

North Carolina State University
IACUC Guideline
(July 11, 2000, updated October 20, 2009)

Intra- and Postoperative Monitoring and Required Record Keeping for Surgery and Anesthesia

Regulatory guidelines and standards of adequate veterinary care impose certain requirements for intraoperative monitoring and postoperative care for research animals, and for the maintenance of appropriate medical records. These responsibilities are the Principal Investigator's. However, each NCSU animal resource unit has an attending veterinarian who should be consulted, during the planning stage for experimental surgical procedures, about the provision of appropriate perioperative care. Assistance with experimental surgery, anesthesia, and postoperative care is available from CVM Laboratory Animal Resources (Chief Veterinarian: Dr. Richard Fish, 513-6480; rick_fish@ncsu.edu) or through the CVM Central Procedures Laboratory (Dr. Karen Taylor or Mrs. Kirsten Pitoc, 513-6486; karen_taylor@ncsu.edu or kirsten_cromly@ncsu.edu).

From the *Guide for the Care and Use of Laboratory Animals* (1996): "Presurgical planning should specify the requirements of postsurgical monitoring, care and record-keeping, including the personnel who will perform these duties. The investigator and veterinarian share responsibility for ensuring that postsurgical care is appropriate."

From the USDA Animal Welfare Act Policy #3 (1/14/2000): "Health records are meant to convey necessary information to all people involved in an animal's care. Every facility is expected to have a system of health records sufficiently comprehensive to demonstrate the delivery of adequate health care. For those facilities that employ one or more full-time veterinarians, it is expected there will be an established health records system consistent with professional standards that meets and probably exceeds, the minimum requirements set forth in this policy."

Individual written records of anesthesia/surgery/postoperative recovery must be maintained for all nonrodent mammals that undergo recovery anesthesia *OR* surgical procedures. (Information about rodents and non-mammalian vertebrates is below.) The record must be kept in the room where the animal is housed, or nearby, and must be accessible by the attending veterinarian. Records should be retained as a part of the animal's permanent medical record. Format for records is flexible, as long as required elements (below) are documented and clear; forms are available from CVM Laboratory Animal Resources (Chief Veterinarian: Dr. Richard Fish, 513-6480; rick_fish@ncsu.edu) or through the CVM Central Procedures Laboratory (Dr. Karen Taylor or Mrs. Kirsten Pitoc, 513-6486; karen_taylor@ncsu.edu or kirsten_cromly@ncsu.edu).

There are no requirements for medical record keeping in non-survival (terminal) procedures. However, from the standpoint of both the animal's welfare and the success of the experiment, intraoperative monitoring may be just as important in terminal experiments as in recovery procedures (see following section). For non-survival procedures, PIs are encouraged to keep records that document their use of anesthetic, analgesic, and tranquilizing agents, and their intraoperative monitoring procedures.

Intraoperative Monitoring and Record Keeping – Nonrodent Mammals

Intraoperative monitoring of the animal's state of homeostasis and anesthesia status is necessary, and maintaining an intraoperative record may be important to enhance recognition of trends in monitored variables. The types and frequency of monitoring will vary with both the species and the nature/length of the anesthesia/surgery; monitoring should assess circulation (e.g., heart rate and character, ECG, blood

pressure); oxygenation (e.g., mucous membrane color, pulse oximetry); ventilation (e.g., respiratory rate and character, capnography); and body temperature. (See suggestions by the American College of Veterinary Anesthesiologists: <http://www.acva.org/professional/Position/pstn.asp> See “Recommendations for Monitoring Anesthetized Veterinary Patients”).

Recovery surgery/anesthesia records must include at least the following:

- Date of procedure
- Animal identification
- Surgeon and PI name(s)
- Brief description of the procedure
- Time of anesthetic induction and termination
- All drugs administered, including dose, time, and route of administration

In addition, recovery surgery/anesthesia records must include documentation of monitoring appropriate to the procedure:

- At a minimum (e.g., for minor and minimally invasive surgeries), temperature and heart and respiratory rates should be recorded immediately before and at the conclusion of the procedure.
- For invasive procedures lasting more than 30 minutes, results of intraoperative monitoring (minimally heart rate, respiratory rate, and body temperature) should be recorded every 15 minutes.

Postoperative/Postanesthetic Monitoring and Record Keeping – Nonrodent Mammals

Immediately following surgery/anesthesia, animals should be placed in a clean, quiet environment where they can be observed closely by appropriately trained personnel while they recover from anesthesia. Animals recovering from anesthesia must be closely attended, at least until they regain the righting reflex (ability to maintain sternal recumbency). All food and water bowls and any other physical hazards should be removed from the cage/pen where the animal is recovering from anesthesia. Monitoring of the animal must continue at appropriate intervals throughout the postoperative period, which extends until the removal of sutures and the observation that incisions are essentially healed.

Postoperative/postanesthetic medical monitoring should be done on animals according to the extent of recovery from surgery and/or anesthesia. The animal's condition and the surgical procedure performed determine the need for supportive care, e.g. fluids, electrolytes, analgesics, antibiotics, etc.

The postoperative/postanesthetic record should be attached to the surgery/anesthesia record and must include the findings, with date/time and initials or signature of person performing the examination, of each physical examination during the postoperative period. Nonrodent mammals should be examined, and records kept, according to the following schedule:

- A. Animal unconscious or semi-conscious; unable to sit or maintain sternal recumbency.*
1. Animals should be monitored continuously until extubated, or until there is a strong swallowing reflex.
 2. Thereafter, examine the animal not less than hourly. Monitoring should include:
 - body temperature
 - heart rate and pulse character
 - respiratory rate and character

- mucous membrane color and capillary refill time
 - assessment of anesthetic depth (e.g., jaw tone, response to toe pinch, corneal reflex)
 - additional methods as necessary to identify potential postoperative problems and ensure uneventful recovery
3. Recumbent animals should be turned from side to side frequently to prevent dependent pulmonary congestion and edema, and muscle damage.
 4. Ambient temperature should be adjusted (circulating water pad, heat lamp or warming board) to maintain normal body temperature. The animal should be kept dry.
 5. The state of hydration should be assessed and fluids provided as necessary.
 6. Analgesic administration may be appropriate, depending on the surgical/anesthesia plan.
 7. The *medical record during this period* must document at least the following:
 - Extubation of the animal, if applicable
 - Results of monitoring (minimally: body temperature, heart rate, respiratory rate, and assessment of anesthetic depth)
 - Any clinical abnormalities
 - All treatments provided (including drug, dosage and route of administration)
- B. Animal conscious and can maintain sternal recumbency or sit but cannot stand.*
1. Examine the animal not less than every 6 hours depending on the nature of the surgery and the status of the animal. Monitoring should include:
 - body temperature (until it becomes normal +/- 2 degrees F)
 - heart rate and pulse character
 - respiratory rate and character
 - mucous membrane color and capillary refill time
 - condition of the operative site
 2. Examine closely for other abnormalities.
 3. Keep the animal dry and adjust the ambient temperature to bring the body temperature to normal.
 4. Administer analgesics based on the surgical/anesthesia plan and/or indications of pain
 5. The *medical record during this period* must document at least the following:
 - Return to consciousness or ability to maintain sternal recumbency
 - Results of monitoring (minimally: body temperature)
 - Any clinical abnormalities
 - All treatments provided (including drug, dosage and route of administration)
- C. Animal can stand and move about; not eating and drinking normally.*
1. Examine animal twice daily. Monitoring should include:

- body temperature
 - mucous membrane color and capillary refill time
 - hydration
 - attitude and activity
 - food, water consumption
 - eliminations (urine, feces)
 - condition of operative site
2. Examine closely for other abnormalities.
 3. Administer analgesics based on the surgical/anesthesia plan and/or indications of pain.
 4. The *medical record during this period* must document at least the following:
 - Appetite and eliminations
 - Results of monitoring (minimally: body temperature once daily)
 - Any clinical abnormalities
 - All treatments provided (including drug, dosage and route of administration)
- D. Animal active, alert, eating and drinking normally; skin sutures in place.*
1. Examine animal daily until the sutures are removed (or absorbed, in the case of approved protocols using absorbable sutures in the skin); monitor condition of operative site and attitude, appetite, and eliminations.
 2. Sutures should be removed within 10 to 14 days of surgery.
 3. The *medical record during this period* must document at least the following:
 - Daily check-off of observation and normal recovery
 - Any clinical abnormalities
 - All treatments provided (including drug, dosage and route of administration)
- E. Animal normal; skin sutures removed. Specific post-surgical care and records no longer required.

***If progress in recovery from anesthesia isn't as expected or if there are medical complications, veterinary staff must be contacted.**

Recovery (Non-terminal) Surgery in Rodents and Non-mammalian Vertebrates

Smaller species and nonmammals present special problems in completing successful anesthesia, surgery, and postprocedural recovery. Animals must be monitored for adequate depth of anesthesia, e.g., by pedal reflex. Physiological monitoring is difficult to quantitate, and is typically accomplished by subjective analysis of the animal's respiratory rate and character, and mucous membrane color (when possible). Following anesthesia/surgery, animals must be observed until conscious.

In general, group records are adequate for rodents and nonmammals undergoing the same procedure on the same day. Records should be retained in the animal housing room, or nearby, to facilitate

postoperative observation and care. Anesthesia/surgery/postoperative records for rodents and non-mammalian vertebrates must include at least the following:

- Date of procedure
- Animal identification(s)
- Surgeon and PI name(s)
- Brief description of the procedure
- Time of anesthetic induction and termination (if group record, for last animal)
- All drugs administered, including dose, time (for last animal), and route of administration
- Intraoperative monitoring results, if applicable
- Any abnormalities
- Documented (with time) observation, on the day of surgery, that animals have regained consciousness and are ambulatory

If progress in recovery from anesthesia isn't as expected or if there are medical complications, veterinary staff must be contacted.