From: Redacted by agreement @mdanderson.org>
Sent: Wednesday, January 02, 2019 11:04 AM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization Framework Draft Version 1
Attachments: Draft - Chimpanzee Health Categorization Framework v1 sah sjm Redacted by docx

Sheri,

I made a small edit and added a few definitions for diabetic states. Please modify as you see fit.

Thank you,

Redacted by agreement DVM, MS, DACLAM
Michale E. Keeling Center for Comparative Medicine and Research
Department of Comparative Medicine
MD Anderson Cancer Center
Redacted by agreement @mdanderson.org

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Tuesday, December 18, 2018 12:39 PM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>
Subject: [EXTERNAL EMAIL] Chimpanzee Health Categorization Framework Draft Version 1
Importance: High

Dear Colleagues,

Attached to this email is the revised Chimpanzee Health Categorization scheme to reflect updates based on our recent meeting. Previous updates were accepted so only modifications from meeting 2 are noted in red font. I have placed this into a Word document so you may make modifications using track changes or insert comments so I can easily track all suggestions. I tried to incorporate all suggestions from our second meeting and have a meaningful level of detail. I incorporated information on cardiac examinations and consults and I refer to your own SOPs for further detail of physical examinations. It is my understanding that all facilities plan to adopt a QOL Plan for behavioral concerns. I will expect each facility to draft such a plan if one does not already exist.

Please let me know if you have any comments, questions or suggested edits. Please return this to me with your edits/comments by Friday, January 4, 2019.

Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator

Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

Health Category	Description of Chimpanzee
I	Animals that are normal and healthy; have no underlying disease or behavioral concerns; have no behavioral management requirement; and are at minimal risk of one or more relocation-related adverse events. Minimal anesthetic risk.
II	Animals with minor disease and slight-to-mild systemic physical health or behavioral disturbance for which the animals can compensate; minimal to no behavioral management is required; class includes geriatric and obese chimpanzees; at slight risk of one or more relocation-related adverse events; slight anesthetic risk.
III	Animals with obvious disease, moderate systemic disease or disturbances, and mild clinical signs; class includes animals with anemia, moderate dehydration, fever, mild to moderate cardiac disease as determined by cardiac evaluation defined below (recommend these animals have as needed additional complete cardiovascular examinations as defined below), mild osteoarthritis, controlled non-insulin dependent diabetes, or moderate behavioral issues where behavioral oversight and guidance is needed to evaluate possible progression of behavioral concern; have a history of successful social group integration; at moderate risk of one or more relocation-related adverse events; moderate anesthetic risk.
IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances (e.g., severe dehydration, shock, uremia, toxemia, high fever, moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below (strongly recommend these animals have additional complete cardiovascular examinations as defined below), pre-diabetes requiring frequent monitoring and/or management with oral medications, insulin-dependent or uncompensated diabetes, pulmonary disease, moderate osteoarthritis or emaciation). Also included are animals that have severe behavior that could cause severe harm to the animals themselves or to other animals, that may restrict their integration into social groups, or that requires increased behavioral oversight and guidance to follow progression of concern and escalation of severity; at high risk of one or more relocation-related adverse events; high anesthetic risk.
V	Animals with life-threatening, systemic disease (e.g., advanced cardiovascular as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below], kidney, liver, or endocrine disease; profound shock; severe trauma; pulmonary embolus; uncontrolled diabetes, severe osteoarthritis or terminal malignancy); extremely severe behavioral issues; at extremely high risk of one or more relocation-related adverse events; animals assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns may makes it extremely difficult to maintain QOL, which includes

Commented [Redacted by agreement] Suggest deleting anemia.

Commented [HS([2]: Unclear to me if I have the diabetes classifications correct.

Commented [MS([3]: Clarification is needed on where to place pre-diabetes (Class III or IV).

	criteria for humane endpoints and consideration for euthanasia; extremely high anesthetic risk.

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Definitions:

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Geriatric: at least 35 years of age

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Controlled Non-Insulin Dependent Diabetic: Animal diagnosed with diabetes, currently well controlled on oral medications

Insulin-Dependent Diabetic: Requires injectable insulin treatment to treat diagnosed diabetes

Uncontrolled Diabetic: Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications

Pre-Diabetic: Animal exhibiting symptoms of pre-diabetes (elevated BG, obesity) that requires frequent blood glucose monitoring and/or management with oral medications

From: Hild, Sheri (NIH/OD) [E]
Sent: Wednesday, January 02, 2019 1:25 PM
To: Redacted by agreement; Redacted by agreement; Redacted by agreement; Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]; Hild, Sheri (NIH/OD) [E]; Vonkollmar, Desiree (NIH/OD) [E]
Subject: Chimpanzee Health Categorization: Meeting 3
Attachments: Classification Scheme Agenda 3.docx; Draft - Chimpanzee Health Categorization Framework v1 sah sjm.docx

Importance: High

Dear Colleagues,

Thank you for completing the doddle poll. Our next meeting will be **Thursday, January 10 at 1 pm ET.** I will send a calendar invite through Outlook as well.

Attached is the proposed agenda. Please review and return the Chimpanzee Health Categorization scheme I sent previously (also attached for your reference). I hope to receive these all by Friday, January 4, so I can create a "compilation" for our meeting. A big thank you to those who have already returned the document!

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Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

Attendees:

Alamogordo Primate Facility (APF): Redacted by agreement

Chimp Haven (CH): Redacted by agreement

Keeling Center for Comparative Medicine Research (KCCMR): Redacted by agreement

Southwest National Primate Research Center (SNPRC) Redacted by agreement

NIH: Sheri Hild, Stephanie Murphy, and Taylor Gilliland

Agenda

- Topics to be covered:
  - Refining categories – draft document
  - Definitions – Are these sufficient
  - QOL Plans for each facility
- Wrap-up and next steps - Sheri

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From: Redacted by agreement @chimphaven.org>
Sent: Monday, January 07, 2019 10:31 AM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization: Meeting 3
Attachments: Draft - Chimpanzee Health Categorization Framework v1 sah sjm.CH edits.docx

Hello Sheri-

I apologize for the missed January 4th deadline, however I was working offsite and realized my email submissions were stuck in my outgoing email folder. Please find attached CH input on the Harmonized Chimpanzee Health Categorization framework.

Sincerely,

CHIMP HAVEN
A NEW BEGINNING
Redacted by agreement | Attending Veterinarian I Sansom Head of Veterinary Medicine
CHIMP HAVEN, INC.
13600 Chimpanzee Place
Keithville, LA 71047
Phone: Redacted by agreement | Fax: 318.925.9576
chimphaven.org | 1.888.98CHIMP

Consider being a chimpanzee's best friend. Click here for more information.

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Wednesday, January 2, 2019 12:25 PM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>; Vonkollmar, Desiree (NIH/OD) [E] <drat@mail.nih.gov>
Subject: Chimpanzee Health Categorization: Meeting 3
Importance: High

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Best regards, Sheri

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Mobile: 301-708-8954
hildsa@mail.nih.gov
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Commented [HS([1]: Unclear to me if I have the diabetes classifications correct.

Commented [Redacted] All diabetic cases (pre-diabetes and non-insulin dependent) requiring intervention (increased positive reinforcement training, diet modifications and/or use of oral medications with controlled clinical signs are considered a III.

Commented [MS([3]: Clarification is needed on where to place pre-diabetes (Class III or IV).

	assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns makes it extremely difficult to maintain QOL, which includes criteria for humane endpoints and consideration for euthanasia; extremely high anesthetic risk.

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From: Hild, Sheri (NIH/OD) [E]
Sent: Tuesday, January 08, 2019 8:38 AM
To: Redacted by agreement; Redacted by agreement; Redacted by agreement; Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]; Vonkollmar, Desiree (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization: Meeting 3
Attachments: Draft - Chimpanzee Health Categorization Framework v2 sah sjm.docx

Dear Colleagues,

Attached is the compilation document, which we will discuss on Thursday. I accepted the changes that we previously discussed and for which I did not receive comments. Suggested edits appear under track changes (highlights) as well as in comments. Looks like most of our discussion will focus on refining the definitions of diabetic categories (questions from the non-vet in the group, but remember these will also be seen by others who are not vets!) and determining which class to place the diabetics (Class III and IV).

I look forward to meeting with you on Thursday!

Best regards, Sheri

From: Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>
Sent: Wednesday, January 2, 2019 1:25 PM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>; Vonkollmar, Desiree (NIH/OD) [E] <drat@mail.nih.gov>
Subject: Chimpanzee Health Categorization: Meeting 3
Importance: High

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Commented [HS([1]: Suggested drop anemia

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Commented [HS([2]: Suggestion that All diabetic cases (pre-diabetes and non-insulin dependent) requiring intervention (increased positive reinforcement training, diet modifications and/or use of oral medications with controlled clinical signs) are considered a class III.

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Commented [HS([3]: Suggestion was to include in Class III.

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Diabetes Categories:

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Commented [HS([4]: Added Diabetic Categories as suggested. Questions are mine (non vet).

Commented [HS([5]: Would this also require frequent blood glucose monitoring?

- **Pre-Diabetic:** Animal exhibiting symptoms of pre-diabetes (elevated blood glucose, obesity) that requires frequent blood glucose monitoring and/or management with oral medications
- **Uncontrolled Diabetic:** Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications

Commented [HS([6]: What about an animal that is difficult to control with insulin?

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From: Vonkollmar, Desiree (NIH/OD) [E]
Sent: Thursday, January 10, 2019 8:45 AM
To: Hild, Sheri (NIH/OD) [E] Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]
Subject: Webex meeting invitation: CHC #3
Attachments: Webex_Meeting.ics; RE: Chimpanzee Health Categorization: Meeting 3

Hello

See below for Webex connection Information for today's Chimp Health call.
Thanks
Desiree

CHC #3
Thursday, January 10, 2019
1:00 pm | Eastern Standard Time (New York, GMT-05:00) | 1 hr

Meeting number (access code): Passcode

Meeting password: Passcode

Add to Calendar When it's time, join the meeting.

https://nih.webex.com/nih Passcode

Join by phone
1-650-479-3208 Call-in toll number (US/Canada)
Global call-in numbers

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Sent: Tuesday, January 08, 2019 8:38 AM
To: Redacted by agreement; Redacted by agreement; Redacted by agreement; Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]; Vonkollmar, Desiree (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization: Meeting 3
Attachments: Draft - Chimpanzee Health Categorization Framework v2 sah sjm.docx

Dear Colleagues,

Attached is the compilation document, which we will discuss on Thursday. I accepted the changes that we previously discussed and for which I did not receive comments. Suggested edits appear under track changes (highlights) as well as in comments. Looks like most of our discussion will focus on refining the definitions of diabetic categories (questions from the non-vet in the group, but remember these will also be seen by others who are not vets!) and determining which class to place the diabetics (Class III and IV).

I look forward to meeting with you on Thursday!

Best regards, Sheri

From: Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>
Sent: Wednesday, January 2, 2019 1:25 PM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>; Vonkollmar, Desiree (NIH/OD) [E] <drat@mail.nih.gov>
Subject: Chimpanzee Health Categorization: Meeting 3
Importance: High

Dear Colleagues,

Thank you for completing the doddle poll. Our next meeting will be **Thursday, January 10 at 1 pm ET.** I will send a calendar invite through Outlook as well.

Attached is the proposed agenda. Please review and return the Chimpanzee Health Categorization scheme I sent previously (also attached for your reference). I hope to receive these all by Friday, January 4, so I can create a "compilation" for our meeting. A big thank you to those who have already returned the document!

The WebEx information will be sent closer to the meeting date.

Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov

6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

Health Category	Description of Chimpanzee
I	Animals that are normal and healthy; have no underlying disease or behavioral concerns; have no specialized behavioral intervention management requirement; and are at minimal risk of one or more relocation-related adverse events. Minimal anesthetic risk.
II	Animals with minor disease and slight-to-mild systemic physical health or behavioral disturbance for which the animals can compensate; minimal to no specialized behavioral intervention management is required; class includes geriatric and obese chimpanzees; at slight risk of one or more relocation-related adverse events; slight anesthetic risk.
III	Animals with obvious disease, moderate systemic disease or disturbances, and mild clinical signs that are medically controlled; class includes animals with ~~anemia,~~ moderate dehydration, fever, mild to moderate cardiac disease as determined by cardiac evaluation defined below (recommend these animals have as needed additional complete cardiovascular examinations as defined below), mild osteoarthritis, controlled non-insulin dependent diabetes, pre-diabetes requiring interventions (i.e., frequent monitoring and/or management with oral medications, increased positive reinforcement training, diet modifications), or moderate documented behavioral issues where behavioral oversight and guidance is needed to evaluate possible progression of behavioral concern; have a history of successful social group integration; at moderate risk of one or more relocation-related adverse events; moderate anesthetic risk.
IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances (e.g., severe dehydration, shock, uremia, toxemia, high fever, moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below (strongly recommend these animals have additional complete cardiovascular examinations as defined below), pre-diabetes requiring frequent monitoring and/or management with oral medications, insulin-dependent or uncompensated diabetes, pulmonary disease, moderate osteoarthritis or emaciation). Also included are animals that have severe behavior that could cause severe harm to the animals themselves or to other animals, that may restrict their integration into social groups, or that requires increased behavioral oversight and guidance to follow progression of concern and escalation of severity; at high risk of one or more relocation-related adverse events; high anesthetic risk.
V	Animals with life-threatening, systemic disease that poses a constant threat and could result in abrupt death (e.g., advanced cardiovascular as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below], kidney, liver, or endocrine disease; profound shock; severe trauma; pulmonary embolus; uncontrolled diabetes, severe osteoarthritis or terminal malignancy); extremely severe documented behavioral issues that have previously and repeatedly resulted in serious harm to self or others; at

Commented [HS([1]: Suggested drop anemia

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Commented [HS([2]: Suggestion that All diabetic cases (pre-diabetes and non-insulin dependent) requiring intervention (increased positive reinforcement training, diet modifications and/or use of oral medications with controlled clinical signs) are considered a class III.

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Commented [HS([3]: Suggestion was to include in Class III.

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	extremely high risk of one or more relocation-related adverse events; animals assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns may make it extremely difficult to maintain QOL, which includes criteria for humane endpoints and consideration for euthanasia; extremely high anesthetic risk.

Frequency of Assessment and Re-classification: Animals should be evaluated at least annually but more frequently as needed when clinical symptoms dictate further follow-up to determine their health classification. The animal's history and clinical signs will dictate the medical procedures and tests required for diagnosis and re-classification. Determination of further medical and/or behavioral assessments will be determined by the veterinarian, who evaluates the animal. For animals with multiple conditions, the most severe disease state(s) drives the classification; however, multiple conditions itself is indicative of a more severe health classification.

Definitions:

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Complete Cardiovascular Examination: Performed by a board-certified veterinary cardiologist. This evaluation may include systemic blood pressure measurements, a 3-minute ECG, and an echocardiogram. The echocardiogram may include an ECG tracing for timing purposes and sedation with alpha 2 adrenergic agonists should be avoided. The echocardiogram may include a complete cardiovascular assessment of chamber size and function, valvular anatomy and potency, etc. with 2D and Doppler echocardiographic imaging. Ejection fraction may also be calculated.

Diabetes Categories:

- **Controlled Non-Insulin Dependent Diabetic:** Animal diagnosed with diabetes, currently well controlled on oral medications
- **Insulin-Dependent Diabetic:** Requires injectable insulin treatment to treat diagnosed diabetes

Commented [HS([4]: Added Diabetic Categories as suggested. Questions are mine (non vet).

Commented [HS([5]: Would this also require frequent blood glucose monitoring?

- **Pre-Diabetic:** Animal exhibiting symptoms of pre-diabetes (elevated blood glucose, obesity) that requires frequent blood glucose monitoring and/or management with oral medications
- **Uncontrolled Diabetic:** Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications

Commented [HS([6]: What about an animal that is difficult to control with insulin?

Geriatric: at least 35 years of age

Physical Examination: Each facility has a standard operating procedure (SOP) describing an annual physical examination of a chimpanzee including recommended medical tests and evaluation criteria.

Quality of Life (QOL) Plans: Each facility has defined QOL Plans based on health and medical considerations as well as behavioral concerns. The QOL Plans include criteria for humane endpoints and consideration of euthanasia.

From: Hild, Sheri (NIH/OD) [E]
Sent: Friday, January 11, 2019 9:34 AM
To: Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]
Subject: Chimpanzee Health Categorization
Attachments: Draft - Chimpanzee Health Categorization Framework v3.docx

Importance: High

Dear Colleagues,

Attached is what is hopefully a near final draft of the Chimpanzee Health Categorization Framework. It incorporates all the changes we discussed yesterday. I have made editorial changes to improve readability (not affect content) and I have made some obvious formatting changes, which I also hope improves your ability to ready through the classifications and assure us that all necessary points are covered. There are no track changes as that is simply distracting at this point.

I do have a couple comments in the attachment for which I specifically want you to provide a response. This is because these were mentioned and I have them in my notes, but they were not incorporated in the document that Stephanie was so diligently editing during the meeting. Please also provide any other comments or suggestions you may have. Your responses will determine if we need to have a final meeting or not.

Please review and return by COB January 18, 2019. If you can complete this sooner, it would be appreciated.

Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

1/11/2019

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III	Animals with obvious disease, moderate systemic disease or disturbances, and mild clinical signs that are medically controlled; class includes animals with: • mild cardiac disease as determined by cardiac evaluation defined below (recommend these animals have, as needed, additional complete cardiovascular examinations as defined below), • mild osteoarthritis, • controlled non-insulin dependent diabetes (as defined below), • pre-diabetes (as defined below), or • moderate documented behavioral issues where behavioral oversight and guidance is needed to evaluate possible progression of behavioral concern; • have a history of successful social group integration; • at moderate risk of one or more relocation-related adverse events; • moderate anesthetic risk.
IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances, examples include: • severe dehydration, shock, uremia, toxemia, high fever; • moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • insulin-dependent diabetes (as defined below); • moderate to severe pulmonary disease; • moderate osteoarthritis or emaciation. • Also included are animals that have documented behaviors, which could cause severe harm to the animals themselves or to other animals, and may restrict their integration into social groups, or which requires increased behavioral

Commented [HS([1]: Added adjective to align with what was done for other diseases. Is this an acceptable descriptor? If not please provide a suggestion.

	oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
V	Animals with life-threatening, systemic disease that poses a constant threat and could result in abrupt death, examples include: • advanced cardiovascular disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • advanced or progressive kidney, liver, or endocrine disease; • profound shock; • severe trauma; • pulmonary embolus; • uncontrolled diabetes [as defined below]; • severe osteoarthritis or terminal malignancy. • Also included are animals with extremely severe documented behavioral issues that have previously resulted in serious harm to self or others; • at extremely high risk of one or more relocation-related adverse events; • animals assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns may make it extremely difficult to maintain QOL, which includes criteria for humane endpoints and consideration for euthanasia; • extremely high anesthetic risk.

Frequency of Assessment and Re-classification: Animals should be evaluated at least annually but more frequently as needed when clinical symptoms dictate further follow-up to determine their health classification. The animal's history and clinical signs will dictate the medical procedures and tests required for diagnosis and re-classification. Determination of further medical and/or behavioral assessments will be determined by the veterinarian and behaviorist, who evaluate the animal. For animals with multiple conditions, the most severe disease state(s) drives the classification; however, multiple conditions itself is indicative of a more severe health classification.

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maybe ordered. If any cardiovascular abnormalities are noted by the clinical veterinarians, then a complete cardiovascular examination may be scheduled.

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Diabetes Categories:

- **Controlled Non-Insulin Dependent Diabetes:** Animal diagnosed with diabetes, currently well controlled on oral medications.
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- **Uncontrolled Diabetes:** Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications or insulin.

Commented [HS([2]: Added based on my notes; please confirm that this should be included. Is this an appropriate management concern?

Geriatric: at least 35 years of age

Physical Examination: Each facility has a standard operating procedure (SOP) describing an annual physical examination of a chimpanzee including recommended medical tests and evaluation criteria.

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From: Redacted by agreement @chimphaven.org>
Sent: Thursday, January 17, 2019 12:38 PM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization
Attachments: Draft - Chimpanzee Health Categorization Framework v3 edits.docx

Redacted by agreement

Hello Sheri-

Please find attached my minor edits to the Chimpanzee Health Categorization Framework.

Thank you,

CHIMPHAVEN
A NEW BEGINNING

Redacted by agreement by agreement Attending Veterinarian I Sansom Head of Veterinary Medicine
MP HAVEN, INC.
13600 Chimpanzee Place
Keithville, LA 71047
Phone: Redacted by agreement Fax: 318.925.9576
chimphaven.org | 1.888.98CHIMP

Consider being a chimpanzee's best friend. Click here for more information.

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Friday, January 11, 2019 8:34 AM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>
Subject: Chimpanzee Health Categorization
Importance: High

Dear Colleagues,

Attached is what is hopefully a near final draft of the Chimpanzee Health Categorization Framework. It incorporates all the changes we discussed yesterday. I have made editorial changes to improve readability (not affect content) and I have made some obvious formatting changes, which I also hope improves your ability to ready through the classifications and assure us that all necessary points are covered. There are no track changes as that is simply distracting at this point.

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Stephanie was so diligently editing during the meeting. Please also provide any other comments or suggestions you may have. Your responses will determine if we need to have a final meeting or not.

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Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

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1/11/2019

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IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances, examples include but not limited to: • severe dehydration, shock, uremia, toxemia, high fever; • moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • insulin-dependent diabetes (as defined below); • chronic or moderate to severe pulmonary disease; • moderate osteoarthritis or emaciation. • Also included are animals that have documented behaviors, which could cause severe harm to the animals themselves or to other animals, and may restrict their integration into social groups, or which requires increased behavioral

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Commented [HS([1]: Added adjective to align with what was done for other diseases. Is this an acceptable descriptor? If not please provide a suggestion.

	oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
V	Animals with life-threatening, systemic disease that poses a constant threat and could result in abrupt death, examples include: • advanced cardiovascular disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • advanced or progressive kidney, liver, or endocrine disease; • profound shock; • severe trauma; • pulmonary embolus; • uncontrolled diabetes [as defined below]; • severe osteoarthritis or terminal malignancy. • Also included are animals with extremely severe documented behavioral issues that have previously resulted in serious harm to self or others; • at extremely high risk of one or more relocation-related adverse events; • animals assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns may make it extremely difficult to maintain QOL, which includes criteria for humane endpoints and consideration for euthanasia; • extremely high anesthetic risk.

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maybe ordered. If any cardiovascular abnormalities are noted by the clinical veterinarians, then a complete cardiovascular examination may be scheduled.

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Geriatric: at least 35 years of age

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Redacted by agree

Commented I concur with this addition

Commented [HS([3]: Added based on my notes; please confirm that this should be included. Is this an appropriate management concern?

From: Redacted by agreement @TxBiomed.org>
Sent: Thursday, January 17, 2019 3:34 PM
To: Hild, Sheri (NIH/OD) [E]
Cc: Redacted by agreement
Subject: Chimpanzee Health Categorization Framework v3 draft from Sheri Hild
Attachments: Chimpanzee Health Categorization Framework v3 draft from Sheri Hild.docx

Sheri,
I agree with your comments. I just added a comment about contagious infectious disease since we have an animal that has recurrent ocular herpes infection.
Best regards,
Redacted by agreement

Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

1/11/2019

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Redacted by agreement

Commented Fever; contagious infectious disease i.e. herpes virus infection

Commented [HS([2]: Added adjective to align with what was done for other diseases. Is this an acceptable descriptor? If not please provide a suggestion.

	oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
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- **Uncontrolled Diabetes:** Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications or insulin.

Commented [HS([3]: Added based on my notes; please confirm that this should be included. Is this an appropriate management concern?

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From: Redacted by agreement @mdanderson.org>
Sent: Thursday, January 17, 2019 6:01 PM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization
Attachments: Draft - Chimpanzee Health Categorization Framework v3 Redacted by agreement docx

Sheri,

Just a couple more edits. I think your additions look good. I also like the bullet format. There were just a few items left on that didn't seem relevant or make sense in the chimp health context.

Redacted by agreement DVM, MS, DACLAM
Michale E. Keeling Center for Comparative Medicine and Research
Department of Comparative Medicine
MD Anderson Cancer Center
Redacted by agreement @mdanderson.org

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Thursday, January 17, 2019 11:00 AM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org> Redacted by agreement Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>
Subject: [EXTERNAL EMAIL] RE: Chimpanzee Health Categorization

A subtle (or not so subtle) reminder that I need the attached document returned to me tomorrow by COB. I am expecting a response back on the inserted comments even if it is yes I agree with this. Thanks much! Sheri

From: Hild, Sheri (NIH/OD) [E]
Sent: Friday, January 11, 2019 9:34 AM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>
Subject: Chimpanzee Health Categorization
Importance: High

Dear Colleagues,

Attached is what is hopefully a near final draft of the Chimpanzee Health Categorization Framework. It incorporates all the changes we discussed yesterday. I have made editorial changes to improve readability (not affect content) and I have made some obvious formatting changes, which I also hope improves your ability to ready through the classifications and assure us that all necessary points are covered. There are no track changes as that is simply distracting at this point.

I do have a couple comments in the attachment for which I specifically want you to provide a response. This is because these were mentioned and I have them in my notes, but they were not incorporated in the document that Stephanie was so diligently editing during the meeting. Please also provide any other comments or suggestions you may have. Your responses will determine if we need to have a final meeting or not.

Please review and return by COB January 18, 2019. If you can complete this sooner, it would be appreciated.

Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

1/11/2019

Health Category	Description of Chimpanzee
I	Animals that are normal and healthy; • have no underlying disease or behavioral concerns; • have no specialized behavioral intervention management requirement; and • are at minimal risk of one or more relocation-related adverse events. • Minimal anesthetic risk.
II	Animals with minor disease and slight-to-mild systemic physical health or behavioral disturbance for which the animals can compensate; • minimal to no specialized behavioral intervention management is required; • class includes geriatric and obese chimpanzees; • at slight risk of one or more relocation-related adverse events; • slight anesthetic risk.
III	Animals with obvious disease, moderate systemic disease or disturbances, and mild clinical signs that are medically controlled; class includes animals with: • mild cardiac disease as determined by cardiac evaluation defined below (recommend these animals have, as needed, additional complete cardiovascular examinations as defined below), • mild osteoarthritis, • controlled non-insulin dependent diabetes (as defined below), • pre-diabetes (as defined below), or • moderate documented behavioral issues where behavioral oversight and guidance is needed to evaluate possible progression of behavioral concern; • have a history of successful social group integration; • at moderate risk of one or more relocation-related adverse events; • moderate anesthetic risk.
IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances, examples include: • ~~severe dehydration, shock, uremia, toxemia, high fever;~~ • moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • insulin-dependent diabetes (as defined below); • moderate to severe pulmonary disease; • moderate osteoarthr~~itis or emaciation.~~ • Also included are animals that have documented behaviors, which could cause severe harm to the animals themselves or to other animals, and may restrict their integration into social groups, or which requires increased behavioral

Commented [Redacted]: Suggest deleting severe dehydration, shock, uremia, toxemia, high fever. These go along with the human anesthesia guidelines but aren't relevant for the chimps.

Commented [HS([2]: Added adjective to align with what was done for other diseases. Is this an acceptable descriptor? If not please provide a suggestion.

Commented [Redacted]: Sounds good

Commented [Redacted]: Suggest deleting emaciation. It should accompany an already listed condition and not stand on its own.

	oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
V	Animals with life-threatening, systemic disease that poses a constant threat and could result in abrupt death, examples include: • advanced cardiovascular disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • advanced or progressive kidney, liver, or endocrine disease; • profound shock; • severe trauma; • pulmonary embolus; • uncontrolled diabetes [as defined below]; • severe osteoarthritis or terminal malignancy. • Also included are animals with extremely severe documented behavioral issues that have previously resulted in serious harm to self or others; • at extremely high risk of one or more relocation-related adverse events; • animals assigned to a Quality of Life (QOL) Plan for health or behavioral issues; severity of behavioral concerns may make it extremely difficult to maintain QOL, which includes criteria for humane endpoints and consideration for euthanasia; • extremely high anesthetic risk.

Frequency of Assessment and Re-classification: Animals should be evaluated at least annually but more frequently as needed when clinical symptoms dictate further follow-up to determine their health classification. The animal's history and clinical signs will dictate the medical procedures and tests required for diagnosis and re-classification. Determination of further medical and/or behavioral assessments will be determined by the veterinarian and behaviorist, who evaluate the animal. For animals with multiple conditions, the most severe disease state(s) drives the classification; however, multiple conditions itself is indicative of a more severe health classification.

Definitions:

Cardiac Evaluation: At annual physical exam or if clinical signs such as exercise intolerance, respiratory issues, or lethargy are noted, a series of exams maybe initiated outside of the regular scheduled annual physical examination. A cardiac evaluation may include: radiographs (2 views), auscultation of the heart to evaluate murmurs, systemic blood pressure (minimum of 3 readings), and electrocardiogram (ECG) tracing(s) to evaluate conductivity. If possible, a brief 2 view (2 and 4 chamber) echocardiogram may be performed to initially evaluate ventricular size. A Complete Blood Count (CBC) and blood chemistry are standard for all physical examinations and if warranted, cardiac biomarkers such as B-type Natriuretic Peptide (BNP)

maybe ordered. If any cardiovascular abnormalities are noted by the clinical veterinarians, then a complete cardiovascular examination may be scheduled.

Complete Cardiovascular Examination: Performed by a board-certified veterinary cardiologist. This evaluation may include systemic blood pressure measurements, a 3-minute ECG, and an echocardiogram. The echocardiogram may include an ECG tracing for timing purposes and sedation with alpha 2 adrenergic agonists should be avoided. The echocardiogram may include a complete cardiovascular assessment of chamber size and function, valvular anatomy and potency, etc. with 2D and Doppler echocardiographic imaging. Ejection fraction may also be calculated.

Diabetes Categories:

- **Controlled Non-Insulin Dependent Diabetes:** Animal diagnosed with diabetes, currently well controlled on oral medications.
- **Insulin-Dependent Diabetes:** Animal requires injectable insulin treatment to treat diagnosed diabetes and regular blood glucose monitoring.
- **Pre-Diabetes:** Animal exhibiting symptoms of pre-diabetes (elevated blood glucose, obesity) that requires frequent blood glucose monitoring and/or management with oral medications, diet modifications, and increased positive-reinforcement training.
- **Uncontrolled Diabetes:** Animal diagnosed with diabetes that requires frequent blood glucose monitoring and is not well controlled on oral medications or insulin.

Commented [HS([S]: Added based on my notes; please confirm that this should be included. Is this an appropriate management concern?

Commented [redacted by agreement] Sounds good

Geriatric: at least 35 years of age

Physical Examination: Each facility has a standard operating procedure (SOP) describing an annual physical examination of a chimpanzee including recommended medical tests and evaluation criteria.

Quality of Life (QOL) Plans: Each facility has defined QOL Plans based on health and medical considerations as well as behavioral concerns. The QOL Plans include criteria for humane endpoints and consideration of euthanasia.

From: Redacted by agreement @crl.com>
Sent: Friday, January 18, 2019 10:56 AM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: [External]: chat about cages and loading
Attachments: Draft - Chimpanzee Health Categorization Framework v3 APF edits 1.18.2019.docx

Hi Sheri,
Here is our edits in yellow highlight. Do you have time to talk soon?

Thanks

Redacted by agreement **DVM, MBA, DACLAM**
Director, APF
Insourcing Solutions/Charles River
PO Box 956 HAFB, NM 88330
O Redacted by **C** Redacted by **F:575-679-9841**
E-mail: Redacted by **@crl.com**
www.criver.com

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Friday, January 18, 2019 5:59 AM
To Redacted by agreement @crl.com>
Subject: [External]: chat about cages and loading

Redacted by agreement Might you have time for a call to review APF's approach to loading chimpanzees and relevant cage sizes. Appreciate your input. Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
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Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

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IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances, examples include: • severe dehydration, shock, uremia, toxemia, high fever; • moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • insulin-dependent diabetes (as defined below); • moderate to severe pulmonary disease; • moderate osteoarthritis or emaciation. • Also included are animals that have documented behaviors, which could cause severe harm to the animals themselves or to other animals, and may restrict their integration into social groups, or which requires increased behavioral

Commented [HS([1]: Added adjective to align with what was done for other diseases. Is this an acceptable descriptor? If not please provide a suggestion.

	oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
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Definitions:

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- **Controlled Non-Insulin Dependent Diabetes:** Animal diagnosed with diabetes, currently well controlled on oral medications.
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From: Smith, Thomas (NIH/NIDDK) [E]
Sent: Tuesday, January 22, 2019 12:22 PM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: chimp call and a doddle poll

Hi Sheri,

Here's the link to the doodle poll! htt[redacted]s://doodle.com/poll/[redacted] Redacted by agreement

TJ

From: Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>
Sent: Tuesday, January 22, 2019 9:26 AM
To: Smith, Thomas (NIH/OD) [E] <thomas.smith7@nih.gov>
Subject: chimp call and a doddle poll

TJ, reminder we have a call this afternoon.

Will you make a doodle poll to hold a teleconference based on Stephanie's and my availability for before the end of the month? It will be for the Chimpanzee Health Categorization group Meeting 4 and I will send out the poll once its created (4 external sites). Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
Office: 301-594-8937
Mobile: 301-708-8954
hildsa@mail.nih.gov
6701 Democracy Blvd., Room 956, MSC 4877
Bethesda, MD 20892-4877

From: Hild, Sheri (NIH/OD) [E]
Sent: Tuesday, January 22, 2019 12:46 PM
To: Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]; Vonkollmar, Desiree (NIH/OD) [E]
Subject: Chimpanzee Health Categorization - One last meeting
Attachments: Draft - Chimpanzee Health Categorization Framework v4 sjm sah.docx

Dear Colleagues,

Attached is the compilation document with all comments/suggestion inserted. We are almost there! My preference is to have one last WebEx meeting (Meeting 4) to discuss the suggestions and come to consensus on the final document. I think this is better than more email swapping, so please complete the doddle poll:
https://doodle.com/poll Redacted by agreement

The poll is in 1-hour increments, but I doubt we will use more than 30 minutes.

Thanks, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
NIH Office of the Director
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Chimpanzee Health Categorization Framework: Harmonized Across NIH-supported Facilities

Categorizations should be used to better understand the animal's needs in its current and future environments and should inform any relocation decisions (i.e., transfer process, quarantine and resocialization of animals).

1/18/2019

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IV	Animals that are significantly compromised by disease, have preexisting systemic disease or severe disturbances, examples include but not limited to: • ~~severe dehydration, shock, uremia, toxemia, high fever~~; • chronic or recurring conditions with high risk of transmission to other chimpanzees (e.g., recurrent herpes virus) • moderate to severe or uncompensated heart disease as determined by cardiac evaluation defined below [strongly recommend these animals have additional complete cardiovascular examinations as defined below]; • insulin-dependent diabetes (as defined below);

Commented [HS([1]: Combined bullet as requested

Commented [HS([2]: Request to add this

Commented [HS([3]: Suggestion to delete these as they are symptoms and would accompany a diagnosed disease state

Commented [HS([4]: Request to include as these animals (pair) are not able to be combined with other animals due to the spread of the virus.

	• chronic or moderate to severe pulmonary disease; • moderate osteoarthritis ~~or emaciation~~. • Also included are animals that have documented behaviors, which could cause severe harm to the animals themselves or to other animals, and may restrict their integration into social groups, or which requires increased behavioral oversight and guidance to follow progression of the concern and escalation of severity; • at high risk of one or more relocation-related adverse events; • high anesthetic risk.
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Commented [HS([5]: Request to add chronic.

Commented [HS([6]: Request to deleted as it is a symptom and would accompany an already listed disease.

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Commented [SH7]: Suggested change from "conductivity" by cardiologist.

Commented [SH8]: Suggestion by cardiologist to change form may to should; leave as "may" giving the AV the option? opinions?

Commented [SH9]: Suggestions change from may to should by cardiologist; leave as "may" giving the AV the option? opinions?

Commented [SH10]: Another suggested change of may to should; opinions?

Commented [SH11]: Should or may?

Commented [SH12]: Additional information from cardiologist; opinions on the classification of IV or V as suggested?

From: Hild, Sheri (NIH/OD) [E]
Sent: Friday, January 25, 2019 12:43 PM
To: Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement
Cc: Gilliland, Taylor (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]; Vonkollmar, Desiree (NIH/OD) [E]
Subject: Second Attempt! RE: Chimpanzee Health Categorization - One last meeting

Importance: High

The first attempt did not yield a time where we could all meeting so I am trying again for a time between Feb 6 and Feb 8. Hopefully we can find a time slot! Please complete this doddle poll: https://doodle.com/poll/ Redacted by agreement

Thanks, Sheri

From: Hild, Sheri (NIH/OD) [E]
Sent: Tuesday, January 22, 2019 12:46 PM
To: Redacted by agreement @crl.com>; Redacted by agreement @mdanderson.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>
Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Vonkollmar, Desiree (NIH/OD) [E] <drat@mail.nih.gov>
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Sheri Ann Hild, PhD
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Bethesda, MD 20892-4877

From: Redacted by agreement @mdanderson.org>
Sent: Tuesday, January 29, 2019 9:26 AM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: Second Attempt! RE: Chimpanzee Health Categorization - One last meeting

Sheri,

Done. I will be at the ACLAM exam retreat all next week and I am hoping I can find a landline from which to call in. Last year cell phone service was very poor. There were no televisions, but I think I recall telephones in the rooms.

Thank you,

Redacted by agreement DVM, MS, DACLAM
Michale E. Keeling Center for Comparative Medicine and Research
Department of Comparative Medicine
MD Anderson Cancer Center
Redacted by agreement @mdanderson.org

From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Tuesday, January 29, 2019 6:44 AM
To: Redacted by agreement @mdanderson.org>; Redacted by agreement @chimphaven.org>
Subject: [EXT] FW: Second Attempt! RE: Chimpanzee Health Categorization - One last meeting
Importance: High

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---

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Sent: Friday, January 25, 2019 12:43 PM
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Cc: Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Vonkollmar, Desiree (NIH/OD) [E] <drat@mail.nih.gov>
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From: Redacted by agreement @crl.com>
Sent: Wednesday, January 30, 2019 11:39 AM
To: Hild, Sheri (NIH/OD) [E]
Subject: Re: [External]: time on Feb 6

That's fine

Sent from my iPhone

On Jan 30, 2019, at 6:36 AM, Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov> wrote:

Redacted by agreement Would you be able to adjust your schedule to be available between 4 and 5 pm ET on Feb 6 for the Categorization meeting. I don't think this will go a full hour. You are the only one not available at this time. I will also see if Redacted by agreement can adjust her schedule at all as well. Thanks! Sheri

Sheri Ann Hild, PhD
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From: Redacted by agreement @chimphaven.org>
Sent: Wednesday, January 30, 2019 12:06 PM
To: Hild, Sheri (NIH/OD) [E]
Subject: RE: time on Feb 6

Hello Sheri-

My availability is limited as I have quarantine and additional examinations scheduled for this date. My only availability is 3-4PM as indicated.

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From: Hild, Sheri (NIH/OD) [E] [mailto:sheri.hild@nih.gov]
Sent: Wednesday, January 30, 2019 10:40 AM
To: Redacted by agreement @chimphaven.org>
Subject: time on Feb 6

Redacted by agreement Do you have any other availability, even 30 minutes, on Feb 6 for the Categorization call? Everyone else is available Feb 6 between noon and 4 pm ET. If I could fit you within that time window, I could schedule our last call. I think we are very close and will need only 30 minutes. I know you are very busy so I also asked Redacted by agree if he can make a slight adjustment. Please let me know so I can schedule this meeting. Thanks in advance, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
Division of Comparative Medicine, ORIP, DPCPSI
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Office: 301-594-8937
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From: Hild, Sheri (NIH/OD) [E]
Sent: Thursday, February 14, 2019 8:55 AM
To: Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement @TxBiomed.org; Redacted by agreement Redacted by agreement
Cc: Murphy, Stephanie (NIH/OD) [E]; Grieder, Franziska (NIH/OD) [E]; Chang, Michael (NIH/OD) [E]
Subject: Chimpanzee Health Categorization Framework
Attachments: Chimpanzee Health Categorization Framework Final.pdf

Dear Colleagues,

Attached is the final categorization framework that was developed with input from the four facilities housing NIH-owned or support chimpanzees: Alamogordo Primate Facility (APF); Chimp Haven (CH), Keeling Center for Comparative Medicine and Research (KCCMR), and Southwest National Primate Research Center (SNPRC). This consensus document should be used to classify the chimpanzees at your facility. It encompasses both health and behavioral criteria in considering the classification of a chimpanzee.

I would like to thank the representatives from each facility who helped develop this framework Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement and Redacted by agreement However, I know they received support from many of their colleagues, and I appreciate all their input as well!

Best regards, Sheri

Sheri Ann Hild, PhD
Health Science Administrator
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From: Anderson, James (NIH/OD) [E]
Sent: Thursday, February 14, 2019 10:49 AM
To: Hild, Sheri (NIH/OD) [E]
Cc: Grieder, Franziska (NIH/OD) [E]; Chang, Michael (NIH/OD) [E]; Murphy, Stephanie (NIH/OD) [E]
Subject: RE: Final document describing health categorization

Sheri,

Thanks.
I did notice the use of "may".

Jim

From: Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>
Sent: Thursday, February 14, 2019 9:56 AM
To: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Cc: Grieder, Franziska (NIH/OD) [E] <griederf@mail.nih.gov>; Chang, Michael (NIH/OD) [E] <changmic@mail.nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>
Subject: FW: Final document describing health categorization

Dear Jim,

Franziska asked me to respond to your query.

The thought process on the cardiac and the complete cardiovascular examination was these would be recommended guidelines for animals with suspected heart disease and not necessarily routine. Additional cardiac workups and data collection are described, but the wording ("may" was used not "should") allows the attending veterinary the flexibility in deciding how best to proceed considering what is in the best interest of the animal. For example, severe anesthetic risk would outweighed the benefit of the cardiac exam.

I hope this adequately addresses your questions. Please reach out if you need any other clarifications.

Best regards, Sheri

From: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Sent: Thursday, February 14, 2019 7:14 AM
To: Grieder, Franziska (NIH/OD) [E] <griederf@mail.nih.gov>
Subject: RE: Final document describing health categorization

Franziska,

I apologize. I did review these documents when originally sent but failed to respond.

I agree. They are excellent. Let's proceed.

Do you plan to have the cardiology specialist examine them all or just when there is a suspicion of heart disease?

The median age at death in every facility is about 32. Defining geriatric as 35 seems appropriate.

Jim

From: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Sent: Wednesday, February 13, 2019 6:31 PM
To: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Subject: FW: Final document describing health categorization

From: Grieder, Franziska (NIH/OD) [E] <griederf@mail.nih.gov>
Sent: Wednesday, February 13, 2019 1:33 PM
To: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Cc: Kawazoe, Robin (NIH/OD) [E] <kawazoer@mail.nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>; Chang, Michael (NIH/OD) [E] <changmic@mail.nih.gov>; Grieder, Franziska (NIH/OD) [E] <griederf@mail.nih.gov>
Subject: FW: Final document describing health categorization

Jim, as discussed on the phone, here is the e-mail with the harmonization document.

Many thanks for looking at this so we can proceed. Franziska

Franziska B. Grieder
E-mail: griederf@mail.nih.gov

From: Grieder, Franziska (NIH/OD) [E] <griederf@mail.nih.gov>
Sent: Thursday, February 7, 2019 8:41 AM
To: Anderson, James (NIH/OD) [E] <james.anderson2@nih.gov>
Cc: Kawazoe, Robin (NIH/OD) [E] <kawazoer@mail.nih.gov>; Gilliland, Taylor (NIH/OD) [E] <c.gilliland@nih.gov>; Hild, Sheri (NIH/OD) [E] <sheri.hild@nih.gov>; Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Chang, Michael (NIH/OD) [E] <ChangMic@mail.nih.gov>; Grieder, Franziska (NIH/OD) [E] <GriederF@mail.nih.gov>
Subject: Final document describing health categorization

Jim:

Yesterday, on a phone call that Sheri lead with the facilities, the group finalized the document describing the health categorization framework for chimpanzees. The panel reached consensus on the attached document categories and frequency of evaluation.

How would you like to proceed? When you are ready, we suggest that we distribute this document to the facilities in this final form as well as sharing this internally with our NIH colleagues who are interested parties (e.g. independent veterinary panel, OLAW, OACU).

I have also attached the updated table with the WG recommendations. This document addresses Recommendations #2 and #3.

Thank you for letting us know if we should proceed with the plan outlined above.

Franziska

Franziska B. Grieder
E-mail: griederf@mail.nih.gov

From: Murphy, Stephanie (NIH/OD) [E]
Sent: Wednesday, February 20, 2019 4:36 PM
To: Hild, Sheri (NIH/OD) [E]
Cc: Grieder, Franziska (NIH/OD) [E]
Subject: Harmonization document

Sheri,

We have the greenlight from FG and JA that the PDF of the five-class document (harmonization) can be posted on the web site.

Stephanie

Stephanie J. Murphy, VMD, PhD, DACLAM
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From: Hild, Sheri (NIH/OD) [E]
Sent: Thursday, February 21, 2019 12:52 PM
To: Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement Redacted by agreement @TxBiomed.org; Redacted by agreement Redacted by agreement
Cc: Murphy, Stephanie (NIH/OD) [E]; Grieder, Franziska (NIH/OD) [E]; Chang, Michael (NIH/OD) [E]
Subject: RE: Chimpanzee Health Categorization Framework

Dear Colleagues,

I am writing to let you know that ORIP has published this categorization framework on the ORIP website under the Chimpanzee Management Program. The direct link is located here: https://orip.nih.gov/sites/default/files/ChimpanzeeHealthCategorizationFrameworkFinal_508.pdf .

Best regards, Sheri

From: Hild, Sheri (NIH/OD) [E]
Sent: Thursday, February 14, 2019 8:55 AM
To: Redacted by agreement @mdanderson.org>; Redacted by agreement @mdanderson.org>; Redacted by agreement @mdanderson.org>; Redacted by agreement @crl.com>; Redacted by agreement @crl.com>; Redacted by agreement @chimphaven.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @chimphaven.org>; Redacted by agreement @TxBiomed.org>; Redacted by agreement @TxBiomed.org>; Redacted by agreement @TxBiomed.org' <Redacted by @TxBiomed.org>; Redacted by agreement @txbiomed.org>
Cc: Murphy, Stephanie (NIH/OD) [E] <stephanie.murphy@nih.gov>; Grieder, Franziska (NIH/OD) [E] <GriederF@mail.nih.gov>; Chang, Michael (NIH/OD) [E] <ChangMic@mail.nih.gov>
Subject: Chimpanzee Health Categorization Framework

Dear Colleagues,

Attached is the final categorization framework that was developed with input from the four facilities housing NIH-owned or support chimpanzees: Alamogordo Primate Facility (APF); Chimp Haven (CH), Keeling Center for Comparative Medicine and Research (KCCMR), and Southwest National Primate Research Center (SNPRC). This consensus document should be used to classify the chimpanzees at your facility. It encompasses both health and behavioral criteria in considering the classification of a chimpanzee.

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Best regards, Sheri

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National Institutes of Health (NIH)
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)
Office of Research Infrastructure Programs (ORIP)

Physiological and Welfare Concerns of the *At-Risk* Chimpanzee Population—Literature Review Meeting
November 3, 2017

Meeting Report

BACKGROUND

The NIH announced in November 2015 that it will no longer support research using chimpanzees (*Pan troglodytes*) and that all chimpanzees owned or supported by NIH are eligible for retirement in accordance with the Chimpanzee Health Improvement, Maintenance and Protection Act. The federally owned, retirement-eligible chimpanzees residing at non-sanctuary facilities require relocation to the NIH-supported federal sanctuary, Chimp Haven. Many of these animals are at great risk of experiencing severe adverse events during the transfer and relocation process because of their advanced age and comorbid health conditions including heart, kidney and joint diseases and obesity and diabetes. In some instances, the stress of relocation may be fatal for the more frail animals; therefore, relocation would not be justified from a humane and animal welfare perspective. An emerging important responsibility of the NIH is to provide a risk assessment of possible medical conditions that may prevent relocation or place the animals at greater risk during relocation, as well as subsequent quarantine and socialization with other animals at the federal sanctuary. It is required that each non-sanctuary facility will have trained animal veterinary staff to implement a health assessment and issuance of a health certificate of each chimpanzee to determine if relocation is possible or to ensure safe relocation.

An essential part of the NIH guidance process is a review of the literature related to the physiological and general health considerations for at-risk chimpanzees. At-risk are those where relocation might endanger a chimpanzee's welfare, cause unjustified suffering or threaten life. The goal of this literature review is to facilitate discussion among scientific experts with knowledge in veterinary medicine, nonhuman primates, and animal welfare. These subject-matter experts are to assess risk and to inform the NIH on how to safely relocate these chimpanzees and maintain their long-term care, which includes acclimation to social groups. To address this goal, these scientific experts convened on November 3, 2017, to review research articles relevant to chimpanzee health and welfare.

GOALS OF THE MEETING

The goals of the meeting were to develop (1) a risk assessment of the various medical conditions for transfers and introductions of aging chimpanzees to another facility and (2) potential general guidelines based on the literature addressing types of medical conditions that warrant more careful consideration for transfer.

DISCUSSION OF RESEARCH ARTICLES

The set of papers that were the basis of this report resulted from a search of relevant chimpanzee literature from the last 20 years, which was conducted by the National Library of Medicine on behalf of ORIP. This search generated approximately 300 papers. The titles and abstracts, and sometimes the paper itself, were reviewed by four scientists within ORIP, two of whom were veterinarians and two of whom had prior nonhuman primate experience, to select which papers to include/exclude in the final set of papers assigned to several subject-matter experts. These subject-matter experts reviewed 40 research articles relevant to chimpanzee health and social factors affecting transfer and relocation. One paper was excluded from discussion as it was viewed by the subject-matter experts as not providing sufficient information toward the goals of the meeting. In preparation for the discussion, each article was reviewed by a primary and secondary expert reviewer. They were asked to summarize the article's findings (i.e., overall questions addressed and outcomes) and to provide evaluative comments, such as the strengths and weaknesses, study design, or methodology. The following medical-related categories were highlighted for review: general health-related categories; cardiology; aging; obesity and metabolic disease; other (i.e., stroke, viral infection, and renal disease); and stress.

General/Overview

Comparative Pathology of Aging Great Apes: Bonobos, Chimpanzees, Gorillas, and Orangutans. Lowenstine LJ et al.* Veterinary Pathology, *2016;53(2):250–276

The review article by Lowenstine et al. evaluated the geriatric pathology of great apes (bonobos, chimpanzees, gorillas, and orangutans) housed in zoos, laboratories, and the wild. The review discussed medical and dental issues found in aging ape populations, such as cardiovascular disease (CVD), renal aging, liver disease, and obesity. Aging differs between male and female animals. Understanding this pathology will provide information for improving their health throughout their lifespans. A reviewer noted that because captive chimpanzees are aging, there are challenges to end-of-life care in these animals. A retrospective review of existing pathology databases for apes and the development of additional pathology programs to study diseases of wild apes will help scientists to gain insight into the human aging process. A reviewer commented that more comparative research is needed into the pathology of geriatric apes that are zoo-housed or wild.

It was surprising to one reviewer that the authors considered hypertension as the cause of all heart diseases.

For the article, old age is considered as 25 to 30 years old for males and 30 to 35 years old for females. The information from the article is relevant to initial anesthesia, hours-long transport, subsequent anesthesia, quarantine, and introduction to new social companions.

Although there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees, the reviewers agreed that cardiovascular, kidney, and liver diseases are factors to contemplate for transportation. Additional considerations for transport are type 2 diabetes and obesity. Social factors that should be addressed for introduction to new environments are loss of sight and nervous system disorders.

Natural Pathology of the Captive Chimpanzee (Pan troglodytes): A 35-Year Review. Kumar S et al.* Journal of Medical Primatology, *2017;46:271–290

The reviewers commented on this Kumar et al. article that covers the comprehensive review of diagnostic data resulting from biopsies/necropsies from 245 chimpanzees of all ages over a 35-year period. Many of the animals were previously exposed to hepatitis viruses, human immunodeficiency virus (HIV), or treated with monoclonal antibodies. The reviewers deemed that the data represent the most comprehensive pathology review of captive chimpanzees and the article provides a nice description of pathological changes in the entire population (ages 0 to 35 years old). The study revealed that the animals suffered from both acute (i.e., pneumonia, and worm infestation) and chronic (i.e., cardiomyopathies, hemosiderosis) health factors.

The reviewers agreed that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees.

A Systematic Review of the Literature Relating to Captive Great Ape Morbidity and Mortality. Strong VJ et al.,* Journal of Zoo and Wildlife Medicine, *2016;47(3):697–710

The reviewers discussed the paper by Strong et al. that provides a systematic review of great ape literature published from 1990–2014. From a total of 1,146 papers published on great apes, the authors identified 40 percent of the original papers reviewed that addressed the morbidity and mortality of captive apes. The etiologies were infectious (36%), idiopathic-primarily cardiovascular (17%), neoplastic (9%), vascular

(6%), and degenerative (6%). The reviewers noted that the article highlighted three other morbidity-mortality reviews of which two were included for discussion during the meeting (Lammey et al., 2008 and Nunamaker et al., 2012). The major etiologies of chimpanzee morbidity and mortality frequently described in the reviewed reports were heart disease, renal disease, trauma, and neoplasia.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees.

Mortality Rates Among Wild Chimpanzees. Hill K et al. **Journal of Human Evolution,** ***2001;40(5):437–450***

The goal of the study by Hill et al. was to compile the first robust "life table" (mortality data) for 468 wild chimpanzees ages 0 to 50 years old from five study populations and to compare mortality rates in natural chimpanzees to that of human hunter-gathers. Secondly, the study was to compare the data from wild chimpanzees to the published data from the 1990s for captive populations. The authors concluded that wild chimpanzees have a life expectancy at birth of less than 15 years. The infant mortality is approximately 20 percent within the first year, dropping to 3.5 percent annually between ages 10 to 15 years. At age 15, life expectancy is approximately another 15 years. At age 30, the mortality rate is about 8.5 percent annually and life expectancy is an additional 8 years. Males have a lower life expectancy; adulthood is considered as 12 years old with a doubling of the mortality rate every 12.5 years thereafter. Captive chimpanzees senesce at about the same age as wild chimpanzees. The animal population with the lowest mortality shows only 9 percent of animals surviving to age 50, whereas 42 percent of Ache hunter-gatherers in Paraguay survived to age 50 in the pre-contact forest-living period.

The reviewers commented that the study's strength was in the five locations of well-documented wild populations monitored for periods of 10 to 35 years. However, the numbers were low at two locations. There were uncertainties in age and whether animals died or left a group for another. Nonetheless, these uncertainties likely did not greatly change the study outcomes. The reviewers indicated a lack of direct comparison of statistics between wild and captive populations.

The comparisons of animals to hunter gatherers were not important for the study. The authors assigned ages and noted that there were reports of two senile chimpanzees that were considered as statistical outliers. One population of animals was removed from the analysis because of the 2014–2016 Ebola virus outbreak, which severely impacted the population.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation.

Natural Mortality and Cause of Death Analysis of the Captive Chimpanzee (Pan troglodytes): A 35-year Review. Laurence H et al. **Journal of Medical Primatology,** ***2017;46:106–115***

The reviewers discussed the article from Laurence et al. focusing on the primary cause of mortality for 137 chimpanzees (perinatal to geriatric aged) that died naturally or were humanely euthanized at a national primate center from 1980–2014. Several of the animals were chronically infected with either hepatitis C (HCV), hepatitis B (HBV), or HIV. The primary cause of death in adult, middle-aged, or geriatric chimpanzees was related to degenerative etiologies. Lesions involving the cardiovascular system accounted for half of all primary causes of death. Cardiovascular-related deaths were seen typically in middle-aged animals (23 to 35 years old), more than adult or geriatric animals.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation.

Hematologic and Serum Biochemical Reference Intervals for the Chimpanzee (Pan troglodytes) Categorized by Age and Sex. Ihrig M et al. **Comparative Medicine,** ***2001;51(1):30–37***

The reviewers discussed an article from Ihrig et al. analyzing 1,648 hematologic and serum samples recorded in the medical record files of 133 normal, healthy chimpanzees covering 17 years (1978–1996). The blood samples were categorized by age and sex of the chimpanzee, and when the sample was collected. The age ranges included infant (0 to 3 years), juvenile (more than 3 to 6 years), adolescent (more than 6 to 10 years), and adult (more than 10 years). The hematological analysis measured 16 variables (parameters), and the serum analysis was comprised of 24 analytes. The authors discovered that normal hematologic and biochemical values are strongly influenced by sex and age. Both sex and age must be considered when interpreting biochemical profiles collected during the general health assessments of chimpanzees. Normal infants had significantly more lymphocytes than any other age group and displayed a greater percentage of white blood cells than neutrophils for this age category. Adult females had a significantly higher lymphocyte count and considerably lower neutrophil count than did adult males.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. The study, however, provides hematological and serum biochemical reference values derived from a large population of chimpanzees and are categorized by sex and age. These values can be used as benchmarks for normal values to more accurately identify hematological and biochemical standards associated with clinical disease.

Hematologic and Blood Biochemical Variables of Captive Chimpanzees: Cross-Sectional and Longitudinal Analyses. Herndon JG and Tigges J. **Comparative Medicine,** ***2001;51(1):60–69***

The reviewers discussed a longitudinal 9-year study of 252 male and female captive chimpanzees ages 55 days to 58.5 years old. The study was aimed at providing normative hematologic and serum biochemical values throughout the lifespan and to identify the variables associated with aging. There were 1,767 blood samples over 9 years collected annually to identify variables associated with sex and age, and to determine the consistency of these values within each animal and the longitudinal patterns in values in individual animals and those that are aged-grouped.

The authors concluded that the results from the hematological and blood biochemical variables can be used as reference values when managing general health/welfare of captive chimpanzees. There were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. The authors recommend considering each animal's long-term hematologic and serum biochemistry trends, and any aged normal values available in clinical decision making.

Cardiology

Sudden Cardiac Death in 13 Captive Chimpanzees (Pan troglodytes). Lammey ML, et al., **Journal of Medical Primatology,** ***2008;37 Suppl. 1:39–43***

The expert reviewers discussed the published article authored by Lammey et al. that reported sudden cardiac death (SCD) in 11 male and 2 female captive chimpanzees at a primate facility. The cases of SCD accounted for 38 percent of all chimpanzee deaths from 2001–2006. All but two cases of SCD occurred during peak times of animal activity (6:00 a.m. to 10:30 a.m.). The animals were between 10 to 40 years of age; 6 out of 13 animals underwent complete cardiac evaluation by a veterinary cardiologist diagnosing cases of cardiomyopathy: 3 had dilated cardiomyopathy; 2 had left ventricular hypertrophy; and 1 had right ventricular hypertrophy. There were 2 out of 13 animals with hypertension; 13 cardiac arrhythmias;

10 out of 13 with cardiomegaly (males are generally found to have enlarged hearts); and 12 multifocal, interstitial myocardial fibrosis cases. There was no pulmonary edema or observable arteriosclerosis/atherosclerosis.

The reviewers agreed that the authors presumed SCD as the cause of death in the animals because no other cause of death was found. The study conclusions were based on a limited sample size (13 animals) and the association made between myocardial fibrosis, ventricular arrhythmias, and SCD was not definitive. Because 12 cases had myocardial fibrosis and all 13 had ventricular ectopy, an association appears likely. In support of the SCD diagnosis, there were no significant gross or histopathological lesions in these animals.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. Nonetheless, veterinary cardiologists should assess the risk of SCD when transporting animals. Performing a social welfare check during peak times of animal activity, along with echocardiograms, may be helpful. A reviewer wondered how the information from the article would be used for transport, especially of asymptomatic animals.

Successful Treatment of Idiopathic Dilated Cardiomyopathy in an Adult Chimpanzee (Pan troglodytes). Sleeper MM, et al.,* Comparative Medicine, *2005;55(1):80–84

The reviewers discussed the article from Sleeper et al., which is the first case report of successful medical management of heart disease in a chimpanzee. The paper describes a case report for a 27-year-old male captive chimpanzee (named Abraham) with severe congestive heart failure (CHF) and idiopathic dilated cardiomyopathy. Because there is not a normal range of cardiovascular parameters for chimpanzees, 20 healthy captive chimpanzees were subjected to echocardiograms and electrocardiogram (EKG) testing as a normal comparison. Abraham underwent treatment over a 22-month period (1999–2000) that included lisinopril for a history of mild systemic hypertension. Based on his clinical symptoms in 2002, he was placed on lisinopril and furosemide followed by triple diuretic therapy. Following an improvement in his clinical condition, he was then subjected to thoracic radiography, EKG, and echocardiogram procedures under anesthesia, as well as clinical laboratory testing. In April 2003, Abraham was retested and the results showed significant left heart enlargement and reduced left ventricular wall thickness, severe reduction of systolic function, and mild mitral regurgitation—all suggestive of dilated cardiomyopathy. In late 2003, he was briefly treated with carvedilol, which was repeated in early 2004. He regained his ability to do moderate exercise. By April 2004, he showed no overt signs of CHF despite severe dilated cardiomyopathy.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. The reviewers surmised that the findings from the paper describe general recommendations for health management. Possibly, retirement-eligible animals can be trained to "present" for long-term cardiac monitoring.

Echocardiography Parameters of Clinically Normal Adult Captive Chimpanzees (Pan troglodytes). Sleeper MM, et al.,* Journal of the American Veterinary Medical Association, *2014;244(8):956–960

The reviewers mentioned that the report from Sleeper et al. describes the analysis of echocardiographic data from 88 clinically normal adult male and female chimpanzees ranging in age from 12 to 47 years old, obtained from 2002–2011. The authors intended to generate reference ranges for echocardiographic variables for clinically normal adult chimpanzees. This report presents baseline EKG and echocardiograms on 20 normal healthy chimpanzees.

The reviewers agreed that the study lacked a sufficient sample size to arrive at their conclusions. One reviewer commented that they were surprised at the number of males that developed cardiac arrhythmias. There were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. The study served as a reference for echocardiographic ranges.

Electrocardiogram Abnormalities in Captive Chimpanzees (Pan troglodytes). Doane CJ et al.,* Comparative Medicine, *2006;56(6):512–518

The reviewers indicated that the article by Doane et al. is a retrospective review of physical examination records of 265 chimpanzees (142 male and 123 females) obtained from August 2003–August 2005. The authors identified 34 cardiac arrhythmias diagnosed during the 24-month period and observed an increased incidence of cardiac arrhythmia in animals. The reviewers noted that the animals from the study were previously used in biomedical research; therefore, they were positive for one or more of the following viruses: HCV, HBV, and/or HIV. Prior research history (i.e., infection status) was an important factor to consider when interpreting the data. However, infection status did not appear to impact cardiac disease development. Regarding treatment, the animals were not treated if they had ventricular arrhythmias, but had no detectable structural heart disease or clinical signs due to the arrhythmia. The authors suggest that EKG is a useful method for identifying captive chimpanzees at risk of SCD.

The reviewers disagreed with the author's definition of systemic hypertension, which is systolic pressure exceeding 180 millimeters of mercury (mm Hg) or diastolic pressure exceeding 90 mm Hg, or both. These threshold limits exceed the criteria established for humans.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. The analysis was limited to a fairly small population of chimpanzees that consisted entirely of retired research animals. Identifying the infection status may be an important general consideration for animal welfare, but it should not affect the risk of CVD.

Interstitial Myocardial Fibrosis in a Captive Chimpanzee (Pan troglodytes) Population. Lammey ML et al.,* Comparative Medicine, *2008;58(4):389–394

The reviewers commented on the paper by Lammey et al. that retrospectively evaluated the medical cases of interstitial myocardial fibrosis (IMF) in 36 captive male and female chimpanzees ranging in age from 10 to 40 years old. Clinical and necropsy records were reviewed for all animals over a 6-year period. All animals had annual physical exams that included EKG and blood pressure readings. Seven had cardiomyopathy, 3 had hypertension, 15 had cardiac arrhythmia, and 13 had SCD (which was a major cause of death followed by renal failure and septicemia). Approximately 81 percent had IMF; all cases of SCD were diagnosed with IMF. Renal failure was the second most common form of death.

The reviewers said that additional data are needed to identify the cause of IMF in these animals. Also, more objective measures are needed for the diagnosis of IMF. The data suggest, however, that IMF may be associated with arrhythmias and SCD in these chimpanzees. The reviewers disagreed with the author's definition of systemic hypertension, systolic pressure exceeding 180 mm Hg. They noted that the authors reported the viral infection status of the animals.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees.

Diagnosis and Treatment of Pulmonary Arterial Hypertension and Atrial Fibrillation in an Adult Chimpanzee (Pan troglodytes). Lammey ML et al.* Journal of the American Association for Laboratory Animal Science, *2008;47(5):56–60

The reviewers discussed the paper authored by Lammey et al. that provides the first description of antemortem diagnosis and treatment of pulmonary arterial hypertension (PAH) and atrial fibrillation in a 22-year-old adult male captive chimpanzee. PAH was diagnosed by two-dimensional echocardiography. The animal also had mild hepatic fibrosis and moderate congestion. In addition to outlining the methods used to obtain this diagnosis, the authors describe the intense observation and frequent treatments required to address this animal's specific health care needs.

The reviewers noted that no proper history of the animal was reported in the paper and the authors did not establish a normal range for pulmonary arterial pressure or tricuspid regurgitation. The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. A similar intensive treatment regimen, however, may be used for animals that have the same conditions and are undergoing transport to the federal sanctuary.

Blood Pressure Reference Intervals for Healthy Adult Chimpanzees (Pan troglodytes). Ely JJ et al.* Journal of Medical Primatology, *2011;40:171–180

The reviewers discussed the report from Ely et al. describing the analysis of blood pressure data over a 1-year period from a population of 261 healthy and 109 unhealthy captive adult chimpanzees. The authors reviewed records from 396 examinations conducted on 256 chimpanzees ages 10 years or older. The authors defined reference intervals for normotensive, pre-hypertensive, and hypertensive blood pressures in healthy adult chimpanzees. The report referred to animals that were categorized as unhealthy because of conditions requiring sutures or systemic antibiotics; use of intravenous fluid therapy; cardiac medications (Enalapril, Amlodipine, Furosomide); and behavioral medications (Prozac, Phenobarbital). The reviewers acknowledged the limitations of the study that include the lack of a precise definition of obesity in chimpanzees, no mention of infection status, and the lack of data on the long-term risks of CVD posed by hypertension in chimpanzees. The authors did analyze a suitable and large number of animals for the study, and there was an apparent correlation between weight and systolic blood pressure.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees.

Hypertension Increases with Aging and Obesity in Chimpanzees (Pan troglodytes). Ely JJ et al.* Zoo Biology, *2013;32(1):79–87

The reviewers discussed the findings from Ely et al. that measured the blood pressure from 4 years of physical examinations to evaluate the effect of age, sex, and obesity on the development of hypertension in young adult or geriatric captive chimpanzees. Obesity was measured in these animals using five different criteria: abdominal girth, body weight, body mass index (BMI), body surface area (estimated), and basal metabolic rate. The basal metabolic rate was the best measure for obesity in females. Sex was a highly significant factor for systolic, not diastolic blood pressure rates. Obesity increased systolic blood pressure in females, but not in males. Diastolic blood pressure increased with age in both sexes.

Limitations of the article include: the article frequently referred to data as means, while the data in the figures and tables was reported as medians. The article was a 2013 publication and used data collected from 2004–2008; however, a 2011 publication from the same authors (using the same animals) used data from 2002–2003. The reviewers thought that the authors should have combined the 2011 and 2013 data for one publication. The reviewers did note, however, that the selection of anesthetic differed between

these 2011 and 2013 articles; therefore, this difference may preclude the combining of data. The main advantage of the study was that a healthy population was defined, and then blood pressure readings were used to establish reference intervals.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. Captive chimpanzees can emulate a natural low systolic blood pressure, however, by maintaining a healthy body weight.

Electrocardiogram Reference Intervals for Clinically Normal Wild-Born Chimpanzees (Pan troglodytes). Atencia R et al. **American Journal of Veterinary Research,** ***2015;76(8): 688–693***

The reviewers discussed the published article from Atencia et al. that establishes EKG reference intervals for healthy wild-born chimpanzees, by placing the electrodes in bodily locations that are standard for humans. The authors suggest that if human EKG reading criteria were used in the study, 61 percent of adult and 47 percent of young chimpanzees in the study would be classified as having left ventricular hypertrophy (LVH). Furthermore, the authors suggest the need for additional studies that combine EKG and cardiac imaging to establish EKG criteria for LVH. The reviewers commented that because the animals were healthy, using human EKG criteria was inappropriate.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees.

Use of an Implantable Loop Recorder in the Investigation of Arrhythmias in Adult Captive Chimpanzees (Pan troglodytes). Lammey ML et al. **Comparative Medicine,** ***2011;61(1):71–75***

The reviewers noted that the Lammey et al. paper is the first report of the use of an implantable loop recorder (ILR) to diagnose cardiac arrhythmias in non-anesthetized 22- to 32-year-old chimpanzees. Long-term EKG readings are impossible in chimpanzees; however, in this study, an ILR allowed similar EKG data collection as seen with humans. The use of the ILR in four captive chimpanzees identified intermittent arrhythmias that occur during the chimpanzees' normal daily activities. One female had syncope and 3 males had multiform ventricular ectopy (ventricular premature complexes). The reviewer acknowledged the limitations with using ILRs in animals: (1) an inability to store 24 hours of data and (2) can only store periods of EKG data outside of the programmed parameters (i.e., abnormal rhythms with a normal rate).

The reviewers recognized that that paper did not report previous research use in the animals studied, even though they cited that the "colony population consisted of 202 research veteran chimpanzees."

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. The use of ILRs, however, might be used to diagnose atrial fibrillation and for the medical management and welfare of chimpanzees.

Use of an Implantable Loop Recorder in a Chimpanzee (Pan troglodytes) to Monitor Cardiac Arrhythmias and Assess the Effects of Acupuncture and Laser Therapy. Magden ER et al. **Comparative Medicine,** ***2016;66(1):52–58***

The article from Magden et al. reports the use of an ILR for monitoring cardiac arrhythmias during the treatment of a 36-year-old male chimpanzee with frequent ventricular premature complexes (VPCs). The animal was diagnosed with VPCs by EKG during a physical examination. Treatment included the antiarrhythmic beta-blocker Sotalol. EKGs identified no cardiac structural abnormalities in examinations administered from 2012–2013 other than mild valvular insufficiencies that showed no change with

various therapeutics. In 2012, the loop recorder was placed as the VPCs (2.78 per minute) became more severe and the drug was changed to amiodarone. The chimpanzee subsequently developed thrombocytopenia and was weaned off amiodarone in 2013. The VPC rate dropped to 2.08 per minute. In 2014, acupuncture and low-level laser treatments were initiated, and by 2015 when the treatment routine had stabilized, the VPC rate was averaging 0.93 per minute.

A reviewer noted that the behavioral training of chimpanzees to accept treatment during transport may impact their survival.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation of captive chimpanzees. Inclusion of a cardiac evaluation, however, during a routine annual physical examination may be important. Regarding animal welfare, the authors recommend decreasing the excitement level of chimpanzees that have VPCs or cardiomyopathies.

Aging

Chronic Diseases in Captive Geriatric Female Chimpanzees (Pan troglodytes). Nunamaker EA et al. **Comparative Medicine,** ***2012;62(2):131–136***

The article from Nunamaker et al. is a characterization of the types and prevalence of chronic diseases observed in 16 geriatric (more than 35 years old) female chimpanzees at a primate facility. The study identified three chronic diseases—metabolic syndrome, CVD, and renal disease. About 43.8 percent of the animals had metabolic syndrome, 31.25 percent of animals had some form of kidney-related disease, and 81.2 percent had cardiovascular-related ailments. These age-related diseases will present medical management challenges associated with maintaining an aging chimpanzee population. Metabolic syndrome is a name given to a group of risk factors associated with stroke, coronary artery disease, and type 2 diabetes. Other conditions to consider are the animal's weight and obesity. Three animals were positive for HIV; one was HCV-infected.

Although there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation, the authors recommend a thorough semiannual physical exam for the geriatric chimpanzee population, along with monthly health checks and monitoring of responses to therapy.

The authors also suggest that if a captive animal is diagnosed as diabetic, their weight, blood glucose, and hemoglobin A1c (HbA1c) concentration should be initially monitored every 4–6 weeks to evaluate responses to therapy. The monitoring time intervals may be extended to as long as 6 months once glycemic control has been achieved.

The reviewers suggested that geriatric chimpanzees with these chronic diseases would be poor candidates for transportation, relocation, and assimilation into a new physical environment. These chronic diseases will require intense veterinary monitoring and treatment at the receiving organization.

Diagnosis and Prevalence of Uterine Leiomyomata in Female Chimpanzees (Pan troglodytes). Videan EN et al. **American Journal of Primatology,** ***2011;73(7):665–670***

The reviewers discussed the article from Videan et al. reporting the incidence of uterine benign fibroid tumors in 187 reproductively mature females from two primate centers. These tumors were confirmed in 55 females (28.2 %) ranging in age from 19.3 to 47.3 years old. Specific forms of general care at the primate facilities included 140 animals that received non-hormonal contraception (vasectomized male or all-female group), while 55 chimpanzees were housed primarily with non-vasectomized males utilizing

Norplant® or a copper intrauterine device to achieve contraception. Advanced age (>30 years old) was related to an increase in leiomyomata, and use of hormonal contraception was related to a decrease in leiomyomata.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. The paper only presents considerations for colony management with regard to fibroid tumor development. Because of the moratorium on chimpanzee breeding, the animals have gone 10 to 15 years since giving birth. A protective practice of progesterone-based contraception has shown a 40 percent reduction of uterine leiomyomata in women and is suggested to reduce or delay the development of the condition in the chimpanzee. It is predicted that as the chimpanzee population ages with no breeding, the incidence of leiomyomata will increase.

Spontaneous Reproductive Tract Lesions in Aged Captive Chimpanzees. Chaffee BK et al. **Veterinary Pathology,** ***2016;53(2):425–435***

The paper from Chaffee et al. describes the reproductive tract lesions in aged captive chimpanzees as discovered by the retrospective examination of necropsy and surgical samples and records. There were 67 male and female animals ranging from 35 to 56 years old. Chronic health conditions included uterine leiomyomatas in 20 out of 33 female animals. One animal experienced an acute health-related condition, heavy vaginal bleeding from the uterine leiomyomata, which required euthanasia. Pain management was provided for females experiencing chronic conditions.

A reviewer commented that the sample size was small compared to human studies.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation.

Diagnosis and Treatment of Degenerative Joint Disease in a Captive Male Chimpanzee (Pan troglodytes). Videan EN et al. **Journal of the American Association for Laboratory Animal Science,** ***2011;50(2):263–266***

The reviewers discussed the paper from Videan et al. that presents a case study of a 25-year-old male captive chimpanzee that had degenerative joint disease of both the right and left femorotibial joints. The animal had minimal to moderate osteoarthritis of the left femorotibial joint that was caused by osteophyte formation and the slight narrowing of joint space. Treatment was with Celebrex® for 30 days resulting in resolution of symptoms. The joint disease progressed to both joints 1 year after initial diagnosis. Intra-articular injections of ketorolac tromethamine and methylprednisolone sodium succinate were administered. Glucosamine chondroitin, tramadol, and carprofen also were delivered. Treatment resulted in increased comfort, activity level, and interaction with den mates. The reviewer noted that the rate of osteoarthritis progression was quicker than that in humans.

The reviewers concluded that there were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. Nonetheless, a reviewer speculated that arthritis may contribute to a lack of resocialization in captive chimpanzees after transfer to a new facility. Osteoarthritis disease may be a criterion that veterinarians use in determining a chimpanzee's eligibility for relocation.

Obesity/Metabolic Disease

Development of Guidelines for Assessing Obesity in Captive Chimpanzees (Pan troglodytes). Videan EN et al.,* Zoo Biology, *2007;26:93–104

The reviewers commented on a study by Videan et al. that established guidelines for defining and accurately assessing obesity in captive chimpanzees. The authors examined morphometric (weight, height, and body fat distribution) and physiologic (blood pressure, hemoglobin, hematocrit, red blood cells [RBC], mean corpuscular hemoglobin, glucose, triglyceride and cholesterol level) characteristics in 59 captive adult females and males, ages 10 to 48 years old. Morphometric data collected included abdominal skinfold measurement (millimeter), BMI, waist-to-hip ratio (WHR), body weight (kilogram), and crown to rump length (centimeter). Abdominal skinfold measurements and BMI each predicted elevated triglycerides and serum glucose levels (obesity) in females. Males had significantly higher BMIs than females, but most mean skinfold measures were half that of females. Females with high BMI/abdominal skinfold measurement also had significantly higher blood pressure, RBCs, and WHRs. The range of triglycerides and glucose levels for males was considerably smaller than for females and none were above the normal range for humans, despite a high BMI. The authors hypothesized that male BMI was caused by high muscle mass rather than adipose fat.

The reviewers pointed out that the measurements were based on a limited sample size. There were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. Assessing obesity in aged populations, however, provides an objective measure to intervene and direct clinical monitoring.

Determination of Hemoglobin A1c and Fasting Blood Glucose Reference Intervals in Captive Chimpanzees (Pan troglodytes). McTighe MS et al.* Journal of the American Association for Laboratory Animal Science, *2011;50(2):165–170

The reviewers discussed the paper from McTighe et al. that describes efforts to develop reference ranges for Fasting Blood Glucose (FBG) and HbA1c as clinical screening tools for chimpanzees that are at risk for developing Type 2 Diabetes Mellitus (T2DM) or as therapeutic monitoring tools for chimpanzees with T2DM. There were 81 healthy chimpanzees of both sexes and various ages, along with three female chimpanzees already diagnosed with T2DM.

The reviewers noted a study limitation in that the authors did not show an association between obesity, age, and FBG even though other reviewed articles demonstrated this association (Videan et al. 2007; Herndon and Tigges et al. 2001). Therefore, it was surprising that age, sex, or body weight did not help predict FBG or HbA1c levels in healthy chimpanzees. Another study limitation was the use of a single sample per animal to determine the reference FBG ranges. The authors indicated that they may look to perform urine glucose testing in the future or see if abdominal circumference affects FBG and HbA1c levels.

There were no specific guidelines or recommendations on health, environmental, or social factors affecting relocation. However, Hb1Ac may be useful for monitoring of pre-diabetic and diabetic animals that could be tested monthly or bimonthly instead of daily or weekly heel-sticks for FBG. HbA1c can be tested at cage side on a reduced frequency as opposed to FBG. This monitoring approach might be used for relocation, such as maintaining the health stability of a diabetic chimpanzee. It is possible that a stable HbA1c level at 6 percent or below would be indicative of controlled diabetes over a period of 2–3 months.

Morphometric Variables Related to Metabolic Profile in Captive Chimpanzees (Pan troglodytes). Andrade MCR et al.* Comparative Medicine, *2011;61(5):457–461

The article by Andrade et al. investigated the relationship between simple morphometric measurements of waist circumference and body weight and the circulating markers of metabolic, cardiovascular, and hepatic function in chimpanzees. The study included 39 male and female captive chimpanzees; 22 females (ages 23.8 years, plus or minus 10.9 years) and 17 males (ages 21.8 years, plus or minus 7.2 years).

Waist circumference correlates better with metabolic health (blood pressure, insulin resistance, serum glucose, albumin, and triglycerides) than body weight. This correlation was seen particularly in female chimpanzees. The authors discovered a strong relationship between liver alanine transaminase and triglyceride in female chimpanzees, and a correlation between aspartate aminotransferase and cholesterol in male chimpanzees. These findings may indicate that the fasting triglyceride level is a good indicator of hepatic function in chimpanzees.

A reviewer noted that males and females had similar waist circumferences suggesting that females had increased adipose fat.

The authors did not provide any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The reviewers indicated that weight management is an important variable for colony management of chimpanzees.

The Influence of Body Mass Index, Age, and Sex on Inflammatory Disease Risk in Semi-Captive Chimpanzees. Obanda V et al.* Public Library of Science (PLOS) One, *2014;9(8):e104602

The article from Obanda et al. described the impact of BMI, age, and sex on inflammation in semi-captive chimpanzees. The paper describes biomarkers of inflammation obtained during routine health examinations of 42 animals from an animal sanctuary in Kenya, Africa. These biomarkers included neutrophil-lymphocyte ratio, platelet microparticle count (μPLT), and RBC microparticle (μRBC). There was no relationship between μRBC and age or BMI, but there was a significant decline in RBC counts in older males. The proportion of μPLT was positively correlated with age and BMI for both sexes. The study shows that aging and obesity are accompanied by chronic low-grade inflammation.

The reviewers deemed that the authors did not provide any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The authors concluded that the positive relationship found between BMI and inflammatory disease risk suggests that the management of BMI in captive chimpanzees is critical to their health, welfare, and longevity. The reviewers commented that monitoring the immune mediators for captive retired chimpanzees is a good idea. One reviewer noted that inflammation levels can be influenced by the presence of gastric parasites in these animals, especially chimpanzees that were obtained from non-research facilities.

Other (Stroke, Viral Infection, and Renal Disease)

Cerebrovascular Accident (Stroke) in Captive, Group-Housed, Female Chimpanzees. Jean SM et al.* Comparative Medicine, *2012;62(4):322–329

The reviewers discussed the study conducted by Jean et al. that evaluated the predisposing factors, diagnosis, treatment options, and statistics of cerebrovascular accident (stroke) in captive chimpanzee populations. This case report describes the presentation, clinical signs, and diagnosis of stroke in three animals over a 5-year period and an additional three animals from a retrospective review of records from

the previous 30 years. In addition, the authors sent a survey to 43 institutions (38 zoos, 4 research facilities, and one sanctuary) from which they received 27 responses, with six facilities reporting six cases of stroke.

Based on the study, the authors recommended that animals suspected of having a stroke should receive both a physical and a neurological examination. Diagnosis of a stroke should be done as soon as possible to allow appropriate treatment. Diagnostic testing may include EKG, angiograms, computed tomography, or magnetic resonance imaging. Regarding treatment, angioplasty and vascular stenting have not been described in chimpanzees as it is with humans.

The reviewers indicated that the strengths of the article are (1) the authors reached out to other facilities to obtain additional data and (2) the paper identified potential risk factors for stroke that may help with preventive and/or enhanced diagnostic care. The authors observed that 2 out of 9 animals were rehabilitated and returned to social groups. Therefore, the presence of unidentified comorbidities may have attributed to the high death rate in this study.

The authors did not provide any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. Yet, the paper provided general recommendations of how to proceed in suspected cases of stroke and identifying potential risk factors.

Lethal Pneumonia in a Captive Juvenile Chimpanzee (Pan troglodytes) Due to Human-Transmitted Human Respiratory Syncytial Virus (HRSV) and Infection with Streptococcus Pneumoniae. Szentiks CA et al. **Journal of Medical Primatology,** ***2009;38:236–240***

The reviewers discussed the article from Szentiks et al. that describes the outbreak of pneumonia in a captive chimpanzee population as a result of infection with HRSV and *Streptococcus pneumoniae*. A zoo experienced an outbreak of respiratory disease in 10 out of 12 chimpanzees, 4 out of 5 gorillas, 3 out of 6 Bornean orangutans, and 3 out of 10 red-capped mangabeys. HRSV subtype B (HRSV-B) and *S. pneumoniae* were discovered in animals and results show that the virus was transmitted by a zookeeper. A 19-month old female chimpanzee died as a result of the virus transmission and bacterial infection. Preceding death was moderate to severe respiratory clinical signs: hypothermia, nasal discharge, stertorous respiratory sounds, hypoglycemia, and uremia.

The reviewers agreed that because both HRSV-B and *S. pneumoniae* are transmitted by aerosols of respiratory secretions, monitoring the health of humans working in proximity to great apes is important. The authors did not provide any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The reviewers suggested that in the zoo setting, animal keepers with any sign of respiratory disease should not have contact with the apes to prevent disease outbreaks and transmission of pathogens likely to cause deaths in juvenile great apes. The reviewers agreed that this paper represents the significance of human health management, rather than chimpanzee welfare management.

A reviewer noted the difficulty in eradicating RSV from a chimpanzee colony; mild RSV infection can be lethal because of secondary bacterial infection.

Effects of Aging and Blood Contamination on the Urinary Protein-Creatinine Ratio in Captive Chimpanzees (Pan troglodytes). Lammey ML et al. **Journal of the American Association for Laboratory Animal Science,** ***2011;50(3):347–377***

The reviewers discussed the article authored by Lammey at al. that evaluated the effect of age and blood contamination on the urine protein to creatinine (UPC) ratio of urine specimens collected from captive

chimpanzees. These samples were obtained using the cystocentesis procedure as an indicator of renal function in these animals. The study included 125 healthy adult chimpanzees 11.6 to 50.1 years old, and samples were obtained during their annual routine examination.

Several animals were HCV-, HIV-positive, or co-infected with both viruses. The UPC ratios from urine collected by cystocentesis were not only a reliable diagnostic for evaluating renal disease, but also for the overall monitoring and care of captive chimpanzees. The study found that the age of the animal and blood contamination of the specimen were significant predictors of the UPC ratio, but sex was not a significant predictor. The UPC ratio in older animals was significantly higher than in younger animals. Similarly, the UPC ratio was higher in specimens with blood contamination compared to animals with no or minimal blood cells in their specimens. Therefore, renal function progressively declines with age and the UPC ratio is an important diagnostic test that can help define whether renal disease is occurring in captive chimpanzees. The authors recommended developing methodologies to diagnosis and evaluate the complications and disorders that occur as the captive chimpanzee populations continue to age.

One reviewer noted that it was a good study and UPC ratio was associated with glomeruli nephrotic syndrome. The reviewers concluded that the study had no specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. This study established reference standards for the UPC ratio of urine as a diagnostic for proteinuria and renal disease. Consequently, the standards can be applied for maintaining the welfare and long-term care of retired chimpanzees.

Pauci-Immune Glomerulonephritis in a Captive Chimpanzee (Pan troglodytes), and a Review of Spontaneous Cases in Animals. Neidig LE et al. **Journal of Medical Primatology,** ***2016;45:336–341***

The paper from Neidig et al. presents the first case report of pauci-immune rapidly progressive glomerulonephritis (RPGN) in a 28-year-old male chimpanzee, which is the only account of the pauci-immune type in any animal. The animal's history was presented in the paper in what the reviewers deemed as an "abbreviated fashion," noting prior HCV infection and anemia, hypoproteinemia, hypo-albuminemia, elevated alanine aminotransferase, cholesterol, and triglycerides. The animal was euthanized after respiratory distress and a poor recovery following anesthesia. The paper presents gross pathology as well as detailed renal histopathology and tests resulting in the authors' diagnosis. The authors concluded that the poor recovery was a result of cardiomyopathy consistent with the history of arrhythmias, fibrosis, edema, and pulmonary histology. Tissues from other chimpanzees at the facility that had evidence of renal pathology (59 of 191) were re-examined; two additional cases of glomerulonephritis were identified as a result. The authors considered whether the HCV status contributed to disease, as there are reports of HCV-immune complexes in glomerulonephritis in humans, but only two reports of RPGN associated with concurrent HCV infection. The chimpanzee in the current case report did not show immune deposits in the glomeruli; however, there is speculation that antigen could prevent the formation of deposits. Diagnosis of RPGN is clear with the abundance of crescentic glomeruli. The diagnosis of the pauci-immune type of RPGN in the chimpanzee is based primarily on the lack of electron dense deposits in electron microscopy.

The reviewers noted that the paper adequately explained what happened to the male chimpanzee and there may have been easier methods to monitor the multiple symptoms/ailments. The article did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees.

Censored Data Analysis Reveals Effects of Age and Hepatitis C Infection on C-Reactive Protein Levels in Healthy Adult Chimpanzees (Pan troglodytes). Ely JJ et al.* Journal of Biomarkers, *2013;2013: Article ID 709740, 13 pages

The reviewers discussed the article from Ely et al. that presents epidemiological data of 258 high-sensitivity C-reactive protein values on adult chimpanzees 10 years old or older. This population of adult animals (116 females and 142 males) included both HCV-infected or uninfected animals of which both had a subset of healthy and unhealthy animals. CRP was of interest for its potential role as a biomarker for chimpanzee CVD and hepatic damage. In 258 adult chimpanzees assayed, 28 percent of the data were below the quantitation limit (censored). CRP did not predict CVD, but CRP levels were reduced by 50 percent in animals with HCV infection and showed inverse relationships with two liver function enzymes. CRP appears to be an informative biomarker for long-term liver damage in HCV-infected chimpanzees. CRP levels were weakly associated with age, modestly associated with illness, and strongly associated with HCV infection.

A reviewer noted that the data are useful for monitoring chronic HCV infection in captive chimpanzees. The reviewers concluded that the paper provided no specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. CRP could be useful, however, for monitoring and early detection of progressive liver dysfunction related to HCV infection.

Stress

Possible Roles of Consolation in Captive Chimpanzees (Pan troglodytes). Palagi E et al.* American Journal of Physical Anthropology, *2006;129(1):105–111

The reviewers discussed the paper from Palagi et al. that focuses on the role of consolation behavior among captive chimpanzees after an aggressive act by a peer animal. The authors presented the study of 19 male and female chimpanzees in a zoo. Consolation is defined as spontaneous contacts by a third party that engages in affinitive behaviors with the victim of aggression.

The reviewers indicated that the study revealed interesting findings regarding animal group dynamics; consolation occurred between the victimized chimpanzee and unrelated (non-kin) animals mostly after a "scream" type of vocalization from the victim. Friendships between animals did not affect the level of consolation. Consolation occurrence reduced the likelihood of further attacks in the colony, reduced stress in victims, and decreased social tension throughout the group.

The reviewers concluded that the paper provided no specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The reviewers acknowledged that recommendations would be difficult to provide because the study emphasized the importance of third-party consolers. Kinship/friendship with the victim did not necessarily benefit the victimized animal.

A reviewer noted that the study's findings may be useful for preparing animals for transport. Reviewing consolation data may assist animals to better adapt to a new facility and reduce the stress within social groups. An important strategy would be to identify and add a friendly (e.g., "motherly") chimpanzee to animal groups to serve as consolers.

Factors Affecting Wounding Aggression in a Colony of Captive Chimpanzees (Pan troglodytes). Williams RC et al.* Zoo Biology, *2010;29:351–364

The reviewers discussed the study from Williams et al. that examined the effects of individual and social variables on the frequency of wounding aggression. The authors conducted a retrospective multi-factorial

analysis of severe wounding data over a 10-year timeframe that captured information on each wounding event. The wounding information included sex and age of the chimpanzee, as well as the group's age and sex composition, group duration, and when during the week the event happened. There were 83 captive animals (males and females) studied from 1993 to 2003. The study showed that groups made up of all male chimpanzees had the highest risk of this type of aggression. All-adult chimpanzees or mixed-age groups similarly had a higher risk of wounding aggression than sub-adult groups. Increased risk of this behavior was associated with the time during the week when more human activity occurred near the chimpanzees. The authors proposed that it is important for those responsible for captive management of chimpanzees to be aware of group composition and levels of human behavior near these animals. This awareness is important to reduce wounding aggression in captive chimpanzees.

Regarding specific recommendations, the authors concluded that for management of captive chimpanzees, all male groups should be monitored because they typically exhibit more wounding aggression. Changes in group composition can result in this type of behavior. Possibly changing management practices also can result in increased wounding aggression behavior. Therefore, music and other means should be used to reduce tension. The ultimate goal is to establish long-term stable social groups with minimal introduction of new chimpanzees to existing groups, especially if the existing group is composed of all males.

Response of Fecal Cortisol to Stress in Captive Chimpanzees (Pan troglodytes). Whitten PL et al. **American Journal of Primatology,** ***1998;44:57–69***

The paper by Whitten et al. was a study of how to determine a noninvasive method to assess the stressfulness of environmental and social circumstances in captive and wild chimpanzees. Fecal cortisol in four male and female chimpanzees was measured for anesthetic stress after the reporting of responses from seven of eight stressful events. The animals were anesthetized for other procedures that were performed concurrently with fecal collection—females underwent superovulation, while semen collection via rectal probe ejaculation was used for males. One female, however, was discordant with the values from other events and was described as unresponsive to the anesthesia. An increase in urinary cortisol levels confirmed the fecal cortisol results; fecal cortisol increased three-fold on average after an event (a peak at 6 nanograms per gram of feces).

A reviewer commented that the article had flaws, but agreed with the correlative findings of the study. Another reviewer added that the study's data were not as reliable due to the small sample size and the presence of one animal outlier.

The reviewers agreed that the study did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. It is noted by inference, however, that anesthetizing chimpanzees for transport would be stressful to the animals.

Validation of Salivary Cortisol and Testosterone Assays in Chimpanzees by Liquid Chromatography-Tandem Mass Spectrometry. Kutsukake N et al. **American Journal of Primatology,** ***2009;71(8):696–706***

The reviewers discussed the study authored by Kutsukake et al. that assessed the validity of testing salivary cortisol and testosterone steroids using liquid chromatography-tandem mass spectroscopy (LC-MS/MS) in 10 captive male chimpanzees, 11 to 30 years old. The steroid concentrations of saliva versus blood plasma samples were tested using LC-MS/MS versus enzyme immunoassays. The authors also developed and validated a method of cotton-rope washing to obtain saliva samples from ropes used by the chimpanzees, thereby eliminating the need for collecting saliva samples from the mouths of chimpanzees.

There were positive relationships between saliva and plasma levels for these two steroids. Diurnal fluctuations of these steroids could be seen in saliva-based samples. The findings validated the use of the LC-MS/MS technique for cortisol and testosterone concentrations obtained from saliva as indicators of circulating steroids levels. The study also validated the use of collecting saliva specimens from cotton rope, which is a much easier to process than obtaining urine, feces, blood, or saliva that is directly collected from the mouth. Therefore, rope collection is another method of reliable cortisol testing.

The reviewers surmised that the paper did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees.

Physiological and Welfare Consequences of Transport, Relocation, and Acclimatization of Chimpanzees (Pan troglodytes). Schapiro SJ et al. **Applied Animal Behaviour Science,** ***2012;137(3-4):183–193***

The paper from Schapiro et al. studied the outcome of transport, relocation, and acclimatization of 72 healthy chimpanzees (male and female, 11 to 47 years old) transported during a 21-hour trip. Testing was performed before departure, upon arrival, and at additional time points between 3–12 weeks. The animals were anesthetized, weighed, and blood sampled. Blood samples were analyzed for hematological and clinical chemistry parameters, which were compared across various time points. Comparison of values before and after transfer revealed numerous significant differences in hematological, clinical chemistry, and immunological parameters, some of which were indicative of stress. Cell-mediated immune parameters had not returned to pre-transport values 8 weeks after transport; three hematology variables had not returned to pre-transfer values 12 weeks after transport. Animals on average lost 2.5 kilograms during the 21-hour transport; some animals never regained this weight.

The reviewers agreed that the study had a good sample size and the findings were the most relevant to the issue of animal transport, relocation, and adjustment to new environments. It was unusual, however, that some animals did not regain their weight after relocation. One reviewer expressed concern with the use of phytohaemagglutinin for the *in vitro* assays used to measure cellular immune responses. Also, individual animal responses should have been tracked.

Regarding specific recommendations, transportation and relocation does affect animal welfare. Chimpanzees require sufficient periods of time after relocation to properly acclimatize to their new environment. This would be especially important for animals that might be assessed for hematological variables and cell-mediated immune responses.

Cortisol Analysis of Hair of Captive Chimpanzees (Pan troglodytes). Yamanashi Y et al. **General and Comparative Endocrinology,** ***2013;194:55–63***

The reviewers discussed the article from Yamanashi et al. on the effectiveness of measuring cortisol levels in re-grown hair as an indicator of stress in 26 chimpanzees (16 males and 10 females, 11 to 45 years old). The authors reported the cortisol levels in re-grown hair samples collected from the arms of nine chimpanzees, in the same subject's feces that were collected intermittently, and also recorded the incidents of aggression received or initiated by the animals as an indicator of stress. In a subsequent experiment, cortisol levels were measured in hair collected from three different body regions (arm, back, and sides) in all 26 animals. Cortisol was measured using a commercially available enzyme immunoassay kit.

The authors noted higher correlations of hair cortisol with aggression received over a 3-month period, rather than the cortisol levels identified in intermittently collected fecal samples. Hair samples collected

from the same body area provided more consistent values than those collected from multiple sites. The authors cautioned against collection of white-colored hair from any sample site.

The reviewers agreed that the article did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The paper described a preferred method to collect and measure hair cortisol levels as a marker of stress and also presented a correlation of cortisol levels with the receipt of aggression.

Analysis of Hair Cortisol Levels in Captive Chimpanzees: Effect of Various Methods on Cortisol Stability and Variability. Yamanashi Y et al. **MethodsX,** ***2016;3:110–117***

The paper from Yamanashi et al. reports an assay method for sampling, washing, drying, grinding, extracting, and assaying hair for cortisol. The study used 72 captive chimpanzees (38 males and 42 females). The reproducibility of results was high with no differences in cortisol levels among the various storage, drying, and sampling hair methods. The fineness of homogenized hair, sample weight, and extraction time affected the hair cortisol concentration. The authors concluded that this assay can be used "to investigate the factors influencing hair cortisol level to improve the quality of captive care of these animals."

The reviewers noted that the number of total animals reported in the paper (72) did not match the number reported of 38 males and 42 females. The study did not address the performance characteristics of the assay (i.e., no data on precision, recovery, sensitivity, specificity, or linearity). No statistical data were provided nor was information included regarding age or health status of the tested animals. The authors also did not indicate how the commercial assay kit was validated. For these reasons, the reviewers expressed concerns with the study results.

The reviewers acknowledged the importance of monitoring stress levels in long-term captive chimpanzees. The reviewers concluded that the paper did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. Because of the reviewers' concerns with the study approach and the unreliability of the data, the entire expert review panel thought the article's results should not be considered in the goals of the meeting.

Effects of Relocation and Individual and Environmental Factors on the Long-Term Stress Levels in Captive Chimpanzees (Pan troglodytes): Monitoring Hair Cortisol and Behaviors. Yamanashi Y et al. **PLOS One,** ***2016;11(7):e0160029***

The reviewers discussed the paper from Yamanashi et al. that investigated the effects of relocation in addition to individual and environmental factors related to social management on long-term stress levels. The study analyzed 35 male and female socially housed chimpanzees ages 5 to 44 years old. To measure stress, hair was cut from the arms of animals; cortisol levels were assayed using a commercially available enzyme immunoassay kit. Also, aggressive behaviors were recorded by animal caretakers. The authors discovered that cortisol increased during the first year after relocation and decreased in the second year. A higher concentration of cortisol was found in animals receiving aggression and was influenced by rearing history, sex, and group formation. Relocation can affect long-term stress level, but aggression and sex may be more important contributors to long-term stress than relocation alone.

The reviewers concluded that the paper did not have any specific recommendations on health, environmental, or social factors affecting relocation in captive chimpanzees. The article cited factors other than relocation, however, that may contribute to the development of stress in captive animals.

DISCUSSION

A general discussion of risk assessments and other important considerations for the transfer and relocation of captive chimpanzees occurred. Based on the discussed literature, the reviewers conversed on possible guidelines to address medical conditions that would impact transfer, relocation, re-socialization, and animal welfare.

The following points were raised by individual reviewers:

- The "sending" (non-sanctuary) facilities are responsible for making informed decisions regarding transfer.
- Important considerations for long-term care include the length of time required for animals to return to normalcy and the level of aggression that animals receive.
- Although the Schapiro SJ et al. 2012 paper implies a minimum of 8 weeks is required for acclimation, a reviewer mentioned that some animals may die before that timeframe. The reviewers agreed that additional medical testing beyond routine health assessments may not be needed to determine the survivability of animals for more than 8 weeks after transport.
- Animals diagnosed with early-stage hypertension that are medically stable must be closely monitored and evaluated by a cardiologist before transport (i.e., EKGs and medication). The presence of co-morbidities must be considered in the monitoring.
- The animals reported in the reviewed articles do not necessarily represent the actual population of retirement-eligible chimpanzees that are to be transported as the population of animals continues to age.
- The diseases of CVD (early-stage), diabetes, and osteoarthritis, which are medically manageable in individual chimpanzees should not preclude transport of captive chimpanzees.
- Animals diagnosed with liver disease or late-stage CVD are at great risk and should not be transported.
- The presence of arrhythmias is a predictor of SCD and should be monitored.
- Gastroenterological-related diseases and the risks due to anesthesia administration (i.e., death, stress, and obesity) are under-reported factors in captive chimpanzee literature and should be considered for the transport process.

CONCLUSION

Based on the reviewed literature, the health status of captive chimpanzees is not only important for transfer and relocation, but also for the socialization and maintenance of social groups. The articles contained pertinent information regarding chimpanzee health and management; however, the articles did not provide any recommendations or additional insight to assist the attending veterinarian in conducting individual risk assessments for transfer and introduction of geriatric chimpanzees with various illnesses. In particular, the literature under-reports health conditions that affect geriatric chimpanzees, such as: renal disease, which is the second leading cause of death in captive chimpanzees; anesthetic risks, which would be exacerbated by the requirement of additional physical examinations; gastroenterological disorders; and the impact of stress on these diseases as well as the presence of co-morbidities/co-infections. Attending veterinarians at the non-sanctuary facilities are the most knowledgeable about the individual chimpanzees residing at their facility, as they perform routine physical exams to include body weight, hematological and serum clinical chemistries, cardiac evaluations, and full dental and physical examinations. Veterinarians at the facilities should provide input as to the general health and well-being of the chimpanzees under their care that consists of medical assessment, including disease status and severity, as well as the potential impact of frequent anesthesia administration, stress, and formation of new social interactions on the individual animal's health.