implementation of an international CE process.

An old proverb explains: “Give a man a fish and feed him for a day. Teach him how to fish and feed him for life.” Training the local nurse anesthetists is an important step on the route to sustainability in developing countries. Teaching in accordance with the local environment and resisting the imposition of first-world systems in third-world conditions is important. Regardless of the focus, for international organizations to be effective in the future, they must be able to provide international solutions to local problems. In other words, they must be effective across borders as well as within borders. The effectiveness of the strategies to create knowledge translation in developing countries is highly variable and dependent on the setting; success hinges on whether the strategies have been tailored to the local needs.

The number of anesthesia providers available per capita of population is markedly reduced in low-income and lower-middle-income countries compared with developed countries. There is a need not only for increasing the number of providers but also for enhancing the
knowledge base of active providers. Nurse anesthetists in developing countries need a way to access CE in their home country. Being able to do so would provide CE without loss of income or locally critical anesthesia services. The purpose of this project was to develop a nonprofit, volunteer-based model for providing nurse anesthesia CE that can be reproduced and used in any developing country.

Discussion of State of the Art
There are numerous organizations providing anesthesia care on an interim volunteer basis in developing countries. The training that occurs has historically occurred in the operating theater and is a practical approach to hands-on learning. There has been, however, a lack of knowledge in relation to understanding the specific educational needs before the onsite arrival of the volunteer trainer. This leads to a lack of preparation for the specific needs of the nurse anesthetists in developing countries.

Historically, education has been delivered face-to-face. Lenn6 believes the global marketplace and new technology are contributing to the rapid globalization of higher education. As a result of this globalization, higher education is no longer provided solely within national borders. The author, in conjunction with the Nurse Anesthesia Overseas arm of Health Volunteers Overseas (HVO), developed a program model for the CE of nurse anesthetists in developing countries. The program model consists of both an online component and a face-to-face delivery of requested CE modules. The online aspects included the CE Needs Tool survey, the program satisfaction survey, the instructor evaluation, and the 6-month posttest. The online components act as facilitators to learning in that they are immediate and automatically analyze results. The face-to-face component consists of a pretest, presentation of the CE module, and an immediate posttest.

Once a CE program is requested, negotiations need to be made with an onsite course coordinator to facilitate the organization of a program site and group for the face-to-face delivery. Health Volunteers Overseas has contacts in the developing countries that request nurse anesthesia CE.

The objectives of the program are presented in the Table.

Both HVO and the IFNA would like to see this program function as an exclusively online program. The rationale for this includes decreased costs, greater safety for volunteers, and the opportunity for nurse anesthetists facing extremely challenging situations in developing countries to have the ability to download a video-based and/or audio-based digital slide (PowerPoint, Microsoft Inc, Redmond, Washington) CE module and save it to disk. By saving the CE presentation on a compact disk or USB drive, the CE participant can then take the disk and review the content repetitively at his or her own pace.

Characteristics of the local population will vary based on the differences of the given country, and include lan-

<table>
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<tr>
<th>Objective</th>
<th>Met</th>
<th>Comment</th>
</tr>
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<tr>
<td>Develop a continuing education needs assessment tool.</td>
<td>Yes</td>
<td>In consultation with Margaret Faut-Callahan, CRNA, PhD, FAAN, and Suzanne Brown, CRNA, the Continuing Education Needs Tool was developed and placed on the web-based survey tool SurveyMonkey. This was used in the Cambodian pilot program.</td>
</tr>
<tr>
<td>Develop an initial CE module library by 2008.</td>
<td>Yes</td>
<td>All 5 CE modules from the Cambodian pilot program were then placed on the HVO website.</td>
</tr>
<tr>
<td>Increase the knowledge base of Phnom Penh, Cambodian, nurse anesthetists as measured by pretests and posttests.</td>
<td>Yes</td>
<td>All Cambodian CE participants showed a significant mean increase in knowledge of 35% to 90% (P &lt; .01).</td>
</tr>
<tr>
<td>Secure adequate volunteer assistance, defined as providing a volunteer-delivered CE program within 6 months of the request.</td>
<td>Yes</td>
<td>The Cambodian pilot CE program was requested in November 2007 and delivered in May 2008, which meets the objective of CE program delivery within 6 months of the request.</td>
</tr>
<tr>
<td>Increase the knowledge base of the nurse anesthetists in 2 new developing countries per year starting in 2009.</td>
<td>In progress</td>
<td>Knowledge base in Cambodia has increased. Program needs to be implemented in 1 more developing country by the end of 2010.</td>
</tr>
<tr>
<td>Obtain 90% program participant satisfaction by 2013.</td>
<td>Yes</td>
<td>On the Cambodian CE participant satisfaction survey, 90% of responses indicated satisfaction with the program.</td>
</tr>
<tr>
<td>Develop standards for CE in developing countries.</td>
<td>In progress</td>
<td>This is a long-term objective. The IFNA is currently working on recommendations.</td>
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Table. Program Objectives and Outcomes
Abbreviations: CE, continuing education; HVO, Health Volunteers Overseas; IFNA, International Federation of Nurse Anesthetists.
guage, culture, availability of resources, and anesthesia program or programs attended. Issues of access include physical distance between the project director and the CE program participants, potential US state department travel advisories, fiscal or physical inability to attend the face-to-face presentation, and travel logistics. The program was piloted with nurse anesthetists in Phnom Penh, Cambodia, where HVO already has established a congenial working relationship.

The Logic Model process is a tool that has been used for more than 20 years by program managers and evaluators to describe the effectiveness of their programs. The model describes logical linkages among program resources, activities, outputs, and audiences, as well as short-, intermediate-, and long-term outcomes related to a specific problem or situation. Once a program has been described in terms of the Logic Model, critical measures of performance can be identified.16 The Logic Model for the project is shown in Figure 1.

Methods

Because this CE model is very specific in terms of scope and there are no established benchmarks, there were no available tools applicable to CE for nurse anesthetists in developing countries. Therefore, several of the online tools were developed in consultation with Margaret Faut-Callahan, CRNA, PhD, FAAN, and Maura McAuliffe, CRNA, PhD, FAAN. Dr. Faut-Callahan was the nurse anesthesia program director for many years at Rush University in Chicago and currently serves as the dean of nursing at Marquette University, Milwaukee, Wisconsin. Dr. McAuliffe has written extensively on nurse anesthesia in developing countries and is the nurse anesthesia program director at East Carolina University, Greenville, North Carolina.

The CE Needs Tool is one of the online tools that were developed for this program. The CE Needs Tool for Developing Countries uses a 5-point Likert scale ranking of desired CE areas, ranging from 1 = not important to 5 = very important. There are also some qualitative questions for demographical purposes, such as: (1) Where did the participant attend anesthesia training? (2) Where does the participant practice anesthesia? (3) Has the participant ever attended a CE program, and if so, how long has it been since the participant attended the CE program? In order to focus on change and improve outcomes, there are 2 qualitative questions pertaining to the participant’s experience with the online survey and how the survey might be improved. The CE Needs Survey determined the most requested CE needs and development of the CE modules that met those identified needs. The CE modules are adapted from donated nurse anesthesia educator lectures at nurse anesthesia programs in the United States.

The CE Needs Tool was distributed to the Cambodian nurse anesthetists in February 2008. Cambodian emails were obtained from the chief Certified Registered Nurse Anesthetist (CRNA) at the clinical site in Phnom Penh, Cambodia. The clinical site for the pilot program had a total of 3 nurse anesthetists, 1 student registered nurse anesthetist, and no anesthesiologists. A limitation of the pilot study was the low number of participants. This is to be expected, as many of the hospitals in developing countries are small, with a limited number of anesthesia providers.

After review of the Cambodian nurse anesthetist’s responses to the CE Needs Tool, nurse anesthesia program lectures were modified for the following CE modules: Electrocardiography (ECG), Cardiac Anatomy and Physiology, Thoracic Anatomy and Physiology, Local Anesthetics, and Upper Extremity Blocks. These CE modules were presented to and left with the Cambodian nurse anesthetists. All 5 CE modules were then placed on the HVO website, and password access was granted to the Cambodian nurse anesthetist participants.

Adult learning can be reinforced by reflection; at the end of a session the learners ask themselves basic questions about what they have learned and how it might affect their behavior in the future.4 Reflection-based reinforcement for this model included performing a pretest to determine the knowledge base, followed by a presentation of the requested CE modules, and then an immediate posttest. Retained knowledge is evaluated with a 6-month posttest delivered via an online survey tool (http://www.SurveyMonkey.com). As there were no preexisting pretests and posttests available before the initiation of this project, and as this was a pilot program, validity and reliability of the instruments have yet to be determined. Readability of tests was taken into account by using a web-based readability calculator (http://www.online-utility.org/english/readability_test_and_improve.jsp). Tests were created so that a US eighth-grade level was required to understand the text on the first reading.

Results

All 3 nurse anesthetist participants and the 1 student registered nurse anesthetist scored 40% or less on 4 of the CE module pretests, and 60% or less on 1 of the CE module pretests (Figure 2). All participants showed a significant increase in knowledge, with a range of 35% to 90% (P < .01). This change in test scores was more significant when the student was eliminated from the data evaluation.

Participant satisfaction surveys were developed for both the program participants and the program volunteers. The satisfaction surveys use a 5-point Likert scale ranging from 1 = disagree most to 5 = agree most. The surveys were delivered via SurveyMonkey at the end of delivery of the CE modules. The surveys were completed immediately after delivery of the last CE module, and the
same survey was delivered to each participant.

The definition of 90% satisfaction was responses on questions marked as either agree or agree most. Using this guideline, the responses for agree or agree most equated to 90% satisfaction. Although this was a good start, there remains room for improvement in satisfaction.

The open-ended questions identified the most useful

CE modules, areas of further CE interest, and the fact that all 4 participants had their expectations met by the CE training. All stated that the CE modules presented were useful, and they would not eliminate anything from the CE training.

The areas identified by program participants as having room for improvement were handouts, facilitation of

Figure 1. Continuing Education Logic Model
Abbreviations: HVO, Health Volunteers Overseas; eval, evaluation; CE, continuing education; IFNA, International Federation of Nurse Anesthetists; NA, nurse anesthesia; IRB, institutional review board.
discussions, and language. For the Cambodian pilot program, handouts were deliberately not provided so that their full attention would be given to the presentation. In hindsight, it is a cultural expectation that handouts be provided, as reinforced by the satisfaction survey. At the end of the CE presentation, each participant was given a CD with the lectures. Language translation and miscommunication is an issue that will be a constant threat to the success of this program.

Summary

In partnership with HVO and the IFNA, a reproducible curriculum infrastructure to provide nurse anesthesia CE in developing countries was developed. The program accomplished this by ascertaining the CE needs of the requesting site, developing CE modules to meet those needs, and face-to-face delivery with eventual online delivery of the CE modules. Effectiveness of the program is determined by the use of predelivery, postdelivery, and 6-month postdelivery testing of the CE participants.

The CE Needs Tool, tests, and CE modules are stored on HVO’s website. Access to these tools is granted through HVO. The HVO CE database is growing, but many presentations are still needed. Any donations of nurse anesthesia lectures in PowerPoint or PDF format would be greatly appreciated and can be forwarded to the author for inclusion.

REFERENCES


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