End-Stage Illness Scoring System

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1. ## Purpose

   To establish a guideline for an end-stage illness scoring system to be used for animals displaying severe signs of morbidity, or a moribund state. This guideline does not replace use of common sense and empathy to protect animals from avoidable suffering. The veterinary staff may recommend or mandate euthanasia for animals with scores of 5 or less due to unexpectedly severe experimentally-induced or spontaneous conditions. Many disease models have tailored end-stage illness recommendations or scoring systems, which may be utilized if specifically outlined in the protocol (**See the References section for examples**).

2. ## Definitions

   a. **Body Condition Score (BCS):** A scale of 1-5. This measurement is preferred over body weight as body weight can be skewed based on tumor burden, growth of young animals, or other medical conditions.

3. ## Responsibility

   a. **Principal investigator or designated lab member**
      i. Any animal which is found to be at protocol endpoint or humane endpoint as determined by veterinary staff or this scoring system must be euthanized.
   b. **Husbandry personnel**
      i. Perform standard daily animal health checks and report ATRs per SOP.
   c. **Veterinary personnel**
      i. Upon receipt of an ATR, the veterinary technician must conduct a physical exam, noting any pertinent information.
      ii. Contact the responsible laboratory member as needed.
      iii. Report any issues to the veterinary resident +/- veterinary faculty for the area.

4. ## End-Stage Illness Scoring Procedures

   a. ### Criteria for Humane End Points

      i. To better assess degree of morbidity, a scoring system will be used for all animals that show signs of illness. Animals will be graded on appearance, physical exam parameters, natural and provoked behaviors, and body condition score. This scoring system is extensive but not all-inclusive; some animals with conditions or disease severity not described herein may necessitate euthanasia (i.e. excessive tumor burden, extensive or complicated ulceration, etc.).
      ii. If different endpoints are required based on experimental needs, they should be clearly defined within the protocol. Signs of illness or disease that are expected for a particular model should also be clearly outlined in the protocol, even if end-stage illness scoring is followed.
      iii. Increasing scores can be used to trigger more frequent monitoring and to provision of standard interventions or therapies to support animal welfare and prevent further decline.
      iv. If animals must reach a moribund state, please ensure that these animals are placed within the appropriate pain and distress category in your protocol.
      v. The scoring system is detailed below. **Determine a single score for each category, then add all category scores together to produce a cumulative score.** An example is provided in **Appendix F**.
      vi. An End-Stage Illness Scoring Sheet has been provided in **Appendix G**, which may be used when scoring animals.

   b. ### Scoring System

      i. ### Appearance (This should be assessed while watching the animals in the cage)

         1. **Score (0) Normal:**
            a. Bright eyes
            b. Shiny, well-groomed hair coat
            c. Pink mucous membranes
            d. Well formed nest, if nesting materials present in cage
            e. Animals socially housed are resting together
            f. Well organized cage with toilet area away from resting area

2. **Score (1) Abnormal:**
    a. Sunken or squinting eyes
    b. Tail-tucking
    c. Unkempt/ruffled or dull hair coat
    d. Erection of hair or fur
    e. Mild diarrhea or constipation
    f. Malocclusion
    g. Mild, intermittent hunched body posture
    h. Mild to moderate opaque discharge including purulent, mucoid, or bloody, from any bodily orifice or wound
    i. Mild to moderate wounds/lesions/masses encompassing <5% of the body surface
    j. Unformed nest, un-utilized nesting material if >24 hours after a cage change or provision of new nesting material
    k. Social isolation of an animal, i.e. resting away from rest of animals in cage or a urine stained, flattened nest
    l. Unorganized cage with feces and urine mixed into nesting area
3. **Score (2) Abnormal:**
    a. Dull or dry eyes or nose
    b. Dilated pupils
    c. Ocular discharge
    d. Eye ulceration
    e. Prolonged (>12 hours) hunched body posture
    f. Prolapse of rectum or penis
    g. Abdominal distension
    h. Muscle atrophy
    i. Head tilt
    j. Grimacing
    k. Bruxism (teeth-grinding)
    l. Ulcerated tumors
    m. Signs of self-mutilation
    n. Moderate diarrhea or constipation
    o. Sporadic vomiting
    p. Mild to moderate wounds/lesions/masses encompassing 5-30% of the body surface
4. **Score (3) Abnormal:**
    a. Hunched, unmoving body posture with eyes closed
    b. Increased, decreased, or labored breathing
    c. Cyanosis (blue color to skin or mucous membranes)
    d. Scant or no feces
    e. Anuria (lack of urination)
    f. Anaphylaxis
    g. Severe wounds/lesions or wounds/lesions/masses encompassing >30% of the body surface
    h. Prolonged (>12 hours) or severe frank bleeding from any orifice
    i. Distinct jaundice
    j. Wound dehiscence or non-healing wound
    k. Severe diarrhea or constipation
    l. Repeated or severe vomiting
    m. Uterine prolapse
    n. Dystocia (difficulty in giving birth)

ii. **Physical Exam Parameters (Evaluation may require assistance from veterinary staff. All parameters should be based on species-specific ranges)**

1. **Score (0) Normal:**
    a. Normal heart rate
    b. Normal respiratory rate and effort
    c. Hematological and biochemical values within reference interval
    d. Pink, moist mucous membranes
2. **Score (1) Abnormal:**
    a. Hypo- or hyperthermia
    b. Elevated or decreased heart rate
    c. Elevated or decreased respiratory rate
    d. Increased or absent breath sounds
3. **Score (2) Abnormal:**
    a. Clinical dehydration, such as prolonged skin tenting, sunken eyes, or tacky mucus membranes
    b. Hematological or biochemical values that indicate organ damage or failure
    c. Pale mucous membranes
    d. Prolonged capillary refill time (>2 seconds)

iii. **Behavior**

1. **Score (0) Normal:**
    a. Ambulates easily about the cage
    b. Looks at observer
    c. Takes interest in the environment

       d. If acclimated to food treats, readily accepts treat

       e. Readily walks or runs away or turns to sniff observer

       f. Interacts with cagemates/flock

2. **Score (1) Abnormal:**

       a. Slow to move away or hyperactive response inconsistent with gentle nudge

       b. Takes less interest in the environment

       c. If acclimated to food treats, readily accepts treat

       d. Disregards the observer

       e. Interacts less with cagemates/flock

       f. Decreased food or water intake

3. **Score (2) Abnormal:**

       a. Moves away slowly after extended pause

       b. Unsteady gait

       c. Impaired mobility (can't access food or water readily)

       d. Slow righting reflex

       e. Sits in corner of cage

       f. Hypo- or hyperaggression

       g. Isolated from cagemates/flock

       h. No food no water intake or prolonged decreased food or water intake (>24 hours of decreased food intake, >12 hours of decreased water intake)

       i. Abnormal or excessive vocalization

4. **Score (3) Abnormal:**

       a. Does not move when disturbed

       b. Immobile

       c. Inability to access food or water

       d. Circling or rolling that cannot be interrupted

       e. Writhing

       f. Convulsing

       g. Reacts with an especially exaggerated or excitable response

       h. Unable to remain upright or unable to right self if gently placed on side

       i. Unconscious with no response to external stimuli

iv. **Body Condition Score (BCS)**

1. To assess BCS, the observer uses the thumb and index finger to palpate the degree of muscle and fat over the sacroiliac region. **See Appendix A** for a visual guide for assessing BCS. Note that for acute conditions, body condition score may be unaffected.

2. Assign a BCS of 1-5. Convert that to an end-stage illness score according to the statements below.

       a. Score (3): BCS 1 = Emaciated with no palpable fat over the sacroiliac region, severely reduced muscle mass, with prominent vertebrae and iliac crests (emaciated)

       b. Score (2): BCS 2 = Some fat deposition and muscle mass with visible iliac crests (thin)

       c. Score (0): BCS 3 = Easily palpable fat pads, reduced definition of vertebral bodies, palpable but not visible iliac crests and thick prominent muscle mass (normal)

       d. Score (1): BCS 4 = Difficulty in palpating iliac crests, difficulty assessing vertebral definition, and prominent fat pads overlying muscled areas (overweight)

       e. Score (2): BCS 5 = Fat pads that overlay muscle and iliac crests thereby obscuring their presence both tactilely and visually and giving the animal's rump a rounded appearance (obese)

v. **Guidelines for Immediate Reporting**

1. Regardless of the cumulative score, a score of (3) in any category should be **immediately reported to veterinary personnel or euthanized.** Veterinary technicians, residents or faculty may recommend or mandate euthanasia for these conditions regardless of cumulative score.

vi. **Cumulative score**

1. Add the scores together for Appearance, Physical Exam Parameters, Behavior and Body Condition Score. This will be the Cumulative Score.

2. Interpret the Cumulative Score according to Table #1 below.

3. **Table #1: Cumulative Score Interpretation**

Cumulative Score	Interpretation	Action
0	Normal	– Continue regular monitoring. – No further action needed.

1 - 5	Mild to moderate signs of morbidity	– Report to veterinary personnel to discuss changes to monitoring frequency +/- implementation of Treatment Options as detailed below. – Consider outlining a treatment regimen in the protocol.
6 - 8	Significant signs of morbidity	– Report to veterinary personnel to discuss changes to monitoring frequency +/- implementation of Treatment Options as detailed below. – Recommend euthanasia. – Consider outlining a treatment regimen in the protocol.
9 - 11	Moribund	– Euthanize immediately.

4. In all cases, notify veterinary personnel if unanticipated adverse consequences become evident in your model, i.e. multiple animals developing unanticipated clinical signs or disease.

c. **Treatment Options**

   i. Suggested treatment options for rodents demonstrating signs of morbidity may include:
1. Softer bedding
2. Enhanced nesting materials or enrichment
3. Veterinary approved heat source
4. More palatable diet
5. Easier to reach water
6. Topical hydration (sterile lubricant)

   ii. If appropriate and with veterinary consultation or as described in approved animal care and use protocol, treatment options also include:
1. Analgesia
2. Antibiotics
3. Fluid Therapy

   iii. Contact veterinary personnel in order to determine an appropriate treatment plan.

5. **Appendices**

a. **Appendix A: Body Conditioning Scoring**
b. **Appendix B: ULAM Pain Assessment in Mice**
c. **Appendix C: ULAM Pain Assessment in Rats**
d. **Appendix D: ULAM Pain Assessment in Rabbits**
e. **Appendix E: ULAM Health Checking with an Enviropak (Nest Scoring)**
f. **Appendix F: End-Stage Illness Scoring Example**
g. **Appendix G: End-Stage Illness Scoring Sheet**

6. **References**

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