Controlled Substance Dispensing and Accountability in United States Anesthesiology Residency Programs

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Controlled substance dependence (CSD) among anesthesiology personnel, particularly residents, has become a matter of increasing concern. Opinions vary as to the effectiveness of controlled substances (CS) accountability in deterring, identifying, or confirming CSD. A survey of program directors of American anesthesiology training programs was conducted in the summer of 1990 to determine the level of CS dispensing and accountability within their programs. The survey demonstrated that CS dispensing and accountability varied considerably among programs, among hospitals associated with individual programs, and within geographically distinct anesthesia delivery areas within the same hospitals. Nevertheless, most institutions were moving toward improved methods of CS dispensing and providing more and better CS accountability. The presence of significant CSD, particularly among anesthesiology residents, was reconfirmed. We were unable to correlate the level of accountability of CS with the incidence of CSD. It remains to be seen to what extent CS accountability will continue to develop and whether CSD prevalence will then be changed. (Key words: Accounting control systems. Analgesics, intravenous. Anesthesics, intravenous addiction. Controlled substance dependence.)

CONTROLLED SUBSTANCES (CS), i.e., opioids, benzodiazepines, barbiturates, and to a lesser extent cocaine, are routinely used in anesthesia. Because of the great potential of diversion of these drugs for personal use, their dispensing must be closely monitored by accounting systems.† Presumably, the accountability hurdles are intended to detect or prevent diversion.

Our personal communications with anesthesiologists routinely have indicated uncertainty about how to provide an accounting of drug dispensing or whether it is accurate or effective for diversion reduction. To gather more precise information on these issues, we performed a survey of clinical anesthesia training programs to learn what methods of dispensing and accountability are being used. We also attempted to determine the frequency of substance dependence among anesthesia personnel.

Materials and Methods

A survey was designed by the authors, with assistance from the Oregon Health Sciences University Office of Nursing Research. Suggestions from a joint committee of the American Society of Anesthesiologists Committee on Occupational Health of Operating Room Personnel, in association with a group from the American Society of Hospital Pharmacists, were included in the survey. The authors will supply copies of this survey on request.

The survey requested information regarding demographics and methods of dispensing CS. The methods of dispensing that we included in our survey have been described.2-5 These were as follows: a nurse who, on request, dispenses CS from a central locked container (the traditional method); individual anesthesia providers who have containers at their disposal, usually locked, that have a basic inventory of CS from which the provider dispenses CS; satellite pharmacies in anesthesia delivery areas that dispense CS to the anesthesia provider; and dispensing machines that provide an automated dispensing system. The survey also inquired about methods of daily and periodic accounting for CS use. It included questions regarding the degree to which a two-person checking system, with or without the anesthetic record, was used to determine the amounts of CS administered and residual amounts discarded; whether individual anesthesia provider usage audits were performed; and whether chemical analysis was used to check residual discarded samples. These specific, diversion-detecting accounting methods also have been described.6-8 If increased accountability occurred, we asked for the year when it had changed. The survey was designed to assess consistency of dispensing and monitoring CS among geographically distinct anesthesia delivery areas (main operating room, obstetric department, outpatient surgery, etc.), hereafter referred to as "anesthetizing areas." This was determined within the parent institutions and also within any affiliated hospitals of the teaching program.

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Received from Oregon Health Sciences University, Department of Anesthesiology, Portland, Oregon. Accepted for publication April 14, 1992. Presented in part at the annual meeting of the American Society of Anesthesiologists, San Francisco, California, October 1991.
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Finally, we inquired as to the occurrence of controlled substance dependence (CSD) (not including alcoholism) for 1985–1989.

In June of 1990, the survey was sent to all Society of Academic Chairpersons and Program Directors of all freestanding anesthesiology residencies. One hundred sixty-eight requests were sent. Subsequently, programs without residents enrolled were eliminated, leaving 158 possible returns.

We distributed additional questionnaires to each Program Director so that any affiliated hospitals associated with residency programs also could be surveyed. Anonymity was permitted. A follow-up letter was sent to nonresponders 4 weeks after the initial mailing.

The data were compiled to demonstrate the degree to which the various hospitals associated with teaching programs used various CS dispensing and accountability methods. Chi-square analysis was used to compare the incidence of CSD in hospitals using at least one diversion-detecting accountability method and hospitals not using any of these accounting techniques.

Results

We received responses from 102 program directors or their designees (64% response rate) from programs with residents in training. Four responses were returned from programs currently without residents and were not included in the statistical analysis. Fourteen responses were anonymous. Twenty-one respondents returned more than one survey questionnaire, from the primary institution and from one or more affiliated teaching hospitals. Hereafter, these are referred to as “multiple responses.” We had a total of 137 usable survey responses. There was a very slight variation in the total number of answers to individual survey questions because of incomplete or unanswered questions.

Demographic Data

The approximate number of personnel associated with all institutions responding was 2,461 faculty anesthesiologists, 1,278 certified registered nurse anesthetists, and 2,890 anesthesiology residents. The latter represented approximately 60% of the 4,876 residents for the 1989–1990 academic year.

The number of residents from the programs sending multiple responses was inferred from the response with the largest number of residents. Each response from the multiple responses, primary or affiliated, was given separate credit for faculty anesthesiologists and certified registered nurse anesthetists.

Eighty of 136 institutions had more than one anesthetizing area in the hospital. Thirty-nine had more than two.

Drug-DISPensing Method

The different methods of dispensing CS used for 134 institutions are summarized as follows.

1. Traditional nurse dispensing. A surgical registered nurse or a certified registered nurse anesthetist dispensed the drug to the anesthesia providers in 56 (41.7%) institutions. This was the most common method of dispensing CS.

2. Anesthesia controlled “locked box.” Sixteen (11.9%) hospitals used this method. Various individuals, including anesthesiology staff, pharmacists, and other personnel stocked and/or concurred with the accounting for these drugs. It was unclear from the responses whether after-hour dispensing was different in 2 of these hospitals. In 5 hospitals, nurses dispensed CS in the obstetric units.

3. Central pharmacy locked-box control. Ten (7.4%) hospitals used this method. Anesthesia providers had their locked box restocked and CS usage tabulated by a central pharmacy. However, nurses dispensed drugs in 4 of the obstetric theaters in these institutions.

4. Dispensing machines. Six (4.4%) hospitals used a vending machine† from which individual providers obtained CS. Four of the six hospitals using vending machines used nurse dispensing in the obstetrics department.

5. Satellite pharmacy. A satellite pharmacy, located adjacent to or in the main operating room and operated by pharmacists and/or pharmacist technicians was present in 46 (34.3%) hospitals. The hours of operation varied from as little as 1 h, 5 days per week to 24 h, 7 days per week. CS dispensing for other anesthetizing areas and during times when pharmacists were not available was done using a variety of other methods in 35 of the 46 hospitals. Individual patient dispensing was carried out by 35 of these satellite pharmacies, and the other 11 allowed providers to check out drugs for more than one patient at a time.

6. Three responses were ambiguous as to dispensing methods.

We compared dispensing methods with the number of anesthetizing areas. Of the 80 institutions with more than one area, 38 had similar methods of drug dispensing in all areas, and 42 had two or more methods in the different areas.
ACCOUNTING METHODS

Table 1 summarizes the methods by which 135 responding institutions performed CS accounting. Some institutions used more than one method and different methods in separate anesthetizing areas. Accountability methods in different anesthetizing areas were frequently inconsistent. Forty-two hospitals that had more than one anesthetizing area provided the same degree of accountability for all areas, and 38 had different accountability standards in various areas.

Twenty-nine institutions (21%) recorded the type and amount of CS dispensed to each provider as their sole means of accounting. Ninety-two institutions (68%) summarized their daily CS use. (We did not ask whether this was actually done daily for each anesthesiology provider.) Eighty-nine institutions (66%) used two persons to compare the amounts of CS received and returned.

Sixty-one institutions (45%) used the anesthetic record in comparing daily amounts of CS received and returned; of these, 50 (37%) did the comparison with two persons. Thirty-four did it for all anesthetizing areas. Sixty-six (49%) randomly reviewed the anesthetic records and compared the "narcotic log" to check for amounts of CS administered and discarded. Thirty-three hospitals indicated that both a daily and a random anesthetic record for opioid use perusal was performed. Of these, 23 did it for all anesthetizing areas.

Random, individual provider CS usage audits were performed in 43 institutions (31%). Of these, 16 had one anesthetizing area, and the other 27 had two or more. Of the 27 institutions having two or more areas, 20 performed the random audits for all. Thirty-one institutions performed random qualitative and/or quantitative chemical analysis of discarded CS.

Ninety-two institutions (68%) performed at least one diversion-detecting accountability technique in at least one anesthetizing area. Forty-three did not. Only 14 used all accounting methods, and 5 of these did not provide this level of accounting for all areas.

In only 2 of the 21 programs sending multiple responses there was consistency in dispensing and accountability methods among all institutions associated with these programs. These 2 did not perform any periodic accountability review.

CHANGE IN CONTROL SYSTEM

Of 137 responding institutions, 95 indicated that a previously used control system had been replaced (dispensing and/or accountability method). Seventy-one made the change in or after 1985, for an average of 14 per year. Seventeen changed in 1989 or 1990. Eleven institutions had changed but were uncertain as to the time of the change. The other 13 had changed before 1985. Of the 42 institutions that had not changed systems, 17 were considering doing so. In addition, 88 of the 95 institutions indicated that their control systems were currently undergoing additional changes.

CONTROLLED SUBSTANCE DEPENDENCE INCIDENCE

Figure 1 demonstrates the incidence of CSD by type of anesthesia provider. Of the 137 responding institutions representing 102 teaching programs, 95 indicated that they had had at least one CSD individual in the last 5 yr. The incidence per institution varied from none to as many as 11 in the 5 yr studied. A total of 224 CSD individuals was reported, of which 139 were anesthesiology residents. The average number of CSD individuals among anesthesiology residents was 28 per year, corresponding to approximately 1% of the total resident population surveyed.

We were able to eliminate duplicate counting of CSD individuals from the multiple survey responses.

RELATIONSHIP OF ACCOUNTABILITY TO CONTROLLED DRUG DEPENDENCE

The only comparison we attempted was the incidence of CSD in programs that had at least one diversion-detecting accountability technique in at least one anesthetizing area at the time of the survey versus those that did not. Only the CSD individuals detected in 1989 and 1990 were included because there had been too many recent changes in accountability techniques to analyze previous years. In addition, the total number of providers present in previous years was unknown. (Our demographic data included only the number of providers employed in June of 1990.)

Approximately 4,456 anesthesia providers were employed in the 92 institutions that used at least one diver-
CONTROLLED SUBSTANCE ACCOUNTABILITY

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<th>Year</th>
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Fig. 1. Summary of the number of controlled substances dependence (CSD) individuals for each year 1986–1990/type of anesthesia provider (224). CRNA = certified registered nurse anesthetist.

Dispensing Methods and Periodic Accounting

In the 46 institutions using satellite pharmacies, 31 (67%) did random anesthetic record-opioid log comparisons, and 18 (40%) performed individual use audits. Fifteen performed chemical analyses of residual amounts of CS. Of the 10 institutions using central pharmacy locked-box control, 7 did anesthetic record-opioid log comparisons and 6 did random usage audits and chemical analysis. The institutions using traditional nurse and anesthesia-controlled locked-box dispensing systems rarely used any of these accounting methods.

Discussion

To our knowledge, this survey represents the first attempt to determine how institutions associated with United States anesthesiology training programs dispense and account for CS. Like all mail surveys, our results need to be interpreted with reservations. Incomplete sampling and delegated responses from potentially less informed individuals may contribute to inexact information. However, the response rate of 64% is comparable to response rates in other reported studies of a similar nature. We also are somewhat assured about the reliability of our data in that the incidence of CSD that we found was similar to the reported occurrence rate of CSD among anesthesiology residents, approximately 1% per year.\(^5\)\(^–\)\(^11\) We reiterate that our survey specifically inquired about CSD and did not include alcoholism.

We have shown that at the time of the survey there was considerable variation in methods of dispensing and/or accounting for CS. This variation extended to separate associated hospitals within a single training program, to geographically distinct anesthesia delivery areas within each institution, and even to the time of day.

Only 68% of the surveyed hospitals associated with American anesthesiology programs used, at least in part, one type of diversion-detecting accountability method. From 1989 to June of 1990 we could not find a significant difference in the incidence of CSD among institutions that had used any methods of accountability and those that had not. There was essentially no overall difference in the incidence of CSD in the 5 yr studied. However, most of the programs that had an accountability method developed it during the study years. Some might choose to interpret these data as implying that accountability had no effect on CSD incidence. However, the level of accountability using all diversion-detecting accountability methods was very incomplete, and diversion would likely go undetected. Until more programs adopt a comprehensive accountability system for all anesthetizing areas in all of the hospitals affiliated with the program, the question of whether adequate accountability can reduce diversion and thereby affect the incidence of CSD may be unanswerable.

Currently, observation of behavioral changes—e.g., social withdrawal, mood swings, unreliability, and working alone and for long hours—along with occasional direct observation of diversion are considered to be the recog-
nized methods of CSD detection.** However, waiting for these behavioral changes to be noticed by one’s peers usually results in the recognition of CSD late in the disease state. Lack of early detection results in reduced salvage of medical careers and greater risk of overdose or suicide.¹¹ Again, because of the lack of consistent accountability, questions regarding earlier detection are also unanswerable.

If CSD is suspected and intervention occurs, documentation of record falsification and altered composition of discarded solutions of CS, along with unusual opioid usage patterns, provides firm evidence of diversion. Inadequate accountability may delay intervention because of the lack of such evidence.

A CS accountability diversion-detecting method not surveyed would be comparison of postoperative patient analgesia patterns with individual provider usage audits, particularly if diversion is suspected. More than one responder suggested this in remarks on the questionnaire.

Certainly CSD is a recognized⁹-¹⁸ occupational hazard of anesthesiologists. There are anecdotal reports of CSD individuals choosing anesthesiology as a specialty because of the known easy access of CS.¹³,¹⁵ According to reports from recovering CSD individuals, “the drug and substance control systems in the hospitals in which they had trained were rated at ‘fair to poor’ by more than 70% of the respondents.”¹⁵ A recent educational video distributed by the American Society of Anesthesiologists Committee on Occupational Health of Operating Room Personnel states that accountability is an important aspect of CSD control.†† What then are the reasons CS are not better controlled? Some survey responders suggested that reasons may include cost, inertia, uncertainty as to how to institute an accounting method, and concern as to whether there was any value in doing so.

It is probably impossible to determine the degree to which abuse of opioids and other CS can exist without the compulsive addiction and increased tolerance associated with CSD. It is recognized that the amount of intake does not determine whether CSD develops.¹⁶ Not all CS diverters use large or increasing amounts of drugs. Some also use a variety of other mind-altering substances. Some individuals may delay or avoid dependence for long periods of time. Strict accountability probably will not detect these groups of individuals.

An alternative method of CSD detection would be urine testing. Unfortunately, a cheap, accurate test for fentanyl and its congeners is still not available.¹⁷ However, urine testing may be more complicated and no more complete than comprehensive accountability in its ability to detect CSD. Accompanying issues that have not been resolved include concern over privacy, false positive results, rigid certifying paper trails, and determination of who is to be tested and how often.¹⁸ The United States Department of Transportation requires that workplaces doing urine testing provide physician medical review officers who are responsible for the testing programs.¹⁹ This has the potential for considerable problems, particularly in the area of liability. The greatest problem during the current medical cost retribution may be the considerable operating expense and the decision about who is responsible for this expense.

Controlled substances dependence is not a problem confined to training hospitals. The pharmacy literature suggests that there is increased concern for accountability in private hospitals.³,⁵ It should be noted that private practitioners of anesthesiology also are at risk, particularly in their early years of practice.²⁰ Did some of these practitioners start to divert CS during residency?

On a positive note, this survey suggests that the increased concern over CSD has led to attempts to improve CS accountability. Automated dispensing machines have the capability of providing easier usage audits through computerized databases. Our survey suggests that pharmacy personnel are increasingly being used and that accountability had improved in hospitals where they were involved. Though still incomplete, increased efforts are being made to provide CSD prevention education.²¹ Our survey found similar information.

We are unable to answer this question: does increased accountability reduce CSD incidence or permit its earlier detection? However, it appears that training programs are moving in the direction of increased accountability. We believe that until this approach is proven futile, anesthesiology training programs should adopt comprehensive CS accountability. This, coupled with better educational efforts, remains, at present, our best recourse.

References

4. Keicher PA, McAllister JC III: Comprehensive pharmaceutical

†† Farley WJ, Arnold WP: Unmasking Addiction. Chemical Dependency in Anesthesiology. 1991. (Educational video prepared in cooperation with the ASA Committee on Occupational Health of Operating Room Personnel.)
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