

Pediatric Anesthesia for Voluntary Services Abroad

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Voluntary agencies from developed countries deliver a wide variety of medical services to less developed countries worldwide (1–3). More than 150 programs based in the United States alone send volunteer medical professionals to developing countries for periods ranging from 1 wk to 3 yr to offer medical services or training.¹ Among the direct services provided are visiting surgical programs for elective treatment of congenital and acquired conditions that cause physical impairment or threaten longevity (e.g., congenital heart disease, orthopedic deformities, cleft palate, and burn contractures) or that result in social stigmatization (e.g., cleft lip or urogenital abnormalities).

This review article recommends strategies to organize elective surgical teams for voluntary medical services abroad (VMSA), emphasizing issues related to perioperative safety for the pediatric patient. This review draws upon the collective experiences of members of the Society for Pediatric Anesthesia to address logistical considerations, preoperative assessment, anesthetic techniques, monitoring, and postoperative care. (Note: Emergency relief services, large-scale medical emergencies, and programs providing indirect services occur outside the scope of this document.)

Why Guidelines for VMSA Programs?

Practices for perioperative care in VMSA programs differ from those of the sponsoring and host countries. In

sponsoring countries, elective surgery occurs after the patient's medical condition is optimally stabilized; modern operating rooms (ORs), a postanesthesia care unit (PACU) staffed with well-qualified personnel, access to intensive care, and drugs and equipment, such as monitors, infusion pumps, and specialized regional techniques, are standard.

By contrast, in underdeveloped countries, anesthetic drugs, monitors, and ancillary resources are typically limited; surgery for elective correction of congenital deformities is uncommon. Because most patients undergo surgery for trauma, obstetrics, or a few general surgical procedures, surgical subspecialties are sparsely represented. Anesthesia may be provided by a physician or a physician extender such as a nurse, clinical officer, or anesthesia assistant. Because much of the surgery performed in these settings is not wholly elective, the assessment of acceptable perioperative risk may differ from that for elective procedures.

VMSA programs providing elective surgery represent a third distinct type of anesthesia practice and has four characteristics. First, many of the patients treated would not ordinarily be encountered in industrialized countries. Common preexisting medical conditions include chronic respiratory symptoms, nutritional deficiencies, and advanced states of the surgical condition.

Second, VMSA operating teams are composed of practitioners who usually have not worked together and who arrive with diverse skills, personalities, and expectations of one another. The importance of team cohesion in minimizing oversights and errors is not measurable but has been shown in human factors research to play a significant role in promoting high quality care and safe outcomes (4).

Third, VMSA programs seek to treat large numbers of patients in a short time. The newly configured team must achieve efficient patient screening, rapid operating room turnovers, brief recovery, and optimal postoperative stability of patients in a setting of minimally experienced postoperative supervision.

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¹ Many are indexed at the web site for the Society for Pediatric Anesthesia http://www.Pedsanesthesia.org/vmsa_search.iphtml.

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Finally, anesthesia providers often must work without their customary equipment and monitors and may find themselves modifying their usual requirements to accomplish a trip's goals. For example, they may accept some patients at serious risk for perioperative complications while working in a technologically austere environment.

Planning and Organizing the Trip

A successful voluntary surgical program requires scrupulous planning for more than 1 yr (1-3). Handling difficult physical conditions, working with a multinational team, and learning to use unfamiliar equipment and supplies are challenging for practitioners.

The sponsoring agency must energetically communicate with prospective team members to ensure planning concerns are addressed in a timely manner. For example, prospective volunteers should investigate early whether their malpractice insurance covers the volunteer work and if not, decide whether that constitutes an impediment. Most VMSA agencies do not have policies to cover individuals. Team members also need to be given realistic expectations about the site's protocols and infrastructure, the limits of their own physical and mental endurance, and the expressed and implied cultural agendas of the host country and hospital.

Volunteers can expect that difficulties will arise in the form of equipment or supply shortfalls, unanticipated deficiencies in infrastructure (e.g., water or electricity), or shortages of qualified support personnel. Despite these problems, agencies may elect to go forward with their programs if they determine the shortfalls will not preclude the success of the endeavor. Pressures to move ahead may arise from a desire to satisfy a specific commitment to a program, to respond to perceived expectations from donors, or to provide important experience for participants. For such reasons, improvisation and nonstandard approaches to clinical issues characterize VMSA programs. The boundary distinguishing required versus unacceptable improvisations is difficult to define. However, knowingly structuring a trip to require improvisation that borders on unsafe practice is a disservice to everyone involved.

Goals

Generally, VMSA programs originate with an invitation or request for service from an in-country medical or lay group. It is essential that in-country hosts and the VMSA agency fully understand and agree with the purposes of the program. Consensus among local practitioners, community leaders, and medical supervisory staff in the host community regarding the need for the VMSA services and the anticipated scope

of work must be clearly articulated in advance. The VMSA organization should have a clear understanding of the host's expectations from the visit and the role the host wishes to play in the program. Critical questions include the following:

- What vested interests are behind the invitation and the program's success?
- Is the primary goal to provide direct medical service or educate local staff?
- Are local practitioners expecting to participate?
- What types of surgery are anticipated, and what are the limitations to proper medical management in the setting?
- What types and ages of patients are expected, and how many might be treated (2)?
- What equipment (e.g., anesthesia machines) is available?
- How far will patients have to travel? If required, are there provisions for family members to stay the week of surgery?

There are important opportunities to develop bonds and share knowledge and experience with in-country providers. However, when local culture and social structure is ignored, or relationships are not properly cultivated, there can be grave misunderstandings and resentment. Resistance (and even quiet sabotage) may result if local practitioners believe the program has paternalistic undertones, disparages their stature within their own community, or leaves behind unsolicited responsibilities for follow-up (1).

Preliminary Site Visit

Once a request for service has been accepted, a preliminary site visit is essential. Even for the smallest VMSA projects where there are extensive correspondence and photographs of the facility, a site visit should be strongly considered. Besides a first-hand view of facilities and equipment, the visit allows the cultivation of professional relationships and the identification of one or more specific program advocates who may help in future negotiations and problem solving. The visit should occur far enough in advance so issues can be addressed satisfactorily. A VMSA agency representative knowledgeable about space, facilities, and equipment for perioperative care should be on the visiting team. A follow-up written report with photographs documenting the physical layout and facilities (e.g., anesthesia machines, oxygen supply, and electrical access) should be sent to the team leaders.

As part of the site visit, a VMSA agency representative should meet with local civic sponsors, political leaders interested in the project, and medical staff leaders, including the individual clinical department directors. Lack of full support from any of these

groups or local rivalries and resentments could impede program success. If individual directors are unavailable, surrogates should be identified so questions regarding facilities and manpower can be answered. Expectations must be clarified, and the desire for formal educational exchanges or clinical participation by local personnel must be discussed. Plans for temporary licenses and hospital privileges also should be made, allowing sufficient time for bureaucratic delays.

Arrangements for volunteers. Arrangements for volunteers include in-country transportation, housing, meals, and security. Responsibility for these arrangements and the adequacy of the arrangements must be fully outlined with back-up plans made in advance. In addition, the work schedule, importance of adequate rest, and mutual social obligations should be addressed. To be hospitable, host organizations may want to plan what could turn out to be excessive social obligations for volunteers.

Security issues to consider include:

- Notifying the in-country United States Embassy of the planned program
- Understanding restricted activities while in the host country
- Providing escorts where required
- Furnishing emergency contact information (e.g., embassies or airlines)
- Formulating contingency plans for medical emergencies, natural disasters, or civil conflicts
- Reviewing, on a timely basis, travel cautions posted by the United States State Department and health advisories from the Centers for Disease Control and related organizations (Appendix).

Hospital facilities. The hospital or clinic facility should be able to accommodate the expected volume of patients (and their family members) for screening, surgery, and recovery. To what extent will the surgical program disrupt normal hospital routines? Will the local providers agree to the disruption? Will management of emergencies be compromised? Do provisions need to be made to redirect other hospital patients? What costs will be incurred in supporting laboratory, radiographs, pharmacy needs, and facility needs? Who will bear these costs?

The adequacy and reliability of such basics as electricity (e.g., current type and outlet placements), water, oxygen, suction, and fresh air or air conditioning must be evaluated. Contingency plans for their breakdown should be investigated. Frequency of outages and the availability of back-up generators should be noted. Inconsistent electrical supply is a common problem in many developing countries, and electrical connections adequate for in-country hospital operations may be inadequate for an intense surgical schedule. Even if the facility reports infrequent outages, flashlights may prove useful.

Laboratory facilities should be appropriate to the needs of the proposed surgery and able to support management of complications (e.g., blood gases, coagulation studies, and electrolytes). The blood bank should be able to type the expected number of patients and to provide blood products if required. Radiologic facilities must be investigated, including determination of the availability and cost of film for simple studies.

The pharmacy should be reviewed to assess its ability to provide backup in the event of shortfalls of analgesics (including controlled substances), anesthetics, and emergency supplies. In some cases, routine drugs are more easily obtained from community pharmacies than the hospital.

Communication between team members is often a critical issue. Telephone connections within the hospital among the various patient care areas, as well as plans for contacting the surgical team after hours, should be reviewed. Hand-held two-way radios are a practical means of allowing team leaders to maintain regular contact because many sites do not have alternate means of rapid communication. Plans for how translators will be recruited, oriented, and dispatched during the entire program should be formulated.

Screening and registration. The patient screening area should be reviewed for patient flow through screening stations and space required for registration, generation of medical records, and preoperative and follow-up consults. The local facility might not have adequate supplies (e.g., tongue depressors, blood pressure cuffs, otoscopes, and electrocardiograph machines/paper), and plans must be made accordingly.

Plans to integrate medical records between the volunteer agency and the local facility should be developed. Patient identification must accommodate local conventions regarding family and personal names. This simple but crucial issue will allow filing records so they can be easily matched with patients. Forms should be standardized and kept in duplicate so that hospital records and laboratory tests can be accessed both locally and at the VMSA agency's home base. How patients will consent for surgery and whether written forms will be used should also be worked out at this juncture.

Operating rooms (ORs). The number of ORs occupied by the VMSA program should take into account the host hospital's daily and emergency needs. Storage of equipment and supplies should allow for easy daily setup and takedown of the OR. Equipment should be secured nightly because loss or theft may result in the suspension of the entire program and may adversely affect VMSA-host relationships.

Because the VMSA distribution of OR tables may differ from the hospital's usual arrangement, it is important to document the availability of adequate surgical lighting, access to suction devices, and oxygen

supplies. In some cases, several OR tables may be set up in a room. This arrangement facilitates teaching, enables circulating nurses to assist several teams, and may permit anesthesia providers to assist other teams in an emergency.

Many hospitals have no central oxygen supply and depend on refillable H cylinders. When there is a central supply of oxygen, it is likely piped from large tanks of compressed gas and not refrigerated liquid oxygen reservoirs, as used in developed countries. Although larger quantities of oxygen may be stored in liquid form, liquefying oxygen requires generating high pressures (5–10 atm) and low temperatures (–100°C to –150°C), and these technologies may be unavailable. If a central oxygen supply is not available, each OR table will require a dedicated tank (G or H cylinder), and the PACU should be equipped with a tank for every two beds. G and H cylinders, when fully charged to 2200 psi, hold 5300 and 6900 L, respectively. In general, when using a nonrebreathing system, a full H cylinder will last for 15–20 h or more of anesthesia if properly conserved. Emergency supplies should be close at hand for the OR, PACU, and postoperative areas. An adequate number of tank regulators should be provided for the program's needs (note that threading may differ among countries). Nitrous oxide is not likely to be available because of cost, but when used, safety devices such as proportioning systems and meters of inspired oxygen concentration should accompany it.

Temperature regulation may be a problem in surgical areas when the presence of large numbers of VMSA patients and staff overheat the environment. Provisions for adequate ventilation, fans, or air conditioning are important to help the staff endure long daily schedules. Conversely, in cool climates, availability of warming devices for patients under anesthesia is important.

Shipment of supplies. For surgical and anesthesia supplies (discussed below) to arrive intact and in a timely fashion requires substantial advanced planning. For materials that will not be hand carried, shipping arrangements should consider the timing, possible delays, and meticulous documentation for customs agents. Endorsement letters from government agencies or internationally recognized charities may facilitate transit through customs. Materials past their expiration dates should not be shipped because the discovery of even one may provoke confiscation of the entire shipment. Similarly, controlled substances should not be included without proper authorizations. Some organizations have been able to piggyback supplies with the shipments of willing companies that regularly do business in the host country, allowing both economy and efficiency.

Expected patient population. Strategies for publicizing the VMSA program and for notifying and transporting potential patients should be developed during the site visit. Steps should be taken so proposed services are described in ways that neither encourage inappropriate candidates nor discourage appropriate ones. Although the screening clinic during the actual program will produce the final surgical list, preliminary screening by local health providers before arrival of the team may be useful. The site visit is the time to orient these field personnel or, at the least, provide materials that should be communicated to them. Preliminary screening can prevent unnecessary hardship and travel for individuals who are not good surgical candidates, as well as keep the VMSA team from being overwhelmed by patients.

Team Composition

Anesthesiologists traveling to developing countries will face people, cultures, and circumstances that are unfamiliar. Nonetheless, they must provide safe and effective care and use skills used in everyday practice, e.g., adaptability, strict attention to details, cooperation, conservation, conflict resolution, and team building.

Team roles should be defined and communicated to the entire team. Although in-country medical personnel may play a vital role, it is important to delineate their responsibilities and time commitments before the trip. A particular challenge is forming a cohesive team among culturally diverse practitioners who may have disparate expectations of each other's roles. The importance of team cohesion cannot be overemphasized. Team members need to depend upon each other for clinical efficiency as well as for prompt identification and resolution of potentially serious complications (4).

Volunteers should be oriented before the actual trip to local customs and expectations (e.g., proper greetings, appropriate dress, and hospital etiquette). Customs regarding introductions, ceremonies and gifts, personal behaviors, use of alcohol, tobacco, or other drugs, and actions perceived as romantic displays should be well understood.

Team leadership. There are four principal team managerial responsibilities. The team manager should be experienced in international medical programs, knowledgeable about the site, and familiar with important local contacts. He or she is responsible for all matters related to team mobilization and site preparation and should participate in the site visit. Specific duties include recruitment, credentialing of team members, assuring appropriate housing, transportation, and local facility use, and coordinating with local hospital and community personnel. The surgical and anesthesia team leaders are responsible for patient

selection, perioperative care supervision, and professional relations with local physicians. The clinical supervisor (often a nurse) is responsible for managing supplies, equipment, and nonphysician personnel. The leaders must work closely in planning patient screening and selection, range of services provided, and traffic flow. They should also prospectively develop plans to manage adverse events.

Team size. Distribution of personnel, given the confines of the local environment, should be as close as possible to perioperative care standards of US-based practices. This means adequate levels of skilled nursing for preoperative, PACU, and postoperative care. Even the most skilled local nurses may have limited experience managing large numbers of children after surgery or in assessing airway and cardiovascular issues in postoperative pediatric patients. Errors in recognizing respiratory complications, dosing analgesics, and adequate hydration in small patients are potential sources of avoidable complications. Therefore, the VMSA team should either include personnel who can provide this care or be prepared to supervise in-country personnel.

The number of personnel should be adequate to cover problems and complications arising in postoperative patients while surgeries are underway. For programs handling many patients each day, an intensivist, anesthesiologist, or pediatrician should be available to manage problems arising in preoperative and postoperative areas. An intensivist or anesthesia float should also be available to assist with IV access, airway difficulties, or other problems that arise in the OR. Additional core personnel to consider for the team include logistics assistants, a medical records librarian, respiratory therapist, biomedical technician, and other medical professionals as suited to the program.

Anesthesia providers. Selecting skilled anesthesia volunteers is a complex issue. Whereas VMSA agencies may not want to curtail activities for lack of pediatric anesthesia support, we believe that programs treating young children should require anesthesia volunteers with extensive experience dealing with pediatric patients. They should be familiar with various induction techniques, have experience using the anesthetic techniques and drugs to be used on the trip, and have experience dealing with perioperative issues specific to the planned surgical procedures (e.g., bleeding and edema related to palate repair). More important than whether a provider is a certified registered nurse anesthetist, doctor of osteopathy, or doctor of medicine is the provider's experience and comfort level dealing with pediatric patients in an austere setting. However, some countries do require all anesthesia providers to be physicians.

Registered respiratory therapists have been used on some trips as anesthesiology assistants. Because of

their familiarity with perioperative issues, airway management, and equipment, they can assist with preoperative evaluation, airway assessment, patient transport, equipment setup, vascular access, management of mechanical ventilation, extubation, and transport to the PACU.

On-call team and Trip MD. Arrangements for an on-call schedule to manage postoperative emergencies and clear instructions for communicating with the team after hours should be developed. Plans should allow for an anesthesiologist or intensivist skilled in emergency airway management to be immediately available in the hospital each day until all patients are discharged from the PACU. Also, one team physician should be designated team doctor to deal with the medical problems of team members.

On the Ground

Communications

Team meetings are an essential part of forging a cohesive team (4). Team leaders should meet to agree on program goals, patient selection criteria, scope of surgeries to be performed, and to review the spectrum of clinical skills available to the team. A meeting of the entire team must take place before the beginning of clinical work where team members fully discuss their roles and expectations.

Once the program is underway, daily team meetings are essential to air differences, provide updates, and discuss concerns. Some VMSA veterans have found it useful to have each discipline report concerns at the full team meetings while reviewing the activities of the previous day. Although seemingly simple, such a format allows for an exchange of ideas, validates the role of each team member, and makes it possible to address differences in style and experience. For example, some OR nurses are not accustomed to assisting during the anesthesia induction. Similarly, anesthesiologists differ in how accustomed they are to proceeding unassisted. PACU nurses may have varying expectations of how care is transferred or how wakeful children should be on arrival.

At the end of each day, the various chiefs should conduct a systematic review of the day's cases to evaluate problems or concerns. Additional team meetings (both inter- and intradisciplinary) should occur daily for the first few days, if not throughout the trip, to pass on information, problems, and tips. Although it may seem that meetings take up a disproportionate amount of time, in reality much can be accomplished by focused discussions over a meal or on a bus ride.

Conflict resolution. Because of the intensity and close working quarters associated with VMSA surgical

programs, disagreements over resource allocation, interpersonal strife, and staff illnesses may have a serious impact on the program's success and safety. Euphoria over initial success in providing good quality care may give way to fatigue from stressful days, sleep deprivation, excessive social commitments, and discontent with unfamiliar foods. Additional stresses may result from the illness of colleagues and the consequent redistribution of workload. Some volunteers may become irritable, confrontational, or even careless in their practice. Recognizing the risk and the symptoms of emotional and physical fatigue and adjusting the pace of the work and social activities is essential not only for enjoying the rewards of the trip, but also for providing high quality and safe patient care in a challenging environment.

Screening Clinic

The process of selecting patients for surgery is of paramount importance, and criteria for patient selection should be prospectively established. Whereas proper patient selection allows for positive outcomes, ill-considered selections may have negative ramifications far beyond the individual patient or trip.

Considerations of patient safety would dictate that patients be selected based on the goals of the program, skills of the team, and availability of facilities. For instance, selection of small infants on the basis of interesting disease, surgeon's skills, teaching value, or lack of older patients may be inappropriate. One must additionally account for the PACU facilities and the postoperative staff's familiarity with management of the infant airway, hydration status, respiratory function, and pain management. Thus, whereas the surgical and anesthesia staff may be comfortable managing small infants, if the nursing staff is unfamiliar with postoperative care of small infants, safety may dictate that elective surgery not be offered.

A stratification of priorities based on surgical condition, teaching value, distance traveled, or access to alternative facilities will help determine the final OR schedule and prioritize procedures. Despite their emotional appeal to team members, some children may not be appropriate candidates for surgery in these settings because their disease process is too advanced, the complexity of the proposed surgery is too demanding, or appropriate postoperative care is unavailable.

Once criteria for patient selection have been established, strategies for managing problems that are likely to be encountered during screening should be developed. The screening clinic should strive to uncover previously undiagnosed congenital anomalies and intercurrent illnesses of concern. For many patients, this will be their first evaluation by a physician. Frequently, preoperative laboratory tests or radiographs are not practical. Language barriers may

hinder a thorough medical history. Therefore, it is vital that a competent translator assist the screening physician. Anemia, parasites, reactive airway disease, tuberculosis, otorrhea, rheumatic heart disease, and soft tissue infections are common. In addition, some patients may deliberately conceal underlying medical conditions for fear of not being accepted for surgery (5). The assessment of risk is primarily an anesthetic concern; in equivocal cases, the final decision should rest with the anesthesia team.

Surgical schedule. The operating schedule should take into account when the last patients of the day are expected to be discharged from the PACU, as well as potential openings because of cancellations. Younger children and more complex cases are best performed early in the day and early in the trip so that complications can be addressed while full team resources are available. However, cases scheduled for the first day should be uncomplicated and their start times staggered to allow for identifying and managing unforeseen problems. In considering the surgical list, the team should anticipate that local sponsors may request additional special cases be accommodated.

Notification. The method of notifying patients as to whether or not they will be offered surgery must be clearly publicized at the screening clinic. Those turned away will likely be upset, disappointed, or frustrated. It is important that team members, translators, and, if available, social workers help explain reasons for the selection and realistic alternatives available. Patients should not be gratuitously invited to return next year if it is unlikely the team will return or the surgery offered.

A final station in the screening clinic should provide clear instructions on preoperative preparation and where and when to report for surgery. The information should be available in writing (in the appropriate language) and posted conspicuously at a predesignated location. Besides the frustration of missing a surgical opportunity after long anticipation and extensive waiting in the screening clinic, a vacant OR slot also deprives another potential candidate of surgery.

NPO guidelines. NPO guidelines should reflect the standards in use by VMSA participants in their own practices. The American Society of Anesthesiologists' recommendation for preoperative fasting is: 2 h for clear liquids, 4 h for breast milk, 6 h for infant formula, and 8 h for solids (6). However, there is no firm evidence that gastric emptying is enhanced after 3-4 h in young children, and some anesthesiologists shorten the fast after solid food to 6 h. In tropical and arid climates, dehydration and hypoglycemia can develop quickly, particularly in malnourished children with limited glycogen reserves. The margin of safety during the inhaled anesthetic induction is greatly reduced in dehydrated patients. Therefore, small children and infants should be given some glucose-containing oral

fluid in the preoperative fasting interval, whether or not they seem to want it. Suitable clear liquids include sweetened tea or clear juice drinks.

Consent. Often the importance of patient education and consent are overlooked on VMSA trips. Although practitioners are well intentioned, without adequate communication (including local translators), the needs of patients and families will not be adequately anticipated and addressed. VMSA teams often assume that language barriers and the need to process large numbers of patients mean they need not be concerned about the consent process. Experience has shown that family expectations can be unrealistic, and unless the surgical plan and intended outcome are adequately discussed, there is a high risk for bitter disappointment. Whether written forms will be used or not, it is essential that patients and their families understand the intended procedures and their possible outcomes.

Anesthesia

Equipment

If a trip is organized by a large institution, portable machines may be available. However, often the anesthesia provider must adapt basic machines available in the developing country. At best, these anesthesia machines include an oxygen source and variable bypass, as well as flow-over vaporizers (availability of soda lime for partial rebreathing systems must be confirmed in advance). Sometimes a pressurized oxygen source is not available, requiring the use of draw-over vaporizers. The use of oxygen analyzers should be considered, particularly if mixed carrier gasses are used. Scavenging systems may need to be devised (Table 1).

Frequently, only one type of vaporizer is available, which, optimally, is a halothane or sevoflurane device for inhaled anesthesia induction. However, there may be times when only isoflurane vaporizers are available and the team has packed halothane. Because these anesthetics have similar vapor pressures, it is possible to use halothane in an isoflurane vaporizer (or sevoflurane in an enflurane vaporizer) (7). Before changing anesthetics, vaporizers should be completely drained, refilled to the one-fourth point with the new anesthetic, and then drained again to prevent the delivery of mixed inhaled anesthetics. A potential danger is the delivery of an excessive concentration of inhaled anesthetic because the isoflurane vaporizer can deliver up to a concentration of 5% halothane and the enflurane vaporizer, when set to 7%, delivers approximately 10%–11% halothane. Older vaporizer types (e.g., Copper Kettle, Vernitrol side arm) may also be available. Because they are not drug specific, any inhaled anesthetic may be used. If the anesthesia

Table 1. Suggested Anesthesia Supplies Checklist

Anesthesia stations
Anesthesia machines, vaporizers
Monitors: electrocardiograph, arterial pressures, CO ₂ , O ₂ saturation, oxygen concentration, noninvasive blood pressure, temperature, respiration
Defibrillator (1)
Oxygen regulators and flowmeters
Hand-held blood gas/electrolyte analyzer
Vacuum/suction capability
Nerve stimulator
Electrical converters
Electrical outlet extensions
Syringe pump (if using propofol)
Airway equipment
Laryngeal mask airways
Anesthesia circuits
Anesthesia bags
Jackson-Rees circuits (as applicable)
Face masks—neonate, infant, toddler, child, and adult
Mask strap
Nasal cannulae
Self-inflating ventilating bags
Earpiece and precordial/esophageal stethoscopes
Endotracheal tubes
Endotracheal tube stylettes, adult, and child
Laryngeal mask airway
Lighted stylette
Endotracheal tube brush
Laryngoscope handles and blades
Oral airways in varied sizes
Nasal trumpet airways in varied sizes
Stethoscope
Magill forceps, child, and adult
Suction catheters (include catheter to suction endotracheal tubes)
Other anesthesia supplies
Scissors
Hemostat
Examination gloves
IV cannulas
IV tubing, connectors, and stopcocks
Alcohol swabs
Syringes, varied sizes
Straight needles, varied sizes
"Butterfly 25" IV needles
Intraosseous needle
Adhesive tape
Benzoin spray
Adhesive bandages
Penrose drain/tourniquets
Nebulizers
Pocket knife
Flashlight
Protective eyewear
Simms connectors
Scavenger tubing
Plastic adaptors 15/22 mm
Laryngoscope bulbs
Batteries—AA, C
Syringe labels
Scrubs
OR hats, surgical masks, shoe covers

OR = operating room.

provider is unfamiliar and uncomfortable with such devices, they should be avoided because of the danger of delivering substantial anesthetic overdoses.

At times, teams have found upon arrival that some of the equipment documented in the preliminary site visit is dysfunctional. Repairs and spare parts are expensive or unavailable in remote areas. We recommend that anesthesia providers consider bringing nonbreathing systems because they offer the advantage of portability and eliminate reliance on local supplies of soda lime. The Mapleson D, the Bain modification, or the Mapleson F (Jackson-Rees) function well for either controlled or spontaneously ventilated patients and are therefore suitable systems. The primary disadvantage is the need for large fresh gas flows, which deplete oxygen and vapor supplies more readily. For agencies using sevoflurane as their usual anesthetic, the expense may be very important.

A resuscitation kit with equipment appropriate for pediatric patients of all sizes should be accessible to all perioperative areas. The PACU is an appropriate central location for storage. The kit should include an electronic defibrillator, a self-inflating ventilating bag, a set of laryngeal mask airways (LMA North America, Inc., San Diego, CA), airway adjuncts such as oral airways, nasal trumpets, and intubation supplies, and appropriate resuscitative drugs (Table 1) (8). Dantrolene in sufficient quantity should be available on all trips where malignant hyperthermia triggering drugs are in use. Enough emergency self-inflating ventilating bags (e.g., Ambu®, Penlon®, Laerdal®) should be available to ensure that all anesthetized patients can be hand-ventilated if the oxygen supply fails.

Monitors

VMSA providers should strive to approximate safety and surveillance standards in their home ORs. The American Society of Anesthesiologists' standard requires patient oxygenation, ventilation, and circulation be continually evaluated (9). With general anesthesia, this includes pulse oximetry, capnography (unless invalidated by the nature of the patient, procedure, or equipment), electrocardiography, and measurement of pulse and blood pressure at 5-min intervals. Temperature measurement is required when clinically significant changes in body temperature are intended, anticipated, or suspected. When mechanical ventilation is used, a disconnection alarm is also required. These standards undoubtedly exceed those available in many host hospitals. VMSA providers should keep in mind that acceptable risks for elective reconstructive surgery differ significantly from non-elective cases in host hospitals.

Reuse of Disposable Items

Whereas PVC and hard latex items are generally marketed in the United States as disposable items, it is common practice in the developing world to disinfect and reuse anesthesia masks, endotracheal tubes, oral airways, nasogastric tubes, and urinary catheters. If standard disinfection techniques are observed, it is appropriate for VMSA programs to follow this practice. According to the Spaulding (10) hierarchy, disinfection processes yield high, intermediate, or low-level disinfection. High-level disinfectants are chemicals effective against vegetative bacteria, viruses, fungi, and mycobacteria (Table 2). The distinction between high-level disinfection and sterilization rests on the ability of the germicide to inactivate bacterial spores, which in turn largely depends on the chemical's concentration and duration of contact (11). Labeling a chemical as an effective high-level disinfectant/sterilant requires stringent testing under laboratory conditions.

Medical devices are characterized by the intensity of patient contact as critical (contacting sterile tissue or the vascular system), semicritical (contacting mucous membranes or nonintact skin), or noncritical (touching intact skin). Devices such as laryngoscopes and endotracheal tubes are semicritical and require high-level disinfection (12,13). Chemicals that do not provide assurance of sporicidal activity may be satisfactory for high-level disinfection of anesthesia equipment. (For more information, see Favero and Bond (11) and Rutala (13).)

For any chemical to be effective, the objects must be thoroughly cleaned to remove organic and particulate material (such as tissue, blood, and secretions) and to reduce the microbial burden. Factors important in adequate decontamination include the topography of the object (hinges, lumens, and crevices), the amount and variety of microbial contamination, the concentration of the disinfectant, and the temperature and duration of the immersion (13). Several methods of chemical disinfection that do not require specialized apparatus are certified by the United States Food and Drug Administration (FDA)² for high-level disinfection or sterilization (13). These include wet pasteurization at 70°C, glutaraldehyde 2%–3.5% (Cidex® and others),

² The responsibilities of several agencies overlap. The Food and Drug Administration (FDA) regulates the use of medical devices and liquid germicides used to disinfect medical devices (14). The Environmental Protection Administration (EPA) regulates chemical germicides for surface decontamination and in agriculture. The Centers for Disease Control and Prevention (CDC), a non-regulatory federal agency, performs applied research related to infectious diseases and develops guidelines and recommendations related to causes and prevention of infectious diseases. The Association for Professionals in Infection Control and Epidemiology (APIC), a voluntary organization, serves educational and advocacy functions, including supplementing CDC guidelines on disinfection (12).

for decontamination of anesthesia equipment. Similarly, formulations for surface cleansing (low-level disinfection) such as quaternary ammonium compounds, very dilute bleach solutions, and detergents are inadequately antimicrobial. Phenols, also used for surface cleaning, may leave injurious residues even after thorough rinsing and should not be used.

High-temperature steam or dry sterilization (autoclaving) is appropriate for metal equipment, including reusable spinal or epidural needles. Flash sterilization requires exposure to 132°C for 10 min. Laryngoscopes and other nonlumened items also may be flash sterilized for 3 min. Laryngoscope bulbs usually tolerate this process, although degradation is hastened. Tabletop steam sterilizers that do not require a waterline connection are suitable for shipping with other equipment.

Liquid germicides should not be used for needles because it is impossible to assure adequate penetration into the lumen; microscopic air bubbles, for example, could keep germicide from localized areas. In addition, needles for central or peripheral blockade should not be cleaned with chemical disinfectants because residual chemicals may cause chemical meningitis or arachnoiditis.

Medications

In addition to drugs and medications for the anticipated surgical program, medications will be required for unexpected needs. Providers should expect to manage complications in their own patients but might also find they are asked to assist in emergencies at the local hospital. Providers may want to bring additional supplies, although some supplies may be more easily purchased on site than shipped (e.g., IV fluids are bulky and costly to ship) (Tables 3 and 4).

Anesthesia Techniques

Premedication. In the hectic environment of VMSA ORs, premedication may be beneficial, especially when language barriers intensify young patients' anxieties. Premedication may facilitate a smooth inhaled or IV induction (19-22) or allow placement of a regional nerve block. For oral use, midazolam (0.5-0.7 mg/kg) (19) or ketamine (5-7 mg/kg) (20,21) may be mixed with ibuprofen elixir, acetaminophen elixir, or a flavored beverage. Sedation begins within 10 min, with the maximal effect reached by 20-30 min. Alternatively, ketamine (2-3 mg/kg) alone (22) or mixed with midazolam (0.1 mg/kg) and atropine (0.02-0.03 mg/kg) can be administered IM. This combination provides good analgesia and an indifferent demeanor for IV placement or regional nerve block. The inclusion of an antisialagogue in the premedication, either orally or IV, is useful to suppress secretions

caused by ketamine or during dental and palate surgery and to maintain the heart rate during halothane anesthesia.

Sedative premedication of young children is not routine in developing countries because of the types of cases and costs involved. Therefore, anesthesia providers planning to introduce premedication should designate the logistics of its administration (e.g., location and administrator) and prepare in-service materials for local providers.

Regional anesthetics. Regional anesthesia (peripheral nerve blockade or spinal, epidural, or caudal anesthesia) may serve as the primary anesthetic instead of general anesthesia. When working with constrained resources, regional anesthesia is cost effective, allows for rapid room turnover, and limits the reliance on the host country's anesthesia machines. Patient comfort and immobility can be achieved by supplementing the regional technique with IV or IM ketamine and midazolam.

Even if the patient requires a general anesthetic, nerve block of the surgical field before skin incision allows for maintenance of a light general anesthetic, quiet emergence, and a period of postoperative analgesia. In the lower extremity, lower abdominal, and penoscrotal procedures, a single caudal epidural injection of 0.5-1.0 mL/kg of 0.25% bupivacaine or 0.2% ropivacaine may provide 4-6 h of postoperative analgesia. For lip surgery, infraorbital nerve block is done by injection of 0.5-1 mL of 0.25% bupivacaine with epinephrine 1:200,000 at the infraorbital foramen, either transcutaneously or transorally. Similarly, in palate repair, the surgeon may infiltrate with a long-acting local anesthetic with epinephrine to achieve good vasoconstriction with satisfactory analgesia for the early postoperative period. Conceivably, having the patient comfortable and awake may minimize the risks of airway obstruction caused by excess sedation or secretions generated by agitation.

General anesthesia. Because mechanical ventilators are infrequently available on the anesthesia machines, spontaneous ventilation during anesthesia is desirable. With an inhaled anesthetic induction, IV access may be secured before tracheal intubation. Having IV access before intubation reduces the risk of hypotension or bradycardia during deep inhaled anesthesia because anesthetic gas concentrations can be reduced while deepening anesthesia with IV lidocaine or a hypnotic. Alternatively, a short-acting neuromuscular blocking drug, such as mivacurium, may be used with immediate return to spontaneous ventilation. Succinylcholine is not recommended for routine use after inhaled anesthetic induction because of the concerns regarding masseter spasm and muscle rigidity (23). If an IV induction is planned, the combination of IV propofol and lidocaine provides adequate anesthesia for tracheal intubation without neuromuscular blockade.

Table 3. Anesthetic and Perioperative Medications

Drug	Comment
Inhaled anesthetics	
Hypnotic anesthetics	
Thiopental, methohexital, propofol, ketamine	
Muscle relaxants	Short-acting drugs (mivacurium) may be used to facilitate endotracheal intubation while avoiding the use of succinylcholine in children. Longer-acting drugs may be required based on the intended surgical procedures.
Succinylcholine	
Nondepolarizing muscle relaxants	
Neostigmine	
Anticholinergics	
Atropine, glycopyrrolate	
Sedatives	In addition to IV administration, midazolam can also be used for oral or intranasal administration (see text). Midazolam is a controlled substance. International transport may require special arrangements; in-country purchase may be inexpensive.
Midazolam	
Flumazenil	
Analgesics	Many countries have IV preparations of tramadol and nonsteroidal antiinflammatory drugs that are not available in the United States. International transport of opioids may require special arrangements. Transport of mixed agonists/antagonists (butorphanol, dezocine or nalbuphine) may be less restrictive. Local purchases of parenteral opioids (fentanyl, morphine and meperidine) may be inexpensive.
Acetaminophen suppositories, elixir and tablets	
Nonsteroidal antiinflammatory drugs	
Opioids, oral and parenteral; mixed oral preparations (acetaminophen/codeine)	
Bronchodilators	Include nebulizers for pre- and postoperative use.
Albuterol, metaproterenol	
Local anesthetics	0.75% or 1% concentrations can be diluted to 0.2%–0.25% with normal saline for use in central/peripheral blocks. Consider a small supply of materials for subarachnoid block.
Bupivacaine, levobupivacaine, ropivacaine	
Lidocaine	
Antibiotics, oral and parenteral	
Antiemetics	
Metoclopramide, ondansetron, promethazine	
Steroids	
Parenteral, dexamethasone, methylprednisolone, hydrocortisone	
Oral, prednisone	
Nasal vasoconstrictors (oxymetazoline, xylometazoline)	
Dextrose 50%	Isotonic IV solutions with dextrose are much more expensive in many locales than saline or lactated Ringer's. Five milliliters of D-50 per 100 mL of IV fluid yields a 2.5% dextrose solution.
Diphenhydramine	
Vasoactive drugs	
Epinephrine, phenylephrine, ephedrine	
esmolol, labetalol, hydralazine, verapamil	
Furosemide	

During maintenance, spontaneous ventilation provides several safety advantages. First, in the event of an airway misadventure, the patient may continue to breathe spontaneously, an option that cannot be exercised if muscle relaxants are used. Second, with the use of uncuffed tubes, the amount of oxygen expelled around the tube would be much less than with positive-pressure ventilation, thus reducing environmental contamination and possibly the risk of an airway fire from electrocautery use in orofacial surgery.

Analgesia. Acetaminophen rectal suppositories in a dose of 30–40 mg/kg (24) may be given after the induction so that adequate blood levels may be obtained by the time the patient reaches the PACU. Subsequent oral doses are 10–15 mg/kg every 4 h around the clock.

Opioid use is minimized to avoid excess sedation, airway compromise, and prolonged recovery times, especially in the setting of high patient:nurse ratios common to some VMSA programs. Lack of step-down units and frequent limitations in the experience of the local nursing staff with postoperative elective pediatric patients dictate the importance of minimizing the risk of respiratory depression. Additionally, legal barriers often preclude the transportation of opioids (and other controlled substances) across international boundaries. A partial agonist-antagonist, such as nalbuphine, may be sufficient to provide mild sedation and good analgesia when administered in incremental doses of 0.05 mg/kg. Neuraxial opioids may promote unpredictable levels of respiratory depression and generally should be avoided.

Table 4. Emergency Medications to Be Kept with Resuscitation Equipment^a

Medication	Route	Dose
Amiodarone	IV	5 mg/kg bolus
Atropine	IV/IT	0.01-0.015 mg/kg 0.03 mg/kg
Calcium chloride	IV	15-20 mg/kg
Dantrolene	IV	2 mg/kg/dose every 5 min up to 10 mg/kg
Epinephrine	IV/IT	Hypotension: 2-5 µg/kg IV cardiac arrest: 10-30 µg/kg
Flumazenil	IV	0.05 mg/kg every 5 min up to 0.2 mg/kg
Furosemide	IV	0.5-1.0 mg/kg
Insulin/glucose	IV	Hyperkalemia: 2 mL/kg of 25% dextrose +0.2 U/kg regular insulin. This is the bolus dose as well as the hourly dose
Labetolol	IV	0.1 mg/kg increments every 15 min
Lidocaine	IV	Arrhythmias: 1-1.5 mg/kg; then 2-3 mg/kg/h infusion
Mannitol	IV	0.25-0.5 gm/kg
Methylprednisolone	IV	Asthma, anaphylaxis: 1-2 mg/kg; then 0.5-2 mg/kg every 6 h
Naloxone	IV	Excessive sedation from therapeutic opioids 1.0 µg/kg every 2 min up to 10 µg/kg;
	IV/IT	neonatal resuscitation: 5-10 µg/kg
Sodium bicarbonate	IV	Metabolic acidosis: 2 MEq/kg or per blood gases
Succinylcholine	IV	1.5 mg/kg. Use with atropine if <1 year
	IM	4 mg/kg mixed with atropine 0.03 mg/kg
Verapamil	IV	0.1-0.2 mg/kg

All IV medications can be given by intraosseous needle.

^a IT = intratracheally (via endotracheal tube).

Postoperative Care

Plans for physician supervision of the PACU and regimens for postoperative analgesia, fluid administration, and discharge criteria should be reviewed with the entire team before surgery begins. Standing orders should be provided where appropriate. Space requirements for the PACU will vary according to the flow of patients. As a general guideline, the number of PACU beds should equal the number of OR tables. At least one large oxygen cylinder and regulator and one pulse oximeter should be available for every two PACU beds. Means for checking blood pressure should be readily available. As noted earlier, the resuscitation kit should be kept in the PACU. Patients should be brought to the recovery area only when they are fully awake so airway management issues in the PACU are minimal. Nurses with PACU experience should be available, with a recommended ratio of no less than one nurse for two patients. An anesthesiologist or a pediatric critical care specialist with airway skills should be available to the recovery area at all times.

Management of analgesics must be prospectively addressed. Intraoperative use of local anesthetics and non-opioid analgesics should be encouraged to avert postoperative airway complications. Judicious use of agonist or agonist-antagonist opioids may be useful in cases of severe discomfort or marked emergence excitement. It may be helpful to provide written guidelines or standing orders for opioid dosing in the PACU to avoid variations that might result in excessive respiratory depression. Patient discharge from the PACU should occur only after the patient is awake

and breathing comfortably, maintains adequate oxygen saturation on room air, and has good pain control. IV lines should be maintained until patients are taking oral fluids without difficulty.

Follow-Up Care

Team members must anticipate the need for follow-up patient care after their departure. A plan to manage complications should be developed in advance to ensure the following: (a) a qualified staff is available and committed to providing postoperative care, (b) local staff have appropriate supplies to handle anticipated complications, and (c) communication with the original medical staff is available.

Surgical procedures involving complex postoperative issues such as pain management, sustained IV hydration, or a significant risk of wound infection should be scheduled early in the trip. Procedures with anticipated short-term complications, including airway obstruction, bleeding, postoperative nausea and vomiting, or significant postoperative pain, should not be provided on the final day of service. Ideally, all patients should be discharged before the team's departure. In instances where this is impossible, appropriate staff must be identified to provide care. Required supplies should be left with appropriate personnel.

Quality Assurance

There should be a quality assurance process to address major morbidity and examine untoward events.

Events may include those that cause no harm but have the potential for injury (errors and accidents (25)) or only adverse events. Whatever strategy is used, it should be geared to uncovering systems issues that promoted the event and to discerning whether or not the occurrence could be prevented by improving vigilance, monitoring, training, communication, or infrastructure (4,25,26). Examples include adverse events related to sedation or anesthesia, complications leading to prolonged PACU stay or transfer to an acute care facility, and surgical complications. A standardized reporting system should be in place for trip participants to report adverse clinical events so the VMSA agency can identify problems and institute solutions. The VMSA agency should have a committee that evaluates events triggering the quality assurance process that is independent of the administrative aspects of medical services.

Extraordinary Occurrences

Cardiac arrest, respiratory failure, and death are infrequent occurrences in well-planned VMSA trips. Appropriate management of serious adverse events is essential to avert misunderstandings, program disruption, or erosion of team cohesion. The ramifications of a death reach far beyond the program and open the VMSA organization to intense scrutiny. Communication must be open, honest, clear, and timely. The following are suggested actions for dealing with a death or life-threatening complication:

1. *Consider stopping surgery temporarily.* An attempt to continue business as usual sends the wrong message about caring for the family and hosts. A halt in the schedule also allows team members to deal with their feelings without negatively affecting further patient care and enables team leaders to address patient safety issues and team cohesion. Having team members channel all communications with host sponsors and hospital leaders through designated representatives can minimize rumors and misunderstandings, which are caustic to the program. Personal opinions and summary judgments should not be aired outside debriefing sessions.
2. *Meet with family members.* A frank discussion should take place, preferably in the company of a host medical colleague. In some cultures, the full disclosure we value in the United States is unusual. Host colleagues may provide some guidance. Because they will be staying behind after the team leaves, it is important to respect their sensibilities without compromising the team's ethical standards.
3. *Meet with host country sponsors.* There may be many interested parties, but the team leader will find that meeting with a few host sponsors and

local medical staff will help maintain a calm, prudent dialogue. The agenda should be to promote a clear understanding of the event, measures to reduce future risks, resumption of surgery, and channels of communication with the family.

4. *Complete incident reports.* Each person directly involved should write a detailed narrative of the event and surrounding circumstances. In addition, the chief of each clinical discipline should write a report. All records pertaining to the case should be copied and transported with the reports for review by the VMSA clinical leadership after the return home.
5. *Convene a Mortality and Morbidity (M&M) conference.* As soon as team members have written their incident reports, the team leader should convene an M&M conference consisting of the team members (including the anesthesia team leader and nursing director) and host country medical personnel involved in the event. The purposes of the M&M conference are to evaluate the likely cause of the event, to provide information for the team leader (or appointee) to use in presenting the issues to the family and the nonmedical host country sponsors, and to rectify any systems issues. Adverse events, which may result from patient factors, system defects, or human error, are a real part of medical practice. The review should seek to make constructive changes while avoiding the tendency to assign blame. Before the M&M conference, the team leader may want to meet confidentially with individual team members, especially if human error is involved. The goal is to provide emotional support for the team member and help with presenting facts at the M&M.
6. *Debrief the entire team.* Initial small group debriefings aimed at providing information and averting rumors and divisiveness should be followed by a team gathering. The team leader (or designate) should briefly summarize the event and offer all team members an opportunity for discussion. It is essential that they feel free to express their views to allay misgivings, rumors, and resentments. The group leader should be sure team members are comfortable with plans for further action, agreeable about the schedule for resuming surgery, and are reminded about confidentiality issues.

Summary

To optimize surgical outcomes and sustain the trust and good name enjoyed by VMSA programs, volunteers must be committed to upholding practices that foster safe and positive outcomes for patients. Care

standards should approximate those of the sponsoring industrialized country. The surest way to minimize *ad hoc* improvisations is to set up a preliminary site visit with the host hospital and community leaders. Identifying and cultivating a relationship with one or more in-country program advocates will facilitate problem solving and negotiations as the project matures. For the anesthesia team, the most important issues include appropriate recruitment of motivated and experienced anesthesia providers, careful patient selection, adequate staffing for each stage of care, sufficient provision of equipment and materials, and continuing monitoring of perioperative events to identify system issues. Conscientious planning and open communication are the critical attributes to achieve efficiency and safety in VMSA programs.

Appendix. Useful Resources in Planning a Trip

General reference

US Department of Health and Human Services
Office of Global Health

Abundant links to most public sites below, as well as international agencies such as WHO, UNICEF, USAID, PAHO. Provides country information, world health statistics, information on refugee health, and global partnership programs.

www.globalhealth.org

Health for travelers

Centers for Disease Control and Prevention

General information and country-specific health advice for travel abroad. Health Information For International Travel ("Yellow Book") is downloadable (free) or purchasable print resource updated every 2 years. The "Blue Sheet" is a supplemental update listing countries with quarantinable diseases.

<http://www.cdc.gov/travel/>

print version of "Yellow Book": 800-252-1200 or

<http://bookstore.phf.org/prod159.htm>

International Society of Travel Medicine (ISTM)

Lists in-country providers who have expertise in international health for travelers, and are members of the ISTM, as well as summaries of article from the Journal of Travel Medicine.

PO Box 871089

Stone Mountain, GA 30087-0028

email: istm@istm.org

www.istm.org

American Society of Tropical Medicine and Hygiene
Travel Clinic Directory lists US-based and in-country providers with expertise in international health for travelers and are members of the ASTMH.

60 Revere Dr
Northbrook, IL 60062
847-480-9282
www.astmh.org

Country studies, culture

CIA World Factbook

Links to organizations focused on safety and security. World Factbook provides brief country profiles, including contact information for foreign consulates in the US and US consulates abroad.

www.odci.gov

www.odci.gov/cia/publications/factbook/index/html

US State Department Bureau of Consular Affairs

On-line information regarding passports, visas, safety, and travel warnings. Links to key offices of Foreign Service posts, embassies, consulates, and medical clinics.

<http://www.travel.state.gov>

Library of Congress Country Studies

Profiles of history, demographics, economic, and political structures of countries.

<http://lcweb2.loc.gov/frd/cs/>

US State Department—Embassies

List of embassies, diplomatic missions, and missions to international organizations.

<http://www.usembassy.state.gov>

International health

Society for Pediatric Anesthesia

Searchable web site lists ~150 US-based organizations using medical providers of all types who are required for voluntary organizations. Duties include teaching, patient care, public health, and consultation on infrastructure development.

http://www.pedsanesthesia.org/vmsa_search.iphtml

Interaction

Information clearinghouse for 150 US-based NGOs dedicated to humanitarian relief work.

1717 Massachusetts Ave, NW, Suite 801; Washington, DC 20036; (202) 667-8227

www.interaction.org

Global Medical Matrix

Interest in developing international telemedicine resources.

1S10 Brody Medical Sciences Building

Greenville, NC 27858

252-816-2466

www.telemed.med.ecu.edu/international

International Medical Volunteers Association

Resources for volunteers and agencies providing medical services in the developing world. Also interesting articles such as "How the other half dies" and explanation of "disability-adjusted life year" as a measure of the burden of specific diseases in a population.

P.O. Box 205, Woodville, MA 01784; (508) 435 7377;
Fax. (508) 497 9568
e-mail: info@imva.org
www.imva.org

Action Without Borders

General listings of jobs, volunteer opportunities, and other resources (not restricted to health organizations).
<http://www.idealists.org>

Global Health Council

Umbrella organization of professionals, volunteers, governmental organizations, academic institutions, foundations, and corporations with interests in global health issues. Publishes "Directory of US International Organizations".
1701 K St, NW
Washington, DC 20036
202-667-8227
www.globalhealth.org

International Health Medical Education Consortium (IHMEC)

Organization for faculty and health care educators dedicated to international health education in North American medical schools and residency programs. Includes listserv discussion group.

Department of Medicine
Indiana University School of Medicine
M200, Wishard Hospital
1001 West 10th St
Indianapolis, IN 46202
(317) 630-677
email: info@ihmec.org
www.ihmec.org

US Government Printing Office
Washington, DC 20402
202-512-1800
<http://bookstore.gpo.gov>

Travel services

International Service and Travel Center (ISTC)
From University of Minnesota Office of International Programs. Offers student and faculty ID cards, travel and hostel information, and discounts on phone cards, railpasses.
800-770-4782
www.istc.umn.edu

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