AIDS update: Part I
Incorporating universal precautions during anesthesia care
BRENT SOMMER, CRNA, MPHA
San Francisco, California

While no cure or vaccine currently exists to combat acquired immunodeficiency syndrome (AIDS), more than seven years of studying the disease has brought forth answers to many questions. The human immunodeficiency virus (HIV), known to be the causative agent of AIDS, is transmittable via defined mechanisms of transport.

Recent study of these mechanisms has generated a system of universal precautions thought to prevent spread of HIV and related diseases. In this first AIDS update, the author presents recommendations for incorporating these precautions into safe anesthesia practice.

More than 65,000 cases of acquired immunodeficiency syndrome (AIDS) have been reported to the World Health Organization from more than 127 countries throughout the world.¹ Of these cases, 59,491 have been diagnosed in the United States to date. Of those diagnosed in the United States, 56% have died.² Several reports reveal possible AIDS-related deaths as early as 1977, but the majority of reliable case reports began early in 1981 and originated in New York and California.

Reported cases of infection with the human immunodeficiency virus (HIV), which frequently progresses to AIDS, continue to rise daily. There is currently no specific mechanism available to predict if or when the HIV in those persons known to be infected with it will progress to AIDS or a less debilitating condition referred to as AIDS-Related Complex, or ARC. The incidence of progression from known HIV infectivity to AIDS or ARC continues to increase as time progresses. While the HIV pandemic continues in many populations, efforts to prevent and control its spread are irrevocably extensive worldwide.

HIV is found in high concentrations in most infected persons' blood and serum, cerebrospinal fluid and semen. Lower concentrations of the virus are found in some (but not all) infected persons in saliva, tears, urine, breast milk, amniotic fluid and vaginal secretions.

HIV is known to be transmitted during sexual contact with an infected partner, parenteral exposure to infected blood products, and perinatally to offspring of infected mothers. Occupational risks for HIV transmission in health care settings include parenteral (via needlestick or cut) or mucosal membrane exposure (eye or mouth splash) to infected blood or other bodily fluids. Large amounts of cutaneous exposure or prolonged contact with blood, particularly when the exposed skin is chapped, abraded or afflicted with dermatitis, can also result in transmission.

HIV is remarkably similar to the hepatitis B strain of virus in epidemiologic composition, modes of transmission, risk groups affected and po-
Potential for nosocomial infection. Technological advancement is responsible for making hepatitis B a theoretically preventable disease. Until an effective antiviral therapy or vaccine permits such circumstance for AIDS, effective precautions continue to be the primary defense against transmission of HIV.

Intensive study and research of AIDS in recent years have provided a multitude of information about the disease. While no cure or definitive treatment to eliminate the disease is currently available, techniques have been established and proven effective in preventing and arresting the spread of HIV. The education and training of all persons involved with the care of those afflicted with HIV is paramount to the promotion of widespread compliance in eliminating transmission.

**Health care concerns**

Approximately 5.6% of the U.S. labor force consists of health care workers. More than 1,875, or 5.8%, of adults with AIDS whose cases were reported to the Centers for Disease Control (CDC) National Surveillance System were employed in a health care or clinical laboratory setting. Among those health care workers diagnosed with AIDS, 95% belong to a high-risk category, while the remaining 5% were without definitive risk potential. The number of health care workers with AIDS in the undetermined risk category remains slightly higher than the total number of workers in this category (5% versus 3%). These averages have remained stable throughout the past six years.

Several investigations of documented percutaneous or mucosal membrane exposure to body fluids of known HIV-infected patients continue. Most studies include a longitudinal follow-up to ensure ample time from exposure, as antibodies do not evolve immediately after infection. Antibodies develop in most cases from six to 12 weeks post-exposure, although several months may elapse prior to the prevalence of detectable seropositivity. Contrary to most reports, several experts suspect that, as with anti-HBc serology for hepatitis B, not all HIV antibody-positive individuals are infectious. This incidence of HIV antibody-positive persons who are not infectious, however, remains rare. Three particular prospective studies have provided data concerning the risk of HIV infection in health care workers who are exposed to the blood of infected patients. Although it is impossible to define the precise risk of transmission during exposures to contaminated blood, these studies indicate a very low incidence, estimated at less than 1%.

Nine cases have been reported of seroconversion in persons with no other known risk factors for AIDS following parenteral or mucosal membrane exposure to HIV-infected blood or body fluids during the provision of health care services. All exposures documented were the results of accidental needlesticks or exposures where routinely recommended barrier precautions were not taken. These continual case reports, however rare, accentuate the need for all persons at risk for accidental exposure, particularly health care workers, to exercise recommended precautions.

Since exposure to HIV can occur during the asymptomatic carrier state of infection, improved standards of infection control are vital. Recent efforts to enhance infection control practices have been extremely successful, and effective guidelines have been established for use in all health care settings.

**Nosocomial infection**

Nosocomial or hospital-associated infections occur in approximately 5% of all hospitalized patients. The likelihood is often greater than 18% for patients in critical care units. Nosocomial infections account for costs ranging as high as $8 billion per year. Most studies estimate that approximately one-third of all nosocomial infections are preventable. CDC research has further concluded that effective control measures can significantly reduce the rate at which these infections occur. Health care facilities have historically utilized two basic types of procedures as defense against nosocomial infection. Whether the transmission of infection was from patient to patient, patient to health care worker, or health care worker to patient, these routines included basic practices such as handwashing and aseptic and sterile techniques. More specialized isolation procedures and protocol were utilized when a known contagious disease or infection was suspected or diagnosed. These practices originated nearly three quarters of a century ago when public health officials mandated a quarantine system for infection control. Many of the guidelines established since those early times have also recommended physical separation of infectious patients.

While many of these past practices were designed to prevent infection transmission in hospitalized patients, their success has been limited. Drawbacks that have hampered the success of these practices include their inappropriate application and inadequate compliance by health care workers. While cited as the most important measure to reduce nosocomial transmission of microorganisms,
handwashing is frequently found to be ineffective due to inadequate technique.

Infection control practices used by most hospitals and other health care facilities in the past have been dependent upon the known or suspected patient diagnosis. This "diagnosis driven" practice has failed to guard against the spread of diseases not clinically apparent or in a prodromal state prior to the presence of definable clinical symptoms. Inconsistent application of these practices combined with a lack of situational preparedness, i.e., ready availability of gowns, gloves, masks and other supplies, have made apparent the need for consistent implementation of improved infection control precautionary measures.

Body Substance Isolation

The shortcomings of past infection control practices prompted Lynch, Jackson and colleagues to implement a system more appropriate to the needs of today's health care practitioners. Over four years of research has resulted in the Body Substance Isolation (BSI) system of infection control. BSI provides a complete, common-sense approach to the prevention and management of potential or known infectious diseases in today's varied health care settings. The BSI program incorporates a system whereby universal precautions specifically address every aspect of infection prevention and isolation in all areas where patient care is provided.

The BSI system requires the strict application of precautions for all persons, whether or not they have a diagnosed infection. The basic principle behind this system is the simple rationale that the presence of infectious organisms always precedes a diagnosis.

Past infection control practices based on categorical and disease-specific precautions are eliminated with BSI. These practices have proven ineffective in eliminating the spread of undiagnosed communicable diseases.

BSI eliminates the use of numerous and frequently confusing signs to state what specific precautions are necessary. With the use of universal precautions, no signs are posted as reminders of specific precautions to be used in a given area, with the exception of cases where airborne contagion is suspected. Signs reminding personnel that BSI precautions are maintained for all patients throughout every patient care area can and should be posted. Table I is an example of such a sign.

The BSI approach is consistent with CDC recommendations, which emphasize the need to treat all blood and body fluids in a uniform fashion. BSI actually provides a standard of care for all patients that interrupts the spread of potentially transmissible organisms.

BSI recommends six basic principles when the health care provider ascertains that barriers are necessary in order to eliminate the risk of infection transmission. These specific guidelines include:

1. Gloves to be worn when contact with body substances is suspected or possible.
2. Plastic gown or apron to be worn during likelihood of soiling with body substances.
3. Protective masks and/or eyewear to be worn in the presence of airborne disease or to prevent body substance splash to eyes or mucous membranes.
4. Thorough handwashing before and after handling body substances or articles possibly covered with body substances, and after removing gloves at the completion of a task or procedure.
5. Discarding of uncapped needles and syringes in puncture-resistant receptacles placed as close to their point of use as is practical.
6. Discarding trash and linen in impervious plastic sealed bags.

Optimal utilization of the BSI system requires a commitment by all involved parties to practice these basic maneuvers in as diligent a manner as possible.

As both AIDS and hepatitis are blood-borne diseases, BSI precautions basically address only those practices that would transmit via this route. Casual contact, i.e., touching, handling objects not visibly soiled with bodily fluids, and general interpersonal interactions, does not require protective precautions. An effectual handwashing technique must be emphasized in all areas of contact. Adequate handwashing and nailbed cleaning with soap and water, using friction for at least 10 seconds, remain the most effective infection control procedures known.

It is important to appreciate that these guidelines do not negate the need for the types of isolation procedures used currently or in the past, but rather emphasize universal blood and body fluid substance precautions for all patients regardless of their isolation status or diagnosis.

Implementation of these guidelines do, however, eliminate the need for the isolation category, "Blood and Body Fluids Precautions," previously recommended by the CDC for patients known or suspected to be infected with blood-borne pathogens. In addition, designation of potential or suspected specimens or actual patient "labeling" is no longer warranted. This crucial aspect of the BSI
Table I

UNIVERSAL PRECAUTIONS

WASH
BEFORE AND AFTER PATIENT CONTACT

GLOVE
BEFORE TOUCHING BODY SUBSTANCES

GOWN
OR WATERPROOF APRON IF SOILING OF CLOTHING IS LIKELY

MASK
AND GOGGLES FOR AEROSOLIZATION OR SPLASHING

SHARPS
PLACE NEEDLES IN SHARPS CONTAINER. DO NOT RECAP

WASTE
USE PLASTIC BAG FOR DISPOSAL

LINEN
USE LAUNDRY BAG FOR SOILED LINEN

BODY
BLOOD
DRAINAGE
FECES
MUCUS
PUS
SALIVA
SEMEN
URINE

SUBSTANCES

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application avoids stigmatization and the false sense of security fostered by these past practices.

All health care institutions and agencies will be held accountable for maintaining adequate infection control programs in order to comply with federal standards. The Occupational Safety and Health Administration (OSHA) has published recommendations in the Federal Register (Oct. 30, 1987) to enact "standard operating procedures" and categorical classifications of risk potential for health care facilities. If such recommendations are established as standard policies, all health care agencies will be liable for providing safe and healthful working conditions for workers. Failure to comply with OSHA standards may result in fines as high as $10,000.11

Anesthesia-related concerns

The increased risk of exposure to HIV and other transmittable infectious diseases on the part of the anesthesia care practitioner is obvious. The anesthetist must be familiar with these disease entities and the ways they are transmitted in order to make intelligent decisions regarding the appropriate application of the BSI system. While certain procedures related to anesthesia and surgery entail greater risks of exposure than others, each individual task should be evaluated for determining the appropriate precautions necessary to comply with BSI recommendations.

While exposure to potentially infected blood and body fluids is inevitable, several precautionary measures can decrease that risk. Those not immune to hepatitis B, for example, should consider immunization against the virus. Certain preparations now available, i.e., Recombivax HB® (Merck), are free of association with human blood or blood products. Most health care employers currently offer this vaccine to their staff.

Emergent situations, i.e., cardiopulmonary arrest, trauma resuscitation, spontaneous or cesarean section delivery, and neonatal resuscitation, require planning and appropriate preparedness to minimize risk of exposure. The ready availability of protective gloves, masks, gowns and eyewear is essential. A multitude of protective supplies are currently available.

Preventive materials should be carefully selected, considering safety and ease of use, and, of course, cost. Protective eyewear, for example, should be comfortable, not restrict visual perception and acuity, and cover the entire visual field. A national latex shortage continues to restrict the supply of gloves needed to meet increasing demands from the health care industry.

Concerns and interest have prompted the commercial health care supply industry to introduce products for use with recommended infection control practices. A particularly useful item now commercially available is a mechanically operated aspiration device (vacuum) for newborn resuscitation. It provides an alternative to the practice of oropharyngeal (Delee) suction, thereby allowing conformity with CDC standards that recommend the avoidance of direct mucosal membrane and body fluid contact.

Direct handling of specimens containing blood and body fluids is unavoidable. Proper handwashing techniques (both before and after handling) and use of gloves should be practiced while obtaining and transporting specimens. Specimen containers for labwork, blood gases, sputum, etc., should be labeled and placed in a clear plastic bag with identification slips attached to the exterior of the package. Zip-lock bags have been found to be ideal for this purpose.

The use of needles should be limited as much as possible. Incorporating stopcocks into the intravenous administration system markedly decreases the potential for inadvertent needlestick, reported to be the most frequent route of HIV transmission to health care workers. Research has proven that blood cells may indeed be present but invisible in intravenous tubing sets, presenting the risk of potential needle-syringe contamination.12 Unit-dosed medications and single-patient use of syringes and administration apparatus are being used and recommended on an increasingly frequent basis throughout U.S. health care institutions.

Respiratory precautions are of major importance to the anesthetist. The HIV virus has proven to be extremely fragile outside of the host from which it is transmitted. It is not an airborne pathogen and therefore cannot survive in the atmosphere. Consequently, there is no need for any particular air filtering components on ventilatory systems.18

Droplet contamination secondary to aerosolization either incorporated or collecting within the breathing circuit may be prevented. Numerous humidity and moisture exchange components possessing various degrees of microporous filtration properties and expiratory filters are commercially available. These products are currently being evaluated for their efficacy in preventing contamination.

Disposal of trash and linen is important, particularly due to the large amount of disposable products utilized in anesthesia practice today. Discarded supplies should be placed in impervious bags, filled three-quarters full and transported in leak-proof containers to their point of discharge.
Reusable equipment should be thoroughly cleaned with a detergent having antiviral properties. A standard sodium hypochlorite solution, or any comparable disinfectant, should be used to clean the equipment according to manufacturers’ recommendations.\textsuperscript{14} Spills should be immediately contained and removed according to recommended guidelines.

Post-anesthesia recovery areas should be tailored to the needs of each individual patient. While BSI precautions should be utilized at all times for any patient, additional intervention may or may not be warranted and/or appropriate in post-anesthesia recovery areas. Physical isolation should be considered for the patient who may be unable to control body fluids or who produces excessive environmental soilage. Each and every patient care situation should be evaluated individually to determine the appropriate intervention necessary to reduce the risk of transmission.

**Program implementation**

Successful initiation of a consistent BSI program requires adequate resources and direction. Consultation services from persons experienced in establishing BSI in the anesthesia and surgical environment can be advantageous. The effectiveness of such a program depends largely on administrative commitment and support.

Comprehensive and uniform mandatory education programs should be developed and provided for all employees, practitioners and physicians on a continual basis. Educational efforts should also be incorporated into employee orientation programs. Managers and supervisors should be adequately educated in order to act as advisors to employees and to monitor compliance with infection control guidelines. Proper procedure and protocol should become performance evaluation parameters and be addressed during each employee’s performance appraisal.

Training for a BSI system implementing universal precautions requires time and money. One major health maintenance organization has instituted a “Train the Trainers” program to educate core personnel throughout its multi-hospital system. These persons are then responsible for training groups of staff, practitioners and physicians working in a common department or area.

The initial increased costs incurred for training and supplies needed to initiate a BSI system will eventually be offset by savings resulting from the deletion of unnecessary infection control practices (i.e., isolation protocols) and, ideally, by a decreased nosocomial infection rate. Sufficient supplies and staff to maintain all aspects of a BSI system are crucial to its success.

Parameters to evaluate the efficacy of the BSI system are currently being established. Authors of the initial BSI protocol stress repetition of the system’s guidelines as a primary mechanism to ensure compliance.\textsuperscript{15}

**Operational concerns**

The degree of BSI systems management required in a given situation is dependent upon which specific patient practices and policies need to be developed, implemented and enforced. The inappropriate application of recommended standards can easily result in adverse outcomes. For example, the overuse and continual use of gloves that are not always changed between tasks have been attributed to an actual increase in nosocomial infection rates in one institution.\textsuperscript{11} Peer group support can be an effective mechanism to promote compliance with the BSI system.

Establishment of a reliable, confidential and accountable system for staff to report suspected or documented exposures to body substances is the responsibility of each employer. Compliance with any national, state or local legislation and ordinances is crucial. The system should decrease or eliminate anxiety and fear in order to prosper.

The continual provision of safe, high quality care and superior anesthesia services is a definite challenge. The incorporation of a successful BSI system into anesthesia practice will help providers to meet that challenge.

**REFERENCES**

(2) Personal communication with the AIDS Surveillance Department, Division of the Centers for Disease Control, Atlanta, Georgia, April 25, 1988.
(3) Garibaldi RA. 1986. Transmission of Hepatitis B and AIDS. Infection Control. 7 (2) :132-134.


April 27, 1988. Personal communication with M. Jackson, RN, MS, CC, Director of Epidemiology Unit, UCSD, San Diego, California.

Copies of Table I may be obtained through the Brevis Corporation, 3310 South 2700 East, Salt Lake City, Utah 84109; (801) 466-6677.

AUTHOR
Brent Sommer, CRNA, MPHA, is a graduate of Ohio University School of Nursing and The Ohio State University Hospitals Critical Care Internship Program. He graduated from the University Health Center of Pittsburgh School of Anesthesia for Nurses and completed postgraduate studies at the University of Pittsburgh and University of San Francisco.

Mr. Sommer is currently chief anesthetist and manager of Anesthesia Services for The Permanente Medical Group, Oakland, California. He also serves as clinical coordinator for prehospital training at The Western Institute, San Mateo, California.

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