

# ASHP Guidelines on Surgery and Anesthesiology Pharmaceutical Services

## Purpose

In hospitals, surgery and anesthesiology generally have been without direct pharmacist involvement. Drugs have been available through a stock-distribution system maintained by operating-room (OR) personnel, and documentation of controlled-substance use has often been handled by personnel other than those administering the drugs. More important, without direct pharmacist involvement, patient-related issues that are best addressed by a pharmacist usually have been handled by other health care personnel out of necessity. ASHP believes that pharmaceutical services (including drug-use control) to these areas should be provided by pharmacists, ideally with their direct presence. In many hospitals this is accomplished through an onsite satellite pharmacy.<sup>1-5</sup>

The purpose of these guidelines is to help pharmacists identify services they could provide in the areas of surgery and anesthesiology, decide on the scope of these services, and develop performance improvement plans. In addition, the appendix provides guidance for justifying and implementing a satellite pharmacy. Some topics outlined in these guidelines are the subject of other ASHP practice standards, which should be referred to for additional information and guidance. Pharmacists should use professional judgment in assessing their organization's needs for pharmaceutical services in surgery and anesthesiology. The guidance should be adapted, as applicable, to meet those needs.

The term "surgery and anesthesiology pharmaceutical services" should not be interpreted too literally. Many satellite pharmacies serving surgery and anesthesiology areas also serve other areas. These may include cystoscopy and endoscopy suites, cardiac catheterization laboratories or suites, pre-operative holding areas, postanesthesia care units (PACUs), labor and delivery rooms, freestanding surgical centers, and critical care areas. In general, these satellite pharmacies are termed "OR satellite pharmacies" and the pharmacist an "OR pharmacist." The guidelines do not distinguish among terms, because terms may be applied differently in various settings. The terms "satellite pharmacy" and "the pharmacist" are used in their broadest senses.

## Pharmaceutical Services

The successful establishment of pharmaceutical services in surgery and anesthesiology will depend to a large extent on the OR pharmacist's ability to positively affect drug-use management, take a leadership role in all aspects of cost containment, and contribute to improving patient care and outcomes.

The performance of many activities and services may be improved in surgery and anesthesiology through the establishment of pharmaceutical services. Often these include the following:

1. Drug preparation and distribution;
2. Drug inventory control;
3. Waste reduction;
4. Drug cost reduction;

5. Improved revenue generation through accurate patient billing;
6. Improved documentation of drugs administered to patients;<sup>6</sup>
7. Clinical activities;
8. Formulary management;
9. Drug accountability and control, including adherence to organizational drug-use guidelines;
10. Quality assurance and continuous quality improvement;
11. Compliance with standards of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO);
12. Informational, educational, and research activities;
13. Involvement with the use of drug administration devices; and
14. Enhanced interdisciplinary decision-making.

## Drug Preparation and Distribution

In most ORs, the drug preparation and distribution functions can be improved by pharmacy personnel practicing in this setting. These activities should not be so labor-intensive as to exclude cognitive services being provided by the pharmacist. Technicians should be assigned most of the drug preparation and distribution activities, under the supervision of a pharmacist. Drug preparation and distribution can be accomplished in various ways. For non-anesthesiology drugs and drugs that are not case specific, a secure general supply of predetermined medications in limited quantities (e.g., in cart or cassette) can be provided, with the understanding that these drugs may be used for any patient. Anesthesiology medications could be supplied by case or by daily stock replenishment (e.g., an "anesthesia cart"). Increasingly, automated medication storage and distribution devices (e.g., Pyxis Medstation [Cardinal Health]) are being used to supply medications to the anesthesiology, nursing, and surgery staffs. With these devices, automatic and more accurate patient charging is often realized and pharmacy staff spend less time in distribution activities. The methods chosen may depend on the preferences and needs of the anesthesiologists and surgery staff, available resources, and whether there is a satellite pharmacy. The choice should be based on the method that will provide accurate and timely delivery of medications to meet the needs of patients. The common objectives for all methods, however, are reducing the time spent by nursing and anesthesiology staff in gathering and preparing medications and maximizing patient safety by limiting the selection of drugs, quantities, and dosage forms.

## Drug Accountability and Control

The pharmacist should be responsible for all drugs and controlled substances dispensed and distributed in the setting. Pharmacy technicians could be assigned most of the responsibility for these daily activities. If there is a satellite pharmacy, all drug inventories, to the extent possible, should be centralized there. Minimal drug stock should be kept in each

surgical suite. Ideally, the satellite pharmacy should be staffed whenever the surgery and anesthesiology areas are normally staffed. If the satellite pharmacy is not open 24 hours a day, it may be necessary to establish an after-hours drug supply (e.g., a cart). The pharmacist should decide the drugs and quantities required for this supply and the accountability system to be used. The supply levels should be checked and replenished daily. With an OR pharmacy, trends in drug use or disappearance are more easily identified, noted, and reconciled. Systems to track drugs used, to adjust par levels as needed, and to monitor drug expiration dates should be devised.

## Clinical Services

Provision of clinical services should be a major focus of pharmacists practicing in the surgery and anesthesiology areas. These services may be similar to those provided to all other patient care areas. Clinical services can be provided by a pharmacist even without a satellite pharmacy.

To make effective clinical contributions, the pharmacist should be familiar with all drugs used in the setting, including drugs for general and regional anesthesia, neuromuscular blockade, analgesia, preoperative management, hemodynamic control, diagnosis and manipulation during surgery, prevention of infection, treatment of intraoperative emergencies, control of bleeding, and postoperative nausea and vomiting (PONV). Knowledge may be gained by observation of surgery and anesthesia procedures, attendance at anesthesia and surgery conferences, assigned topics to be presented by each pharmacy team member, review of pertinent literature, and direct clinical involvement in patient care. Clinical services may include the following<sup>7</sup>:

**Medication-Use Management.** The pharmacist is especially suited to taking a leadership role in medication-use management in the OR. This could be accomplished through the development of pharmaceutical practice guidelines and critical pathways for select surgical procedures, including intraoperative drug use. Guidelines are routinely developed for the neuromuscular blocking agents, synthetic opioids, propofol, antiemetic agents, volatile inhalation agents, and anti-infectives for surgical prophylaxis. Additional guidelines could be developed on the basis of organizational needs. It has been demonstrated that pharmaceutical practice guidelines for anesthesia-related medications reduce costs without adversely affecting patient outcomes.<sup>8–10</sup> With or without established guidelines, the presence of an OR satellite pharmacy allows the pharmacist to reinforce the appropriate use of agents dispensed from the pharmacy and to monitor patient outcomes.

**Medication-Regimen Review.** Whenever possible, medication requests from surgery or anesthesiology staff should be evaluated before the drug is dispensed for appropriateness (e.g., allergies, disease states, adherence to pharmaceutical practice guidelines), dose, route of administration, timing of administration, and cost compared with other therapeutic alternatives. The pharmacist should review the surgery schedule and routinely screen patient profiles or charts before surgery for allergies (e.g., antimicrobials, narcotics, latex) and notify appropriate personnel of pertinent findings. In addition, doses, timing, and choices of prophylactic antimicrobials should be monitored. Profiles or charts should also be reviewed whenever possible for potential perioperative

drug—drug or drug—disease interactions and for proper continuation of maintenance medications and discontinuation of unnecessary medications postoperatively.

**Medication-Use Evaluation.** The pharmacist should take a leadership role in the performance of medication-use evaluations by establishing criteria, collecting data, analyzing the data, making recommendations, and performing follow-up. Data collection is often more easily accomplished prospectively or concurrently by coordination with surgery and anesthesiology staff. High-cost or high-use medications are good starting places for medication-use evaluations in the OR. Medication-use evaluations are especially useful for assessing compliance with established guidelines. In organizations with automated anesthesia record keepers, collection and manipulation of medication-use information is greatly facilitated.<sup>11</sup>

**Drug Information.** The pharmacist should provide timely and accurate drug information in response to known needs and random inquiries. Inquiries may originate from any type of staff, including surgery and recovery-room staff, anesthesia staff, residents, nurses, perfusionists, and students. Drug information may be provided in oral or written form, as appropriate. The preparation of responses could require detailed literature searches with accompanying interpretations. The satellite pharmacy should maintain a body of pharmaceutical literature containing current primary, secondary, and tertiary literature sources. Scientific and professional practice journals in pharmacy, anesthesiology, and surgery should be directly available or readily accessible to support clinical decision-making for patients in the OR. Online drug information and access to the Internet should also be readily available to OR pharmacists. Reference texts should be current and should provide detailed information in at least the following areas: drug action, adverse effects, dosages, drugs of choice, efficacy, formulations, incompatibilities, indications for use, drug interactions, laws and regulations, pharmacology, pediatric medication administration (if applicable), nonprescription drugs, drug use during pregnancy and lactation, pathophysiology, pharmacokinetics, toxicology, surgery, and anesthesia. The pharmacist may also develop and distribute a newsletter and make available specific articles of interest to others in the setting. The pharmacist should have access to a formal drug information center.

**Formulary System.** The pharmacist should continually evaluate the organization's formulary and advise the medical staff and pharmacy and therapeutics (P&T) committee about drug efficacy, adverse-effect experiences, cost, and ongoing need for formulary agents. OR pharmacists can enforce P&T committee-approved restrictions on anesthesiology and surgery drugs and educate OR personnel on these restrictions.

**Drug Research.** The pharmacist should strive to initiate and participate in research related to drug use in surgery and anesthesia. Pharmacists could be principal investigators or could support the studies of others (e.g., perform randomization, prepare drugs, assist in study design and data collection). Because the OR is one of the most medication-intensive areas of a hospital, it is an excellent setting for pharmacoeconomic analyses and outcome studies.<sup>12–14</sup> These studies are best accomplished when they are collaborative. Given that newer anesthetic agents are often more expensive than

older ones, studies are useful for learning whether a higher drug cost will result in a lower total cost for the patient.

**Adverse-Drug-Reaction Monitoring and Reporting.** The pharmacist should monitor, detect, document, report, and recommend appropriate management of adverse drug reactions that occur in the OR. OR health care providers should be asked to report suspected adverse drug reactions to the OR pharmacist for follow-up.

**Education.** Educational presentations on drug-related topics should be made regularly by the pharmacist to surgery and anesthesiology residents and staff, nursing staff, pharmacy staff, and other personnel. This could include information on drugs added to the organization's formulary, drug precautions, periodic reviews of drugs used during cardiac and respiratory arrest, pain management, and the management of malignant hyperthermia and latex allergy. The pharmacist should also educate OR personnel about drugs used in the setting, giving special attention to the synthetic opioids neuromuscular blocking agents, anesthetic gases, intravenous anesthetic agents, local anesthetics, antiemetics, and antimicrobials (surgical prophylaxis).

Formal educational rotations in the satellite pharmacy may be conducted for undergraduate and graduate pharmacy students, pharmacy residents, or pharmacy fellows. Specific learning and experiential goals and objectives should be developed. The student should learn about satellite pharmacy services and preoperative, intraoperative, and postoperative medication therapy through didactic instruction, observation, project participation, and selected readings. Rotations should be coordinated with the anesthesiology and nursing departments.

**Rounds.** When possible, the pharmacist should be an active participant with anesthesia, surgery, and PACU staff in patient care rounds. The pharmacist may limit rounds to specific types of patients (e.g., cardiothoracic surgery, transplant) for whom the pharmacist's preoperative or postoperative involvement may be most beneficial. The pharmacist should participate in anesthesia grand rounds, morbidity and mortality reviews, and other scheduled educational sessions as appropriate. Pharmacy grand rounds could be conducted by pharmacy staff to provide detailed drug information or to supplement anesthesia grand round topics.

**Pain Management.** The pharmacist should participate actively in epidural anesthesia, patient-controlled analgesia, and other pain-management programs. Participation could include the development of such a program, identification of appropriate patients, patient education, drug preparation, educational presentations to other staff, and participation in rounds with acute-pain-management teams as time permits.

**Participation in Emergency Life Support.** The pharmacist should be authorized to participate in the medication therapy for cardiac or respiratory arrests that occur in the OR. At a minimum, the pharmacist should have current certification in basic cardiac life support (BCLS) procedures and, preferably, training in advanced cardiac life support (ACLS). The pharmacist should also participate in the treatment of malignant hyperthermia by preparing and maintaining malignant hyperthermia emergency kits and preparing and administering medications used to treat malignant hyperthermia.

**Pharmacokinetic Management and Consultation.** The pharmacist should participate in the pharmacokinetic management of patients and should serve as a consultant to surgery and anesthesiology staff on pharmacokinetic of medications dosing.

**Compliance with JCAHO Standards.** The presence of pharmacy personnel in the surgery and anesthesiology areas, especially with an established satellite pharmacy, could help to ensure adherence to Joint Commission standards. Specifically, pharmacy plays a key role in compliance with the standards related to the medication-use process. These include reviewing medication orders; considering patient information when preparing and dispensing medication(s); ensuring pharmaceutical services are available when the pharmacy department is closed or pharmacy personnel are not available; controlling the preparation and dispensing of medication(s) (drugs should be secure from tampering, safe from patient-to-patient contamination, and properly labeled); ensuring that emergency medications are consistently available, controlled, and secure in the pharmacy and patient care areas; and monitoring the effects of medications on patients.

**Documentation of Clinical Activities.** The pharmacist should document clinical activities and identify activities leading to improved patient outcomes and cost reductions. This type of information is critical in order for the pharmacist to prove his or her value and the ongoing need for the services provided. The pharmacist is responsible for safeguarding the patient's rights to privacy and the confidentiality of the patient's clinical information.

## Controlled Substances

All controlled-substance procedures should comply with applicable federal and state laws and regulations as well as the organization's policies and procedures. Procedures for the satellite pharmacy and the surgery and anesthesiology areas served should address the following:

1. Controlled substances (and other drugs) to be monitored;
2. Methods of distribution;
3. Records;
4. Ordering;
5. Storage, access, and inventory control;
6. Reconciliation and disposal;
7. Discrepancy reporting and disciplinary action; and
8. Performance of quality control checks.

The goal of the controlled-substance system is to prevent diversion yet be practical enough that patient care is not adversely affected. The system should limit exposure to controlled substances, be accountable and consistent, and contain an educational component for health care personnel.<sup>15</sup>

**Controlled Substances (and Other Drugs) to Be Monitored.** The pharmacist should be responsible for monitoring the use of all controlled substances. As required (e.g., because of abuse or diversion potential), drugs other than controlled substances (e.g., ketamine) could also be handled according to procedures similar or identical to those used for controlled substances.

## Methods of Distribution

One of two primary methods could be used for distribution of controlled substances in the OR: a per-case method or a daily-supply method.

A per-case system is advantageous in that it minimizes the quantity of controlled substances available to the anesthesiologist and the anesthetist at any one time and allows for a good audit trail. Its major disadvantage is that it is very time intensive for an organization that performs many surgeries per day. This time may be better spent by the pharmacist in clinical activities.

Daily distribution of controlled substances is less time intensive and can be accomplished from a central pharmacy or an OR satellite pharmacy. Its disadvantages are that greater amounts of controlled substances are dispensed at one time and that these substances need to be kept secure throughout the day.

The various advantages and disadvantages of each method must be considered and the appropriate system selected on an organization-specific basis.

To the extent possible, controlled substances should be distributed only in response to signed orders or oral requests from prescribers. Given the urgency often present during surgical procedures, the necessity for prescribers to devote undivided attention to anesthesia procedures, and the use of sterility-safeguard procedures during surgery, it may not always be possible to comply with such a requirement. When it is possible, the organization's standard physician-order sheet or a special controlled-substance request form developed specifically for use in the surgical suite could be used. A par level of controlled substances needed per type of case or for the day could be devised; requests for controlled substances beyond this would be treated as special orders. Whatever the methods used, clear documentation that all controlled substances used were administered to the patient should be signed by the responsible prescribers at the end of each surgical procedure. Ideally, unused controlled substances drawn up by the anesthesiologist should be returned to the satellite pharmacy and wasted by the pharmacist. Alternatively, controlled substances could be disposed of by the anesthesiologist in the presence of a witness, with both parties documenting the disposal. No matter the system, disposal of contaminated controlled substances (e.g., with blood or other body fluid) should occur in the OR and be properly documented.

## Records

Records should be kept of the following:

1. Controlled substances dispensed;
2. Controlled-substance inventories;
3. Controlled substances returned (including controlled substances drawn up but not used), and records reconciliation;
4. Controlled substances disposed; and
5. Controlled-substance use, categorized by prescriber.

If the satellite pharmacy does not provide 24-hour services, the documentation procedures for after-hours use should be as similar as possible to those used when the satellite pharmacy is staffed. This will help ensure staff efficiency and familiarity with the record-keeping requirements after hours. Forms specific to the setting and to the after-hours circumstance may have to be developed.

## Ordering

The pharmacist should be responsible for ordering all controlled substances for the satellite pharmacy. Once received, the controlled substances should be added to the satellite pharmacy's stock and recorded in inventory records. If the satellite pharmacy does not provide 24-hour services, the pharmacist is responsible for ensuring that adequate supplies are available in a secure, specially designated after-hours location. The pharmacist should maintain controlled-substance inventory amounts sufficient only to meet the needs of the OR for a reasonable time. This time should depend on the frequency and timeliness with which controlled substances are available from the central pharmacy. Less inventory is required, for example, if controlled substances are ordered on a daily basis rather than less often. The inventory system should be perpetual in order to provide the most current record of controlled substances on hand.

Shortly after the initial opening of a satellite pharmacy and after drug use has stabilized, stock levels should be reassessed and adjusted as needed. During ordering, the pharmacist should note developing trends in use. Nonformulary controlled substances should be dispensed only by special request.

## Storage, Access, and Inventory Control

Controlled substances should be stored in a locked space (e.g., cabinet, drawer, cart) within the satellite pharmacy. These storage spaces should remain locked when controlled substances are not being dispensed. Access to the space should be limited to satellite pharmacy personnel. If 24-hour satellite pharmacy services are not provided, a separate locked after-hours storage space will be required. Kits of after-hours controlled substances may be useful. No matter how they are configured or located, all after-hours supplies should be checked and all records reconciled by satellite pharmacy staff on the first working day after the after-hours supplies are entered.

If possible, one person per shift should be identified as being responsible for controlled substances (and related procedures) when the satellite pharmacy is not open. That person should have access (key or code) to locked after-hours supplies. This approach enables more consistent record keeping, limits the number of people with access to after-hours supplies, and enables more reliable monitoring of controlled-substance use. Individuals often assigned this responsibility include an "in-charge" nurse or the "first-call" anesthesiology resident.

Controlled-substance inventories should be verified by physical count at least once daily. If the satellite pharmacy is open for two shifts, an end-of-shift count by the morning pharmacist is recommended. The use of automated medication storage and distribution devices for controlled substances may be a timesaving benefit for maintaining a perpetual inventory. Unscheduled audits of controlled substances in the satellite pharmacy should be done by staff not normally assigned to this setting. The results should be documented.

## Reconciliation and Disposal

A thorough system for reconciling controlled-substance use should be developed and include the following components<sup>16-18</sup>:

1. *Comparison of quantities dispensed with quantities documented as administered.* The quantity of controlled substances returned to the satellite pharmacy should be compared with the quantity dispensed. The amount dispensed should equal the amount returned (unopened and partially filled containers and partially used syringes) plus the amount documented as administered.
2. *Verification of use through review of the anesthesia record.* The anesthesia record should be reviewed to ensure that the amount documented as administered (in records returned to the satellite pharmacy) is identical to the amount documented in the patient's anesthesia record. This verification is ideally done for all cases but may be done by periodic audits of randomly selected cases if anesthesia records are not readily available for every case.
3. *Qualitative testing of returned controlled substances.* To verify that unadulterated drug is contained in partially used containers returned to the satellite pharmacy, a refractometer or other device can be used. It is important to randomly audit controlled-substance returns in order to detect trends in diversion. The organization's legal department should be consulted to make sure such testing is permitted.

The pharmacist should account for all controlled substances dispensed and should report all discrepancies to internal and external authorities as required.

Disposal of controlled substances (e.g., partially used syringes) should be done in the satellite pharmacy by a member of the pharmacy staff in the presence of a witness. This action should be documented in the satellite pharmacy's controlled-substance records.

## Communication and Education

It is important that there are open lines of communication among the pharmacist, the chair of anesthesiology (or designee), and the head surgical nurse to allow sharing of information indicative of diversion (e.g., behavioral change). In addition, periodic continuing education for all members of the OR team on the potential for substance abuse may sensitize staff to this problem.<sup>15</sup>

## Performance Improvement

The pursuit of continuous improvement in the quality of services provided should be a philosophy of practice of the pharmacist and the satellite pharmacy staff.<sup>19</sup> In that light, many activities may be seen as pertinent to performance improvement efforts. Some of these are the following:

1. Adverse-drug-reaction monitoring and reporting,
2. Medication-error monitoring and reporting,
3. Medication histories,
4. Periodic inspections of all drug storage sites,
5. Drug therapy monitoring related to improved patient outcome (e.g., decreased time in the PACU, decreased frequency of PONV),
6. Medication-use evaluations,
7. Drug-interaction monitoring,
8. Controlled-substance monitoring,
9. Quality control of compounded parenterals (e.g., cardioplegic solutions) and batch-prepared syringes,
10. Medication-waste monitoring, and

11. Allergy and patient demographic monitoring.

Some of these activities should not be difficult to implement in a satellite pharmacy, because ongoing procedures should already be developed for the organization overall. Sometimes, it may be necessary to develop new programs or variations of existing ones tailored to the surgery and anesthesiology areas.

## Other Activities

**Policies and Procedures.** If there is a satellite pharmacy, the pharmacist should develop and maintain policies and procedures for the satellite pharmacy and its services. There should be policies and procedures for the preparation of drug kits (if applicable), medication distribution systems, controlled-substance handling, hours of operation, preparation of parenteral products, expiration-date checking and monthly inspections, recycling of products, monitoring of drug inventory levels, staff training, quality assurance activities, and after-hours drug distribution.

**Interdisciplinary Interfaces.** The pharmacist should function as a liaison between the pharmacy department and all staff in the setting served, including anesthesiology, nursing, and surgery staff; perfusionists; and management staff. The pharmacist should represent the pharmacy department on appropriate interdisciplinary committees charged with evaluating or making recommendations about services and medication selection and use in the surgery and anesthesiology areas. A committee specifically designed to focus on pharmacy matters may be appropriate.

**Financial Analysis.** The pharmacist should document drug costs, service costs, revenues, and savings attributable to the satellite pharmacy and the activities (clinical and distributive) of its staff. If there is no OR satellite pharmacy, some of the aforementioned items will not need to be included in the analysis. Financial reports should be prepared periodically (e.g., quarterly, annually) and provided to the hospital administration and the departments of anesthesiology, surgery, and pharmacy.

## The Pharmacy Technician's Role

Pharmacy technicians assigned to the satellite pharmacy should be trained to perform their assigned functions. It is critical and appropriate for the technician to do most of the drug distribution-related activities in the satellite pharmacy. Within the total work force of pharmacy technicians in the organization, it is desirable to have some technicians trained as available back-up staff for the satellite pharmacy. Technicians should be trained and certified by the Pharmacy Technician Certification Board or equivalent. In general, technician training and experience should include parenteral drug preparation, drug distribution procedures, physician-order interpretation, anesthesia and OR record interpretation, computer order entry, and controlled-substance record keeping. Specific training should include a review of the following:

1. Procedures unique to surgical suites, including special apparel (e.g., caps, masks, foot covers) and restricted movements and areas within surgical suites;
2. Surgical-suite terms, including abbreviations and acronyms used to name surgical procedures;

3. Drug classes, indications for use, and proper handling of drugs routinely used in surgical suites (e.g., special packaging, preservative requirements for spinal and epidural drugs, infusion concentrations);
4. Controlled-substance procedures;
5. Emergency drugs typically used in surgical suites; and
6. A review of the role of the pharmacy technician in the OR pharmacy area.

Typical activities performed by pharmacy technicians in the satellite pharmacy under the supervision of the pharmacist are drug distribution, controlled-substance handling, sterile drug preparation, drug ordering and restocking, orientation and training of new staff, and quality assurance activities. Each of these will be discussed in greater detail.

**Drug Distribution.** The technician could distribute medications to storage sites in the setting and prepare per-case or per-prescriber kits of medications and distribute these after they have been checked by the pharmacist. If automated medication storage and distribution devices are used, the technician is responsible for all activities associated with restocking these. Given the nature of surgical procedures and the urgency of the need for the requested medications, distribution would be required in response to oral requests. The pharmacist should screen such requests to ensure proper choices of drugs for specific patients. The technician should be trained to ask about patient allergies and relay this information to the pharmacist before preparing a medication. The technician also should be taught which situations must be handled by the pharmacist (e.g., drug information, dose calculations).

The technician could return unused drugs to stock and charge patients or departments for medications used.

Another technician function could be to check and replenish after-hours drug supplies and charge medications used to appropriate patients or departments.

The technician could be responsible for monthly inspections of drug storage areas and drug supply areas in the satellite pharmacy. Technicians should be assigned their own inspection zone when drugs are stored in many places.

**Controlled Substances.** Other responsibilities of the technician could be the distribution of controlled substances and the creation of appropriate records according to the distribution procedures of the satellite pharmacy and according to federal and state laws and regulations. Typical activities could include helping with inventory counts, maintaining perpetual inventory records, disposing of controlled substances with the pharmacist, and participating in audits, assays, and preparation of reports.

**Sterile Drug Preparation.** The technician could aseptically compound, package, and label sterile drugs—for injection and for irrigation—and document all products made. Appropriate records of drug name, diluent, lot numbers, and expiration dates of batch-prepared products should be maintained by the technician.

**Drug Ordering and Restocking of the Pharmacy Satellite.** In addition, technicians could routinely order replenishment supplies of drugs for the satellite pharmacy, check supplies delivered in response to the orders, and place the stock in appropriate places. Requests for odd medications or unusual trends in medication demand should be reported to the pharmacist for further review.

**Orientation and Training of New Staff.** Helping with the orientation and training of new staff (including other technicians and pharmacy students) could also be a responsibility of the technician. An orientation checklist, workflow sheets, and task lists are helpful training tools. An OR pharmacy student module would be a helpful teaching tool for students on rotation in the satellite pharmacy.

**Quality Assurance.** The technician could be involved in quality assurance activities of the satellite pharmacy. Such activities may include regular controlled-substance audits or assays, microbiological monitoring of parenteral drugs prepared, and inspections of drug supplies (e.g., expiration dates).

## Summary

Pharmaceutical services in surgery and anesthesiology should be the standard of practice in health care organizations across the United States. Although not essential, an onsite satellite pharmacy would help in the provision of these services. A majority of distribution-related activities should be done by technicians. The availability of automated devices and other technology may lessen, to some extent, the time devoted to drug distribution. It is important for the OR pharmacist to concentrate on the provision of clinical services, such as medication-use management, drug information services, medication-use evaluations, formulary management, and pharmaco-economic analyses of anesthesia-related medications. These activities provide the best opportunity for the pharmacist to contribute to improving patient care and outcomes and containing costs. Finally, pharmaceutical services in surgery and anesthesiology should be periodically assessed for patient care and financial effectiveness.

## References

1. Powell PJ, Maland L, Bair JN et al. Implementing an operating room pharmacy satellite. *Am J Hosp Pharm.* 1983; 40:1192–8.
2. Opoien D. Establishment of surgery satellite pharmacy services in a large community hospital. *Hosp Pharm.* 1984; 19:485–90.
3. Keicher PA, McAllister JC III. Comprehensive pharmaceutical services in the surgical suite and recovery room. *Am J Hosp Pharm.* 1985; 42:2454–62.
4. Buchanan EC, Gaither MW. Development of an operating room pharmacy substation on a restricted budget. *Am J Hosp Pharm.* 1986; 43:1719–22.
5. Vogel DP, Barone J, Penn F et al. Ideas for action: the operating room pharmacy satellite. *Top Hosp Pharm Manag.* 1986; 6:63–80.
6. Donnelly AJ. Multidisciplinary approach to improving documentation of medications used during surgical procedures. *Am J Hosp Pharm.* 1989; 46:724–8.
7. Shafer AS. Clinical pharmacy practice in the operating room. *J Pharm Pract.* 1993; 6:165–70.
8. Gora-Harper ML, Hessel E II, Shadick D. Effect of prescribing guidelines on the use of neuromuscular blocking agents. *Am J Health-Syst Pharm.* 1995; 52:1900–4.
9. Freund PR, Borolle TA, Posner KL, et al. Cost-effective reduction of neuromuscular-block drug expenditures. *Anesthesiology.* 1997; 87:1044–9.

10. Lubarsky DA, Glass PSA, Ginsberg B, et al. The successful implementation of pharmaceutical practice guidelines. *Anesthesiology*. 1997; 86:1145–60.
11. Lubarsky DA, Sanderson IC, Gilbert WC, et al. Using an anesthesia information management system as a cost containment tool. *Anesthesiology*. 1997; 86:1161–9.
12. Loriglin KA, Weingarten CM, Nagelhout J, et al. A pharmacoeconomic analysis of neuromuscular blocking agents in the operating room. *Pharmacotherapy*. 1996; 16:942–50.
13. DeMonaco HJ, Shah AS. Economic considerations in the use of neuromuscular blocking drugs. *J Clin Anesth*. 1994; 6:383–7.
14. Tang J, Watcha MF, White PF. A comparison of costs and efficacy of ondansetron and droperidol as prophylactic antiemetic therapy for elective outpatient gynecologic procedures. *Anesth Analg*. 1996; 83:304–13.
15. Castellano FC. Developing methods for preventing and detecting substance abuse in the operating room: a disease approach. *J Pharm Pract*. 1993; 6:159–64.
16. Satterlee GB. System for verifying use of controlled substances in anesthesia. *Am J Hosp Pharm*. 1989; 46:2506–8.
17. Shovick VA, Mattei TJ, Karnack CM. Audit to verify use of controlled substances in anesthesia. *Am J Hosp Pharm*. 1988; 45:1111–3.
18. Gill DL, Goodwin SR, Knudsen AK, et al. Refractometer screening of controlled substances in an operating room satellite pharmacy. *Am J Hosp Pharm*. 1990; 47:817–8.
19. Hawkins PR. Quality improvement: pharmacy involvement in the operating room. *J Pharm Pract*. 1993; 6:171–6.

### Appendix— Justifying and Implementing an Operating-Room Satellite Pharmacy

Justification of the need for a satellite pharmacy is a critical step in establishing pharmaceutical services in surgery and anesthesiology.<sup>1,2</sup>

The pharmacist's ability to positively affect medication-use management, to take a leadership role in all aspects of cost containment, and to contribute to improved patient care and outcomes must be highlighted.

**Familiarization with Surgery and Anesthesiology Pharmaceutical Services.** As an initial step, the person in charge of the project should become familiar with typical surgery and anesthesiology satellite pharmacy services. Review of pertinent literature, discussions with pharmacists in other organizations, and site visits to established satellite pharmacies are methods of accomplishing this step. The site visit is especially useful, because it can reinforce and further define information gained by other means. At the conclusion of this step, the pharmacist should have a realistic view of the types and scope of services typically provided.

**Obtaining Support.** If justification is to be successful, the support of key individuals from the major departments affected by the service should be obtained.<sup>1</sup> In most organizations, these are hospital administration, anesthesiology (anesthesiologists and certified registered nurse anesthetists), and surgery, operating-room (OR), and postanesthesia care unit nursing.

The support of the anesthesiology department is necessary because this department represents the major users

of medications in the OR and has significant patient care responsibilities in this setting. Support for pharmaceutical services from anesthesiology department administration is important for the success of the project. If the request for satellite pharmacy services originates in the anesthesiology department, the justification process may be simpler and more collaborative. Data gathered during the preliminary review of the site and information obtained from the literature can be used when the project is discussed with anesthesiology administration. It may be valuable to solicit the support of any anesthesiologists who have been especially receptive to pharmacy involvement. Many anesthesiologists have had positive experiences with OR pharmaceutical services at other organizations. The proposal for a satellite pharmacy might then be presented jointly by pharmacy personnel and anesthesiologists. Once formalized, the proposal should be presented to hospital administration. The administration's opinion will provide some guidance on how to facilitate the approval process for the satellite pharmacy.

If conceptual support from these groups is obtained, development of a more formal proposal can begin. If there are still concerns about the benefits gained from OR satellite pharmacy services, it may be helpful to propose an interim step to expose more hospital staff to OR pharmaceutical services in order to keep the process moving forward. One possible approach is to suggest that a pilot project be conducted involving several ORs or one specific surgical specialty. The establishment of a permanent satellite pharmacy would depend on favorable results from the pilot project.

**Initial Assessment of Setting.** A general review of the surgery and anesthesiology areas to be served by the satellite pharmacy should be done after staff have become familiar with the project. At this time, it is not essential that detailed information be obtained. Useful information to collect includes the following:

1. All locations and quantities of drugs stored in the setting,
2. The location and storage of controlled substances,
3. Controlled-substance accountability systems used,
4. Drug preparation and distribution procedures used in the setting,
5. Billing systems used for all drugs,
6. Stock replenishment and rotation systems used, and
7. The role (or potential role) of automation in the involved areas.

The collection of this information could be speeded by a tour of the area and by inquiries through nurses, anesthesiologists, supply technicians, surgeons, and other OR personnel (e.g., perfusionists).

**Formal Proposal.** The development of a formal proposal is an important part of the justification process. It is essential that the proposal be well organized and factual. The writers of the proposal should expect the proposal to be examined in great detail by hospital administration and others during the decision-making process. The proposal should expand upon the information obtained in the initial review of the surgery and anesthesiology areas. Information that should be in the proposal includes the following:

1. The dollar value of current drug inventory,
2. The dollar value of drugs used per period (e.g., per year),

3. The dollar value of patient charges currently generated,
4. The estimated dollar value of increased revenue,
5. The average cost of drugs used per surgical case,
6. An estimated cost of drug waste per period,
7. The general quality and completeness of controlled-substance records,
8. The number of controlled-substance discrepancies reported per month,
9. The number of reports of drug-related incidents received per month,
10. The time personnel in the setting currently spend performing pharmacy-related activities,
11. The time pharmacy personnel currently spend performing activities for the setting, and
12. Opportunities for collaborative efforts by pharmacy–anesthesiology, pharmacy–nursing, pharmacy–perfusion, and pharmacy–surgery in drug-use management (e.g., development of pharmaceutical practice guidelines, performance of medication-use evaluations).

Collection of this information could be helped through the formation of a multidisciplinary team. Representatives of the departments of pharmacy, anesthesiology, nursing, and surgery should be included. This approach has several benefits. Data collection can be expedited, because the expertise of each individual can be used. The value of a satellite pharmacy will be continually reinforced to these individuals, and all groups will have input into the decision-making process.

A formal proposal should be prepared once the required information has been collected. Minimally, the proposal should contain the following sections<sup>1</sup>:

1. Introduction;
2. Statement of problems and anticipated benefits (and beneficiaries);
3. Summary of the proposed services;
4. Cost–benefit analysis, including staffing, estimated cost savings, revenue projections, and inventory savings; and
5. Implementation plan.

During preparation of these sections, it is important to be as specific as possible and to assign dollar values whenever these are available. The proposal should be endorsed by the members of the multidisciplinary team and should be submitted to the administration by the director of pharmacy. Careful planning, data collection, analysis, and presentation of the information gathered will make approval more likely.

**Implementation.** Implementation should begin as soon as possible after administrative approval.<sup>1</sup> Implementation steps should be planned and executed in a clear, concise manner. To guide planning, an implementation time line should be developed (e.g., Gantt chart), listing the steps to be taken, the task force member responsible for each step, and the expected amount of time required for each activity. The amount of time required for each activity may vary from organization to organization, but the order in which the steps should be performed will be reasonably standard.

The major implementation steps and an approximate order in which they should be completed are as follows<sup>1</sup>:

1. Obtain a formal commitment of space,
2. Assign a project leader (who should be responsible for the project's development and need not be the pharmacist

who will be assigned to staff the satellite pharmacy; often, it is valuable for the project leader to be a supervisor or assistant director),

3. Identify construction and equipment needs,
4. Oversee construction work,
5. Obtain and install equipment,
6. Draft policies and procedures (e.g., controlled-substance accountability, medication distribution system, inventory control),
7. Develop job descriptions,
8. Select staff (pharmacists and support personnel),
9. Design and print forms,
10. Formalize policies and procedures,
11. Determine satellite pharmacy drug-stock levels,
12. Train staff,
13. Identify back-up and relief staff and orient them to the setting,
14. Educate nursing staff,
15. Educate anesthesiology department staff,
16. Educate surgeons,
17. Open the satellite pharmacy for operation,
18. Determine future goals for service, and
19. Determine systems for periodic analyses of the impact of the program.

Many of these steps can be expedited by a close working relationship with members of the anesthesiology and nursing departments.

The satellite pharmacy's services should be monitored and evaluated on an ongoing basis through workload statistics, data on controlled-substance discrepancies, financial data, and patient outcomes data. In addition, the satisfaction levels of the nursing and anesthesiology staffs should be assessed before the program is implemented, six months after implementation, and yearly after that.

## References

1. Vogel DP, Barone J, Penn F, et al. Ideas for action: the operating room pharmacy satellite. *Top Hosp Pharm Manage.* 1986; 6:63–80.
2. Ziter CA, Dennis BW, Shoup LK. Justification of an operating-room satellite pharmacy. *Am J Hosp Pharm.* 1989; 46:1353–61.

---

*These guidelines were reviewed in 2003 by the Council on Professional Affairs and by the Board of Directors and were found to still be appropriate.*

Approved by the ASHP Board of Directors November 14, 1998. Developed through the ASHP Council on Professional Affairs. Supersedes the ASHP Technical Assistance Bulletin on Surgery and Anesthesiology Pharmaceutical Services dated November 14, 1990.

Copyright © 1998, American Society of Hospital Pharmacists, Inc. All rights reserved.

The bibliographic citation for this document is as follows: American Society of Health-System Pharmacists. ASHP guidelines on surgery and anesthesiology pharmaceutical services. *Am J Health-Syst Pharm.* 1999; 56:887–95.