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## ANESTHESIOLOGY CONSULTATION

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This special consult is at the request of the Los Angeles County Chief Medical Examiner Coroner, Dr. Lakshmanan, for a 50 year old decedent who was found with physical evidence of the anesthetic drug propofol in his home.

RELEVANT INFORMATION ON PROPOFOL AND ITS ADMINISTRATION:

Propofol is an intravenous anesthetic with highly favorable properties: rapid onset of sedation and/or unconsciousness, predictable dose response (usually) and duration of action, rapid return of consciousness, little post-anesthesia "hang-over" and little postoperative nausea and vomiting. Unfavorable properties include respiratory and cardiovascular depression, especially on induction or if the IV bolus is rapid. Respiratory and cardiovascular depression is usually dose dependent and is accentuated if other sedatives, such as benzodiazepines, are present. There is also a narrow margin between mere sedation and full general anesthesia, with possible loss of the patient's ability to breathe and maintain their airway. (These properties are the most relevant to this case; other properties of propofol are not listed.)

Since its introduction into clinical practice in 1989, propofol has been widely used for induction and maintenance of anesthesia for surgery and to supplement regional and local anesthesia. It is widely used for sedation during uncomfortable diagnostic procedures and is also used in ICUs for sedating critically ill patients. It is reported to be used to relieve the pain of acute migraine headaches, in pain clinic settings. There are NO reports of its use for insomnia relief, to my knowledge. The only reports of its use in homes are cases of fatal abuse (first reported in 1992), suicide, murder and accident.

Propofol must be given intravenously. Administration techniques include single IV bolus (for induction of general anesthesia, going on to additional anesthesia drugs), repeat IV boluses (when there is a short-term need for sedation in a quick painful procedure) and IV bolus followed by continuous infusion (used for both general anesthesia with the addition of other drugs or for lengthy diagnostic procedures). The infusion technique requires precision control of the dose by way of a controllable infusion pump, because of the narrow margin between mere sedation and full general anesthesia and build-up of the drug as it is administered long-term. Because propofol is painful on injection, lidocaine (1 cc of 1%) is usually given, either immediately before injection or mixed into the amount to be infused. Propofol solutions easily support bacterial growth, and attention to antisepsis is required as well as discarding vials and syringes within 6 hours of use.

Full patient monitoring is required any time propofol is given. The most essential monitor is a person trained in anesthesia and in resuscitation who is continuously present and not involved in the on-going surgical/diagnostic procedure. Other monitors expected would be a continuous pulse oximeter, EKG and blood pressure cuff, preferably one that automatically inflates. An end-tidal CO<sub>2</sub> monitor would be used for fully anesthetized patients and is also highly desirable in sedated patients. Although the measurement of CO<sub>2</sub> would not be accurate in sedated patients, who have a loose mask or nasal cannula for supplemental oxygen, the presence of CO<sub>2</sub> documents that the patient is breathing and that the airway is open. If CO<sub>2</sub> stops being present, for whatever reason, the monitor will alarm (audible and visual signals), which calls attention to the possible apnea and/or airway obstruction, so action can be taken promptly. Of course, airway devices and drugs for resuscitation must always be present. Supplemental O<sub>2</sub> should always be delivered to patients receiving propofol, and they should always have a recovery period with monitoring and observation by trained recovery nurses.

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Because of the risk of sudden onset of full general anesthesia, propofol should be given only by anesthesiologists or other supervised anesthesia providers, who are fully trained to recognize and treat the possible respiratory and cardiac depression. In the ICU setting, propofol should be given by ACLS certified critical care level nurses, following physician orders. (These patients are intubated and ventilated, decreasing the need to deal with respiratory depression or airway problems from propofol.) In procedure rooms such as endoscopy suites, propofol is sometimes given by nurses (hopefully ACLS certified) under the supervision of the physician doing the procedure. This is not ideal and is the subject of conflict between gastroenterologists and anesthesiologists at the national level.

THIS PARTICULAR CASE:

Questions to be answered include was the standard of care for administering propofol met, could the decedent have administered the propofol to himself and what is an anesthesiologist's point of view on the toxicology screen results.

Was the standard of care for giving propofol met? It is not known whether trained medical personnel were continuously observing the decedent while propofol given. There was no evidence of an infusion pump for control of an IV infusion. No monitors were found at the scene; a blood pressure cuff and portable pulse oximeter were recovered from a closet in the next room. A tank of oxygen with some kind of non-rebreathing bag with a clear plastic mask (for positive pressure ventilation) was near where the patient was found by the paramedics. This tank was empty when examined on 7/13/09. A non-rebreathing bag was not attached when the tank was examined. Multiple opened bottles of propofol were found, with small amounts of remaining drug. A used bottle should be discarded 6 hours after opening, to avoid possible bacterial growth. The standard of care for administering propofol was not met.

Could the decedent have given propofol to himself? It is unknown where the propofol physically came from. It would have been difficult for the patient to administer the drugs (others besides propofol were administered) to himself, given the configuration of the IV set-up. The IV catheter was in the left leg. The injection port of the IV tubing was 13.5 cm from the tip in the catheter. He would have had to bend his knee sharply or sit up to reach the injection port and push the syringe barrel, an awkward situation, especially if sleep was the goal. If only bolus injections via a syringe were used, sleep would not have been maintained, due to the short action of propofol. Someone with medical knowledge or experience would have started the IV. Anyone could have drawn up and administered the medications after the IV was started.

What is an anesthesiologist's view point on the toxicology screen results? The levels of propofol found on toxicology exam are similar to those found during general anesthesia for major surgery (intra-abdominal) with propofol infusions, after a bolus induction. During major surgery, a patient with these blood levels of propofol would be intubated and ventilated by an anesthesiologist, and any cardiovascular depression would be noted and treated.

Anesthesiologists would also comment on the presence of other sedative drugs in the toxicology screen. Lorazepam, a long-acting benzodiazepine, is present at a pharmacologically significant level and would have accentuated the respiratory and cardiovascular depression from propofol.

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