Perceptions by an anesthesia care team on the need for medical direction

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A 1992 General Accounting Office (GAO) study on costs of anesthesia found that anesthetics administered by anesthesia care teams (ACTs) were more costly than those administered by Certified Registered Nurse Anesthetists (CRNAs) or anesthesiologists practicing alone. In 1994, Medicare implemented a single payment system in response to the GAO report and recommendations by the Physician Payment Review Commission. Restructuring of many anesthesia departments has followed.

A study was conducted in a 370-bed public teaching hospital to:
1. Examine how one ACT functionally provided services.
2. Identify roles of CRNAs and anesthesiologists within this team practice.
3. Determine if medical direction was perceived as equally beneficial in all cases.
4. Identify practice modifications which could possibly lower costs.

All anesthetics (n=358), excluding obstetrics, were studied over a 4-week period. Sixty-four variables were collected on each case including patient demographics, case characteristics, provider functions, and outcome data. Most patients were healthy and had low complexity operations. Systat statistical software was used for data analysis.

There were clear functional variations in the roles of anesthesiologists and nurse anesthetists within the anesthesia care team. Anesthesiologists provided most preoperative and postoperative care, while nurse anesthetists administered the majority of anesthetics.

Anesthesiologists and nurse anesthetists in this study agreed in their perceptions that more than 70% of these cases did not need medical direction. Logistical regression of variables was used to construct a predictive equation for cases where providers perceived that medical direction was beneficial. Significant case variables included high-risk patients, anesthetics that were more than 2 hours in duration, patient age, type of anesthesia, and the use of invasive monitoring.

Even though this study was from one unique practice setting, it suggests that excessive medical direction may be contributing to the higher costs of ACTs. Revision of medical direction guidelines, focusing on patient and operative factors, are recommended to preserve the ACT as a practice option, while making it more cost effective.

Key words: Anesthesia care team, anesthesiology, economics, manpower.

Introduction
Federal policies aimed at controlling rising health-
care costs have frequently taken the form of regulatory actions designed to reduce or redirect Medicare payments. These policies, however, have too often resulted in cost shifting, increasing case volumes, or service reductions rather than increases in efficiency or decreases in overall costs. Healthcare provider costs have continued to rise and appear resistant to these strategies. Healthcare reform, moving away from private practice and toward managed care, has begun to control systems costs. Attention has yet to be focused at the practice level, however, to insure the appropriate and cost-effective use of anesthesia manpower.

Trends in medical manpower have shifted toward training of fewer physician specialists and more physician generalists. There has also been increased utilization of nonphysician providers. This has generated heated debate in the healthcare community regarding appropriate scopes of practice, levels of education, quality of care, and professional autonomy. Sorting out the legitimate concerns from traditional turf battles makes these issues especially difficult and complex. Anesthesia, which has had two competing providers in the United States since the 1880s, is an example of a specialty which has actively debated and failed to resolve these issues. New federal reimbursement policies, which reduce payments to anesthesia care teams, will mandate change and call for compromise and constructive resolution to these issues.

Certified Registered Nurse Anesthetists (CRNAs) and physician anesthesiologists provide an estimated 25 million anesthetics annually. Since the Korean War, a variety of political, legal, economic, and professional forces have encouraged the growth of group rather than solo anesthesia practices. Anesthesia care teams (ACTs) have been one type of group practice. They are typically composed of CRNAs who administer anesthetics with medical direction from an anesthesiologist; however, they may include anesthesia residents, nurse anesthesia trainees, or anesthesia assistants. ACTs are prevalent in hospitals with large surgical volumes, the military, academic or teaching hospitals, public hospitals, health maintenance organizations, and geographic areas with adequate CRNA manpower.

**Practice economics**

The economics of anesthesia practice are unique in that:

1. Employment has been influenced by nearly equal numbers of two competing anesthesia providers.
2. Anesthesia fees have included charges for anesthetic complexity and for time.
3. Data has demonstrated marked regional variations in anesthesia costs, practice patterns, and the use of nonphysician providers.

Perceptions that anesthesiology is an overcompensated specialty have prompted numerous legislative inquiries and Medicare payment reductions. In 1992, the General Accounting Office (GAO) found wide discrepancies in Medicare payments for anesthesia services for identical procedures. CRNAs practicing independently of an anesthesiologist were the least expensive provider, followed by anesthesiologists in solo practice. Anesthesia care team services cost Medicare an average of 30% more than solo anesthetists. Individual payments to teams with a 1:2 (anesthesiologist:CRNA) provider mix were higher, but anesthesiologists working in teams with a 1:4 provider mix generated the highest hourly incomes. Evaluation of this data raised a significant question. If anesthesia care teams utilized nonphysician providers to provide anesthesia services, why were costs so high?

**Medical direction**

Medical direction of ACTs was first described for Medicare reimbursement in the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 (Table I). These conditions for payment were probably based on the American Society of Anesthesiologists' (ASA) definition of the ACT, also published in 1982. TEFRA regulations were originally developed to prevent Medicare fraud. The seven conditions described services which justified an additional payment to physicians for medical direction. If these services did not occur, the anesthetic was expected to be billed at the lower rate for solo anesthetists. As TEFRA billing conditions became widely interpreted as standards of care and the economic incentive to provide medical direction became clearer, additional physicians were hired to

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<td><strong>TEFRA conditions of payment</strong></td>
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<td>The anesthesiologist billing for medical direction of a CRNA must:</td>
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<tr>
<td>1. Perform the preoperative assessment</td>
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<td>2. Prescribe the anesthesia plan</td>
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<td>3. Participate in the demanding parts of the anesthetic (including induction and emergence)</td>
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<td>4. Make frequent checks during the course of the anesthetic</td>
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<td>5. Remain physically available</td>
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<td>6. Not personally administer concurrent anesthetics</td>
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<td>7. Provide indicated postoperative care</td>
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provide medical direction in many departments. Medical direction was assigned for all anesthetics regardless of complexity or provider skills. Unfortunately, TEFRA requirements and the ASA ACT guidelines were not studied before or after implementation, and therefore, their relationship to anesthetic outcomes is still unknown.

Scrutiny from Congress, the GAO, and the Physician Payment Review Commission resulted in legislation (1993 Omnibus Budget Reconciliation Act) to reduce Medicare payments to ACTs over 5 years. This 30% decrease in payment, along with other healthcare reforms such as managed care, began to destabilize anesthesia services and fuel provider competition. Redistribution, reorganization, and relocation of anesthesia providers has been an apparent result. Some geographic areas are now reporting excess numbers of providers, especially new graduates.

An opportunity to address several important patient care issues has been created in this era of change. Unfortunately, research and data needed to resolve these provider and practice issues have not been available due to:

1. The low priority of health services research.
2. Strained interprofessional relations between CRNAs and anesthesiologists at the organizational level.
4. A lack of consistency in the clinical conduct of medical direction.

This study attempted to begin that investigation through a systematic examination of one ACT.

Olive View/UCLA Medical Center, as one of six acute care hospitals in the Los Angeles County public health system, was experiencing severe shortages in state and federal funding at the time of this study. California's poor economic performance was coupled with a population where 50% of the residents were either uninsured or covered by Medicaid (MediCal). The department of anesthesiaology had experienced an 18% per year increase in workload over 3 consecutive years and was experiencing difficulty recruiting anesthesia providers. The strain on existing resources motivated an innovative examination of the department's service system.

Methods

- **Study site.** This study took place at a 370-bed public hospital which serves as a teaching site for an affiliated medical school. The study was exempted from review by the Institutional Review Board chairman due to its descriptive design. All anesthesia providers in the department participated in the study. This included 15 anesthesiologists, 14 nurse anesthetists, and two senior (third year) nurse anesthetists. A graduate program for nurse anesthetists had been on site for 2 years at the time of the study. There were no anesthesia residents.

The anesthesia department at the study site delivered about 4,000 surgical anesthetics per year in 5 operating rooms. Most major trauma and all orthopedics and open-heart procedures were transferred to other county facilities. Surgery was performed by residents from the affiliated medical school with surgery faculty supervision.

The patient population was primarily healthy; 78% were designated ASA I or II physical status. Pediatric patients were 10% of the surgical patient population. Medicare patients were less than 4% of the hospital's patient population and even less in the surgical population. Most elderly patients were not eligible for Medicare because of their immigration status. Patient demographics had been unchanged over the previous 5 years.

Hospital billing for Medicare patients was on a diagnostic related group (DRG) basis. No billing for anesthesia professional fees was done. Professional fees were "bundled" into the hospital's DRG payment, an uncommon practice. Physicians and CRNAs were salaried and therefore not in direct economic competition. As only 4% of anesthesiologists currently work this way, the practice structure was atypical. Manpower costs accounted for 80% of the department's annual budget.

The ACT team practice structure had been in use at the hospital since the 1960s. Because of the very low percentage of Medicare patients and the absence of professional billing for anesthesia services, the department was not obligated to meet TEFRA regulations for reimbursement purposes. Providers in our institution did attempt to follow them whenever possible to comply with ASA ACT guidelines. Department policy permitted a CRNA to begin and end cases independently with the supervising anesthesiologist's approval. This situation most commonly occurred with low-risk cases or when cases needed to start simultaneously for operating room efficiency. Supervising anesthesiologists were always physically available in the department if needed.

- **Sample.** All surgical anesthetic cases, excluding obstetrics, were studied over a 4-week period. Anesthetics were administered by the ACT with our usual provider mix of one anesthesiologist: two CRNAs. Difficult cases or cases during call shifts (after 7 p.m. and weekends) were assigned a provider-mix of 1:1. Emergency cases were defined as any nonscheduled case. Pediatric patients were defined as less than 13 years of age.
Data collection. An instrument was developed to document anesthetic tasks performed by CRNAs and anesthesiologists. Both providers were given color-coded data sheets at the beginning of every case and asked to independently record their activities. At the conclusion of each case, provider perceptions regarding the need for either medical direction or two providers were recorded. Anesthesiologists provided perceptions on the following questions:

1. Was an anesthesiologist needed at induction?
2. Was an anesthesiologist needed at emergence?
3. Was consultation needed during the case?
4. Were two anesthesia providers needed at any time during this case?
5. Did this case need medical direction?

Nurse anesthetists provided perceptions on the following questions:

1. Was an anesthesiologist present at induction?
2. Was an anesthesiologist present at emergence?
3. Did you request consultation or help from an anesthesiologist?
4. Were two anesthesia providers needed at any time during the case?
5. Did this case need medical direction?

During the research protocol orientation, participants asked for a clarification of question 5. We paraphrased it as “could the CRNA have administered the anesthetic in this case independently; without supervision.” Data sheets were collected in the postanesthesia care unit within 24 hours. Quality improvement data was collected on every case as baseline data for future studies.

Sixty-four demographic, surgical, and anesthetic variables for each case were recorded into a Systat statistical database. Anesthesia tasks were coded as either CRNA performed, anesthesiologist performed, or both team members performed. Surgical complexity was rated by Current Procedural Terminology (CPT-4) codes. Cases were assigned base units according to the "Relative Value Guide" of the American Society of Anesthesiologists (1992). A higher number of base relative value units (RVUs) was assumed to correspond to increasing surgical complexity. Base units did not include modifiers for time, age, or patient severity of illness.

Data analysis. Frequency distributions of anesthetic tasks were useful in describing the roles of ACT team members. Pearson chi-square testing was used to determine the relationship between categorical variables, such as patient age or preoperative patient physical status and the perceived need for medical direction or presence of two providers. The McNemar symmetry chi-square test was used to test matched comparisons (CRNA and anesthesiologist responses to the same case). Logistic regression analysis weighted variables found to be significant for anesthesiologists answering yes to the questions “was medical direction needed in this case?” or “were two providers needed in this case?”

To control for any skew of the data resulting from the teaching of nurse anesthesia trainees or medical students during anesthetic cases, analysis of the data was performed twice including and excluding the cases in which they played primary roles. Perceptions on teaching cases were obtained from the CRNA instructor rather than the student, with the exception of two senior students who worked directly under the supervision of an anesthesiologist. As expected, medical direction was perceived to be needed more frequently on teaching cases even though average RVU data showed that students were not assigned more difficult cases overall.

Validity. Content validity and sampling validity were established in a prestudy trial. Empirical validity, construct validity, and reliability (split-half method) of the instrument and data were clearly demonstrated.

Results

Data was obtained on 95% of 377 anesthetics administered during the study period. The majority of anesthetics were administered on weekdays (93%) and begun prior to 7 p.m. (85%). Patient ages ranged from 6 weeks to 88 years, with 81% being adults (14-69 years). Nonelective cases constituted 38% of cases, with trauma involved in 4%. The patient population was dominated by inpatients (65%). General anesthesia was the most frequently administered anesthetic (74%), with monitored anesthesia care being second most frequent (21.8%) and regional techniques least frequent (4.2%). Invasive monitoring including Swan-Ganz catheters, central venous pressure lines, and arterial lines, was used in 13% of cases. The average surgical complexity, as measured by RVUs, was equivalent to 5.5 base units with the median being 6.0. The range of RVUs was 3 to 15. Intra-abdominal surgical procedures, such as exploratory laparotomies, cholecystectomies, and hysterectomies, composed 33% of the sample.

Task analysis. Anesthetic tasks were grouped into seven categories: equipment preparation, preoperative evaluation, induction of anesthesia, anesthesia maintenance, anesthesia emergence, postoperative care, and “other” (Table II).

Equipment preparation tasks were more likely to be performed by a CRNA. Anesthesiologists were
more likely to participate if the case was an emergency or involved a high-risk patient. Preoperative evaluations were performed primarily by anesthesiologists. Most elective patients (60%) were seen in outpatient clinics 2 days prior to surgery. Preoperative and postoperative patient evaluation duties required one physician full-time equivalent. Duplication of preoperative tasks by anesthesiologists and CRNAs assigned to administer the anesthetic was frequent, as providers had to reassess the patient prior to inducing anesthesia. Most frequently, anesthesiologists who were assigned to the preoperative clinic were not involved with the administration of anesthesia for those particular patients. Laboratory studies/tests ordered in the preoperative clinic were often not available until the day of surgery.

Tasks associated with induction of anesthesia, maintenance of anesthesia, and emergence of anesthesia were performed primarily by CRNAs. Tasks associated with the administration of regional anesthesia and insertion of invasive monitors were performed primarily by CRNAs.

Postoperative care, case reviews, quality improvement, research, continuing education, and consultations were performed primarily by anesthesiologists.

Did this case need two providers?

Theoretically, an advantage of using an ACT practice has been the availability of a second provider to provide assistance at difficult times such as emergencies, massive hemorrhage, difficult intubations, or insertion of invasive monitors. The frequency of needing a "second pair of hands" has never been studied. CRNAs perceived that 21% of cases needed two providers versus 17% by anesthesiologists. Characteristics of cases found to be significant in predicting a "yes" answer to this question were nearly identical to those predicting a "yes" response for the need for medical direction but weighted differently in regression analysis.

Did this case need medical direction?

Medical direction implies a consultation between providers, with an anesthesiologist actually determining (in whole or part) the actions of a CRNA. In actual practice, however, medical direction may be more collaborative in nature and heavily dependent upon the experience, knowledge, and skills of both team members.

At the conclusion of the case, providers were asked if they felt that medical direction was needed for that particular case. Anesthesiologists perceived that 72% of cases in the sample did not need medical direction. CRNA and anesthesiologist responses were in agreement 82% of the time, but CRNAs perceived that more cases (84%) did not need medical direction. The McNemar symmetry chi-square test was significant ($P < .05$), demonstrating agreement in the direction of anesthesiologist and CRNA responses.

Pearson chi-square tests were used to identify case variables which might be predictive of a "yes" outcome to the medical direction question. The patient's preoperative physical status, age group, type of anesthetic, surgical complexity, length of anesthetic, use of invasive monitoring, and teaching cases were all significant ($P < .05$).

Logistic regression analysis of the significant variables was based on the following predictive model: Probability of a "yes" this case needs medical direction = $1/(1 + \exp(-\text{logit}))$. Logit was given by seven predictors. Logit = -$2.14 + 1.17$ ASA physical status + $0.445$ anesthesia time - $1.63$ monitored anesthesia care (MAC) + $1.256$ invasive monitors + $1.00$ third-year nurse anesthesia trainee - $0.030$ age - $0.667$ surgical complexity.

The probability of a "yes" to the need for medical direction increased when the patient's preoperative severity of illness (as measured by the ASA physical status score) increased, the length of anesthesia increased, or when invasive monitors were used. The probability of a "yes" to the need for medical direction decreased with increasing patient age and if MAC was the type of anesthesia administered. This finding may have been skewed by the high number of cataract procedures at this institution. Adding surgical complexity to the equation did not increase the likelihood of a "yes" answer to the medical direction question. Other significant case variables did not add to the predictive ability of the equation and were dropped.

Goodness-of-fit was determined using the predicted probability profiles and actual observed re-
responses. The logistic equation was found to be a reasonable summary of the high dimensional relationship between the outcome and the predictors.

Several methodologies failed to effectively separate cases in which providers perceived that either medical direction or two providers were needed. This suggested a semantic difference within provider groups. It was possible, however, to identify a specific group of cases (18-24%) in which CRNAs and anesthesiologists agreed that either medical direction or two providers was beneficial. (Table III)

**TEFRA regulations**

Compliance with TEFRA regulations or the ASA ACT guidelines have never been studied nor audited, to our knowledge. It was the perception of providers in this study that the guidelines were excessive in many cases. In the sample, anesthesiologists recorded their perceptions of the need to be present for induction and emergence. In the sample, anesthesiologists attended induction 76% of the time. They were less likely to be present if the anesthetic was not a general anesthetic, the patient was greater than 13 years old and the surgical complexity was less than 7 base units. They attended emergence in 21% of the cases. When physicians recorded that the case warranted their presence at emergence, they were present 96% of the time. CRNAs requested consultation or assistance from anesthesiologists in 17% of cases.

**Discussion**

Anesthesia care teams currently administer the majority of anesthetics in America, and these services are 30% more expensive than those administered by CRNAs or anesthesiologists who practice in other settings. Reduction in Medicare payments to ACTs, which began in 1994, could lead to the end of ACT practices, leaving only individual practitioners. This increases the urgency for examination of ACT practices and implementation of cost-effective changes. This study is the first to begin that process.

Excessive medical direction may be implicated in the higher costs of ACTs. Many ACTs assign medical direction for 100% of cases, even though the case complexity or the skills of nurse anesthetists do not warrant it. A number of economic, practical, and political factors have led to this practice. Economic incentives have included higher payments, lower manpower costs, and increased physician productivity. Anesthesiologists providing medical direction have been able to utilize their time out of the operating room to perform nonreimbursed activities such as administration, teaching, research, emergency services, and quality improvement. Other considerations include a department's need to staff preoperative clinics, outpatient units, and provide pain services or obstetric anesthesia during scheduled operating hours. The occasional and unpredictable need for a second anesthesia provider or "another pair of trained hands" is also expedited by available supervising personnel. This availability is perceived by some as effective risk management although data to support this does not currently exist. Lastly, anesthesia providers may prefer team practices because they offer sharing of malpractice risks, emergency call, and some control of work hours.

Professional, philosophical, and political agendas may also affect a department's policy on medical direction. Continuing disagreements between anesthesiologists and CRNAs regarding scope of practice, reimbursement, professional autonomy, liability, education, prescriptive authority, and access to clinical privileges have obstructed efforts to produce efficient, cost-effective, and collaborative ACT practices. Decisions at the federal level may be needed to settle these issues.

TEFRA regulations, originally created as conditions of payment, also contribute to the higher cost of ACTs. They have resulted in anesthesiologists being added to many ACTs and may have had a role in creating an appearance of a provider shortage during the past 10 years. These regulations also serve to demonstrate why specific language, defining actual practice, may be inappropriate in legis-

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<th>Response</th>
<th>ASA I (n = 157)</th>
<th>ASA II (n = 122)</th>
<th>ASA III (n = 64)</th>
<th>ASA IV/V (n = 15)</th>
<th>All cases (n = 355)</th>
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<tr>
<td>MD: &quot;yes&quot;</td>
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<td>24%</td>
<td>48%</td>
<td>73%</td>
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<td>MD: &quot;no&quot;</td>
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<td>76%</td>
<td>52%</td>
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<td>76%</td>
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<td>11%</td>
<td>32%</td>
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<td>CRNA: &quot;no&quot;</td>
<td>92%</td>
<td>89%</td>
<td>68%</td>
<td>55%</td>
<td>82%</td>
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lation. Practitioners then lack the flexibility to successfully adapt in changing healthcare environments.

While some anesthesiology departments have started cost-benefit studies of procedures, equipment, drugs, and supplies, manpower issues continue to remain unaddressed although they are the highest cost of every anesthetic. This study represents the efforts of one anesthesiology department to investigate its own practice and make appropriate changes based on scientific data.

Limitations of this analysis must be recognized. First, this study was conducted at one unique institution with one ACT. A multi-institutional study would enhance the data's quality by utilizing a wider geographic, patient, hospital, and practitioner pool. Second, perceptions about whether cases needed medical direction and/or two providers were obtained at the conclusion of the cases. Prospective prediction may yield different results. Studies have just been completed at our institution to determine whether it is possible to prospectively identify the need for medical direction and whether it is practical to implement medical direction for only indicated cases.

Although results in this study may vary from other anesthesia departments, the importance of understanding the history, economics, and structure of clinical practice is evident. The ACT, although it has existed for decades, has evolved into a rigid, ratio-based arrangement in response to Medicare payment policies. It is time for anesthesia providers to examine their own practices and determine relevant and realistic guidelines for the delivery of quality anesthesia services. In doing so, it is imperative that these professionals remain patient-focused and sufficiently distant from the frenzy of economic competition to make ethical and objective decisions.

The ACT has been shown to be an effective and desirable practice alternative in many institutions. Its future, however, is in question due to its high costs and lack of flexibility to maximally utilize the skills and availability of its team members. We believe that TEFRA medical direction guidelines should continue to be studied, reviewed, and revised to promote anesthesia care based on documented patient needs relative to the skills of the anesthesia providers. We also hope that a new era of professional cooperation can result from this type of inquiry and meaningful discussion.

REFERENCES

AUTHORS
Sharry Fassett, CRNA, MS, is a graduate of the UCLA Program of Nurse Anesthesia (Certificate of Anesthesia in 1979 and a master of science degree in 1992), Los Angeles, California. At the time of this study she was an assistant clinical professor of Anesthesiology and CRNA supervisor at Olive View/UCLA Medical Center, Sylmar, California. She is currently employed at Pioneer Memorial Hospital in Prineville, Oregon, where she has a clinical practice and is conducting research in rural anesthesia.

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