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## A Procedure for the Investigation of Anesthetic/Surgical Deaths

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**ABSTRACT:** A procedure for the investigation of surgical/anesthetic deaths is presented which allows for clearly defined jurisdictional assessment and correlates the autopsy and toxicological findings with the pathophysiology of the anesthetic/surgical event. This procedure facilitates an accurate certification of the cause of death in patients who die during surgery and anesthesia.

**KEYWORDS:** pathology and biology, death, anesthetics, anesthetic/surgical deaths, anesthetic/surgical death committee, American Society of Anesthesiology classification, death investigation

One of the most perplexing responsibilities of a medical examiner is to determine the nature and extent of investigation into deaths that occur during a surgical procedure under general or local anesthesia or in the immediate postoperative period. We recognize that local jurisdictional statutes and regulations may govern the criteria for an active death investigation of surgical/anesthetic deaths. Still, the death investigator generally has certain prerogatives that permit him/her to investigate any surgical/anesthetic death. Difficulties do occur in deciding which deaths merit a thorough investigation; the easiest to identify are those occurring during minor elective surgical or diagnostic procedures. Such deaths evoke the unanimous question, "what went wrong?" This response contrasts to deaths occurring during complex surgical procedures, particularly open heart surgery, where the extent of natural disease obfuscates the contribution that the surgery or anesthesia make to the death. In these deaths the attendant risks of the anesthesia and surgery are significantly offset by the nature of the natural disease process.

Many deaths, however, occur under circumstances that are not clearly defined, that may be obscured by sustaining life-saving techniques, and that can become a central issue of acrimonious debate between attending physicians and surviving family members. Somewhere in between, the death investigator is likely to become entangled in the many issues that are present at the time of death. Even though the death investigator recognizes the limitations of an au-

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topsy examination in such deaths, there will remain the expectation that an answer exists, if only someone would search carefully.

Having studied this frequent dilemma, we propose a scheme for resolving some of the inconsistencies surrounding surgical/anesthetic deaths by using established clinical criteria for jurisdiction of deaths that are investigated. Additionally, our approach includes clinicians in the overall death investigation process. This report outlines the investigative procedure we have developed, the method of our investigation, and its benefits.

### **ASA Classification**

To better allocate resources of time and personnel and concentrate investigative skills, we have developed a method of triaging surgical anesthetic deaths. The method employs the American Society of Anesthesiology (ASA) classification of physical status which is assigned patients before anesthesia is begun and before the surgical procedure is undertaken. The decision to investigate actively a death is largely determined by the ASA category assigned to the patient before anesthesia begins. For the purposes of anesthesia, the classification of physical status adopted by the American Society of Anesthesiology and clarified by Dripps [1] is:

**Class I:** The patient has no organic, physiologic, biochemical, or psychiatric disturbance. The pathologic process for which the operation is to be performed is localized and does not entail a systemic disturbance. Examples: a fit patient with inguinal hernia; fibroid uterus in an otherwise healthy woman.

**Class II:** A patient with mild to moderate systemic disturbance, caused either by the condition to be treated surgically or by other pathophysiologic processes. Examples: nonlimiting or only slightly limiting organic heart disease, mild diabetes, essential hypertension, or anemia. Some might choose to list the extremes of age here, either the neonate or the octogenarian, even though no discernible systemic disease is present. Extreme obesity and chronic bronchitis may be included in this category.

**Class III:** A patient with severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability with finality. Examples: severely limiting organic heart disease, severe diabetes with vascular complications, moderate to severe degrees of pulmonary insufficiency, angina pectoris or healed myocardial infarction [sic!].

**Class IV:** A patient with severe systemic disorders that are already life-threatening, not always correctable by operation. Examples: patients with organic heart disease showing marked signs of cardiac insufficiency, persistent anginal syndrome, or active myocarditis; advanced degree of pulmonary, hepatic, renal, or endocrine insufficiency.

**Class V:** The moribund patient who has little chance of survival but is submitted to operation in desperation. Examples: the burst abdominal aneurysm with profound shock; major cerebral trauma with rapidly increasing intracranial pressure; massive pulmonary embolus.

Most of these patients require operation as a resuscitative measure with little if any anesthesia. **Emergency operation (E):** Any patient in one of the classes listed previously who is operated on as an emergency is considered to be in poorer physical condition. The letter E is placed beside the numerical classification. Thus, the patient with a hitherto uncomplicated hernia that is now incarcerated and associated with nausea and vomiting is classified 1E.

The usefulness of the ASA classification in identifying deaths for active investigation has historical verification. In 1961 Dripps and coworkers [2] did not identify deaths attributable to spinal or general anesthesia in patients classified as I, but mortality increased as the physical condition deteriorated, as reflected in the ASA classification preoperatively assigned the patient. The criteria for selection of patients in this study of Dripps may be challenged, but the conclusions verify the usefulness of identifying which "sudden and unexpected deaths" during anesthesia are truly the province of the death investigator.

To decide what deaths to investigate, we have used the ASA classification as the touchstone of the investigation. By local county medical examiner policy, all deaths that occur in the operating room or within 24 h after surgery, and all deaths directly or indirectly attributed to the anesthetic agent even if the patient survives for days or weeks, are reportable for jurisdictional assessment. Each hospital is obliged to identify a responsible person to ensure that deaths are reported for review.

At the time of report the ASA classification is established. All deaths assigned a classification of I, II, or III are immediately identified for autopsy and complete investigation. All other deaths—those with an ASA classification of IV or V—are briefly reviewed to establish the nature and extent of the natural disease and the type of surgical procedure. Only when an unusual factor or question surfaces during review of such deaths will the death be taken under jurisdiction for investigation. Generally the nature and severity of the disease process is so obvious that no further action is taken. Circumstances or conditions may have occurred or developed that require further investigation. In such instances the issue is clear, for example, in cases of equipment failure, improper intubation, or use of the wrong drug. When such circumstances exist, then even the preoperative IV and V ASA classes will receive the same attention and investigation as the I, II, and III classes. Clearly the opportunity exists for gross errors to be concealed by operating room staff, but utilizing the ASA criteria to establish the level of investigation minimizes this opportunity.

#### **Anesthesia/Surgical Death Committee**

In addition to identifying those deaths that clearly merit a thorough investigation, our system also relies on the clinical disciplines of surgery and anesthesiology. To understand and evaluate the clinical, anatomical, and toxicological examinations during the investigation, we formed an Anesthetic Surgical Death Review Committee.

In 1945, Ruth [3] reported the value of an Anesthesia Study Commission sponsored by the Philadelphia County Medical Society. It was the first identifiable group of physicians organized to study deaths during anesthesia. This group, originally established in 1935 was composed of surgeons, anesthetists, and internists. Other anesthesia study committees [4,5] have been formed; their approach for the investigation sadly relied on clinical information alone in developing and assessing the cause of deaths during surgery. No mention is made in these reports of the value of a thorough and complete autopsy and toxicological examination. We can only surmise that like today, clinicians of past years were quite confident and comfortable with clinical assessments to explain lethal events in the operating room.

We certainly have recognized the obvious need for clinical assessments when we undertake a surgical death investigation. In developing a program to better understand the pathophysiology of death during anesthesia and surgery, we formed a standing Anesthetic Death Investigation Committee whose members all play a vital role in illuminating the pathophysiology of deaths that occur while the patient is anesthetized.

The committee has as its members two recognized local authorities in anesthesiology, one of whom is chairman of the University of Washington Department of Anesthesiology while the other is in anesthesiology practice at a local medical center. Both have been active in their local and state anesthesiology societies and both have a committed interest in studying deaths that are anesthesia/surgery-related. A third member of the committee is a retired surgeon of high local repute who provides a perspective on the nature and course of the surgical procedure and who understands the complexities and technical problems of the surgery itself. The chairman of the committee is the investigating medical examiner, who requires of each member a formulation and reconstruction of the probable course of events leading to death.

Each member has at his/her disposal the hospital and surgical records. The attending anesthesiologist and surgeon of the patient who died are interviewed separately and independently by the individual committee members as required. These interviews generally occur within the

first few days after death. We view these interviews as critical in identifying the events that led to the death. As in any investigation, early action is critical before events are molded and modified by time.

The procedure of an individual death investigation is discussed later in greater detail. The medical examiner who is responsible for the investigation coordinates the activity of the clinicians. The medical examiner may likewise carry on an extensive interview of the surgeon or anesthesiologist, but generally this task is referred to a surgeon or anesthesiologist on the committee. The most important aspect of the early investigation for the medical examiner is that a complete and thoughtful autopsy is performed and that appropriate body fluid samples are obtained for chemical toxicological analysis or both. After completion of a review of the autopsy findings and completion of the toxicological/chemical body fluid analysis, the medical examiner schedules a committee meeting where each member presents her/his information. Analysis and synthesis of the multiple factors of the death is performed by the committee to aid in understanding the pathophysiology of death.

One caution about the deliberations of the committee: detailed records are kept to a minimum. This is the result of a conscious effort to allow for open discussion about all aspects of the death. As death investigators, we are more concerned with understanding the pathophysiology of the cause of death than with the appropriateness of patient management. For example, in a death caused by malignant hyperpyrexia, our primary concern is identifying the pathophysiology that allows for a diagnosis of the cause of death. The issue of whether or not the anesthesiologist or surgeon should have recognized this serious condition while the patient was anesthetized is beyond our sphere of judgment or concern. Significant legal questions are potentially obvious in all anesthetic/surgical deaths, but only someone who has current knowledge of the standard of practice or surgery or anesthesia should attempt to answer questions of appropriate management and patient care. The atmosphere of civil litigations hangs over any surgical death and speculation by the death investigator about patient management and care fosters a justifiable concern in anesthesiologists and surgeons. The success of our program is largely based on an awareness in the medical community that our goals are sharply focused; we consciously avoid drifting into areas that are not truly the province of the death investigator.

### **Investigative Procedures**

When a death occurs during surgery or is thought to be a direct consequence of or related to the anesthetic, it is required that the King County medical examiner be notified. The initial assessment by the investigator identifies common demographic information concerning the death. The most important determination by the investigator at the time of the initial report is ASA classification. If the patient was preoperatively categorized as ASA I, II, or III and the surgery was not performed under emergency conditions, then the death is immediately taken under the medical examiner jurisdiction. At this time the identity of the surgeon and anesthesiologist is established and communication between the anesthesiologist and the medical examiner pathologist is commenced. This procedure allows for an early assessment of the death by the medical examiner and identifies potential areas of investigative concern, such as equipment failure or unexpected clinical deterioration. After this brief assessment by the medical examiner pathologist, the attending anesthesiologist is advised that an anesthesiologist consultant to the medical examiner will conduct an interview concerning the events preceding death and that information then developed will be used in formulating an opinion on the cause and mechanism of death. In addition to the interviews conducted by the consulting anesthesiologist, copies of the complete medical/surgical/anesthetic record are obtained and are reviewed by the medical examiner pathologist and both the surgical and anesthesiology consultants.

After all interviews, record reviews, autopsy and toxicological examinations are completed, the committee reviews these findings to develop an understanding of the events or causes re-

sponsible for death. Emphasis is placed on recreating and understanding the pathophysiology of events preceding death. The most beneficial feature of the program has been a better understanding of events during anesthesia, which has frequently generated new insights about the mechanism of death while a patient is anesthetized, allowing for a more accurate certification of death. The algorithm of the anesthetic/surgical death investigation process is presented in Fig. 1.

**Summary**

We have developed a logical and reasonable method of investigating surgical/anesthetic deaths that occur in our jurisdiction. The methods employed use the talents and abilities of our clinical colleagues who have a sense and understanding of the dynamics of the operating room. The correlation of the autopsy findings, toxicological analysis, and clinical information have provided us with a much greater understanding of the pathophysiology that results in death while the patient is anesthetized and undergoing surgery. This method has allowed for much more accurate identification of the causes of death attendant to surgical procedures and anesthetics and has increased our confidence in the death certification of such victims.

The practicing surgical and anesthesiology community recognizes the value of the program and the data that are available as a result of these careful investigations. This system provides a much better assessment of risk management problems for the practicing anesthesiologist and surgeon. Although there is an awareness of the civil litigation consequences of an active investigation, the practicing medical community has nonetheless cooperated. Equally important, our approach places the death investigator within the local medical community as a recognized concerned physician seeking answers to difficult questions.

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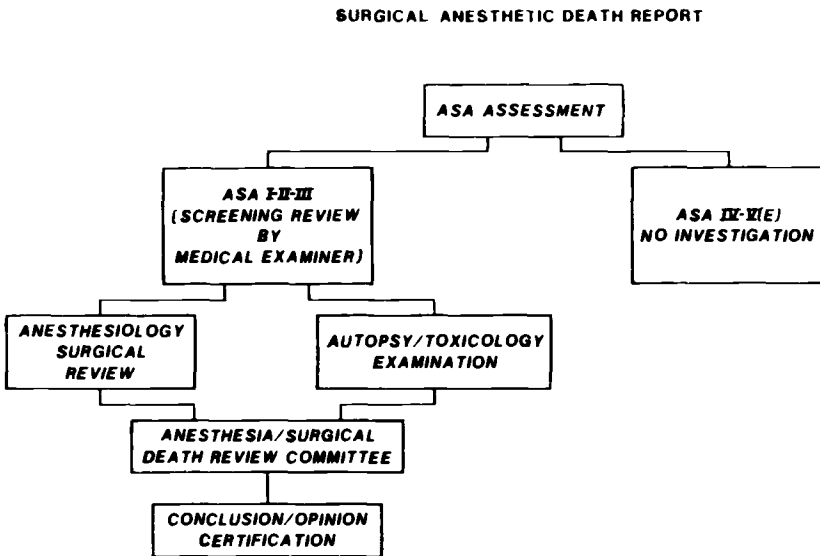


FIG. 1—Algorithm of the death investigation procedure used to assess jurisdiction, investigate the death, and arrive at conclusions concerning the cause of death.

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