1. make every appropriate effort to establish a relationship of trust with the client and should maintain close contact with the client;
2. conduct an interview of the client within 24 hours of initial counsel's entry into the case, barring exceptional circumstances;
3. promptly advise the prosecution the client is represented by counsel and communicate in an appropriate manner with the client regarding the protection of the client's rights against self-incrimination, to the effective assistance of counsel, and to preservation of the attorney-client privilege and similar safeguards; and
4. at all stages of the case, re-advise the client and communicate with the prosecution regarding these matters as appropriate.

**(b)** Counsel at all stages of the case should engage in a continuing interactive dialogue with the client concerning all matters that might reasonably be expected to have a material impact on the case, such as:

1. the progress of and prospects for the factual investigation, and what assistance the client might provide to it;
2. current or potential legal issues;
3. the development of a defense theory;
4. presentation of the defense case;
5. potential agreed-upon dispositions of the case;
6. litigation deadlines and the projected schedule of case-related events; and
7. relevant aspects of the client's relationship with correctional, parole, or other governmental agents (e.g., prison medical providers or state psychiatrists).

**Standard 2-8: Additional Obligations of Counsel Representing a Foreign National**

**(a)** Counsel at every stage of the case should make appropriate efforts to determine whether any foreign country might consider the client to be one of its nationals.

**(b)** Unless predecessor counsel has already done so, counsel representing a foreign national should:

1. immediately advise the client of his or her right to communicate with the relevant consular office; and

2. obtain the consent of the client to contact the consular office. After obtaining consent, counsel should immediately contact the client's consular office and inform it of the client's detention or arrest.

**Standard 2-9: Investigation**

**(a)** Counsel at every stage has an obligation to conduct an appropriate and independent investigation relating to the issues of both guilt and penalty.

1. The investigation regarding guilt should be conducted regardless of any admission or statement by the client concerning the facts of the alleged crime, or overwhelming evidence of guilt, or any statement by the client that evidence bearing upon guilt is not to be collected or presented.

2. The investigation regarding penalty should be conducted regardless of any statement by the client that evidence bearing upon penalty is not to be collected or presented.

**(b)** Post-conviction counsel has an obligation to conduct a full examination of the defense provided to the client at all prior phases of the case. This obligation includes at minimum interviewing prior counsel and members of the defense team and examining the files of prior counsel.

**(c)** Counsel at every stage has an obligation to assure that the official record of the proceedings is complete and to supplement the record as appropriate.

**Standard 2-10: Duty to Assert Legal Claims**

**(a)** Counsel at every stage of the case, exercising professional judgment in accordance with these standards, should:

1. consider all legal claims potentially available;

2. thoroughly investigate the basis for each potential claim before reaching a conclusion as to whether it should be asserted; and

3. evaluate each potential claim in light of:

(A) the unique characteristics of death penalty law and practice; and

(B) the near certainty that all available avenues of post-conviction relief will be pursued in the event of conviction and imposition of a death sentence;

(C) the importance of protecting the client's rights against later contentions by the government that the claim has been waived defaulted, not exhausted, or otherwise forfeited; and

(D) any other professionally appropriate risks and benefits to the assertion of the claim.

**(b)** Counsel who decide to assert a particular legal claim should:

1. present the claim as forcefully as possible, tailoring the presentation to the particular facts and circumstances in the client's case and the applicable law in the particular jurisdiction; and

2. ensure that a full record is made of all legal proceedings in connection with the claim.

**Standard 2-11: Duty to Seek an Agreed-Upon Disposition**

**(a)** Counsel at every stage of the case has an obligation to take all steps that maybe appropriate in the exercise of professional judgment in accordance with these standards to achieve an agreed-upon disposition.

**(b)** Counsel at every stage of the case should explore with the client the possibility and desirability of reaching an agreed-upon disposition. In so doing, counsel should fully explain the rights that would be waived, and the legal, factual, and contextual considerations that bear upon the decision. Specifically, counsel should know and fully explain to the client:

1. the maximum penalty that may be imposed for the charged offense(s) and any possible lesser-included or alternative offenses;

2. the use of the disposition adversely to the client in penalty phase proceedings of other prosecutions of the client as well as any direct consequences of potential penalties less than death, such as the possibility and likelihood of parole, place of confinement, and goodtime credits;

3. the general range of sentences for similar offenses committed by defendants with similar backgrounds and the impact of any applicable sentencing guidelines or mandatory sentencing requirements;

4. the governing legal regime, including, but not limited to, whatever choices the client may have as to the fact-finder and/or sentencer;

5. the types of pleas that may be agreed to, such as a plea of guilty, a conditional plea of guilty, or a plea of nolo contendere, or other plea that does not require the client to personally acknowledge guilt, along with the advantages and disadvantages of each;

6. whether any agreement negotiated can be made binding on the court, penal/parole authorities, and any others who may be involved;

7. the practices, policies, and concerns of the particular jurisdiction, the judge and prosecuting authority, the family of the victim, and any other persons or entities that may affect the content and likely results of plea negotiations;

8. Concessions that the client might offer, such as:

(A) an agreement to waive trial and to plead guilty to particular charges;

(B) an agreement to permit a judge to perform functions relative to guilt or sentence that would otherwise be performed by a jury or vice versa;

(C) an agreement, if permitted under applicable law, regarding future custodial status, such as one to be confined in a more onerous category of institution than would otherwise be the case;

(D) an agreement to forgo in whole or part legal remedies such as appeals, motions for post-conviction relief, and/or parole or clemency applications;

(E) an agreement to provide the prosecution with assistance in investigating or prosecuting the present case or other alleged criminal activity;

(F) an agreement to engage in or refrain from any particular conduct, as appropriate to the case;

(G) an agreement with the victim's family, which may include matters such as a meeting between the victim's family and the client, a promise not to publicize or profit from the offense, the issuance or delivery of a public statement of remorse by the client, or restitution; and

(H) agreements such as those described in the foregoing subsections respecting actual or potential charges in another jurisdiction.

9. Benefits the client might obtain from a negotiated settlement, including:

(A) a guarantee that the death penalty will not be imposed;

(B) an agreement that the client will receive a specified sentence;

(C) an agreement that the prosecutor will not advocate a certain sentence, will not present certain information to the court, or will engage in or refrain from engaging in other actions with regard to sentencing;
(D) an agreement that one or more of multiple charges will be reduced or dismissed;
(E) an agreement that the client will not be subject to further investigation or prosecution for uncharged alleged or suspected criminal conduct;
(F) an agreement that the client may enter a conditional plea to preserve the right to further contest certain legal issues;
(G) an agreement that the court or prosecutor will, to the extent provided by law, make specific recommendations to correctional or parole authorities regarding the terms of the client's confinement; and
(H) agreements such as those described in the foregoing subsections respecting actual or potential charges in another jurisdiction.

**(c)** Counsel should keep the client fully informed of any negotiations for a disposition, convey to the client any offers made by the prosecution, and discuss with the client possible negotiation strategies.

**(d)** Counsel should inform the client of any tentative negotiated agreement reached with the prosecution and explain to the client the full content of the agreement along with the advantages, disadvantages, and potential consequences of the agreement.

**(e)** If a negotiated disposition would be in the best interest of the client, initial refusals by the prosecutor to negotiate should not prevent counsel from making further efforts to negotiate. Similarly, a client's initial opposition should not prevent counsel from engaging in an ongoing effort to persuade the client to accept an offer of resolution that is in the client's best interest.

**(f)** Counsel should not accept any agreed-upon disposition without the client's express authorization.

**(g)** The existence of ongoing negotiations with the prosecution does not in any way diminish the obligations of defense counsel respecting litigation.

**Standard 2-12: Entry of a Plea of Guilty**

**(a)** The informed decision whether to enter a plea of guilty lies with the client.

**(b)** In the event the client determines to enter a plea of guilty, prior to the entry of the plea, counsel should:

1. make certain that the client understands the rights to be waived by entering the plea and that the client's decision to waive those rights is knowing, voluntary, and intelligent;
2. ensure that the client understands the conditions and limits of the plea agreement and the maximum punishment, sanctions, and direct consequences to which he or she will be exposed by entering the plea; and
3. explain to the client the nature of the plea hearing and prepare the client for the role he or she will play in the hearing, including answering questions in court, and providing a statement concerning the offense.

**(c)** During entry of the plea, counsel should make sure that the full content and conditions of any agreements with the government are placed on the record.

**Standard 2-13: Trial Preparation Overall**

As the investigations addressed in Standard 2-7 produce information, trial counsel should formulate a defense theory. Counsel should seek a theory that will be effective in connection with both guilt and penalty, and should seek to minimize any inconsistencies.

**Standard 2-14: Voir Dire and Jury Selection**

**(a)** Counsel should consider, along with potential legal challenges to the procedures for selecting the jury that would be available in any criminal case (particularly those relating to bias on the basis of race or gender), whether any procedures have been instituted for selection of juries in capital cases that present particular legal bases for challenge. Such challenges may include challenges to the selection of the grand jury and grand jury forepersons, as well as to the selection of the petit jury venire.

**(b)** Counsel should be familiar with the precedents relating to questioning and challenging of potential jurors, including the procedures surrounding "death qualification" concerning any potential juror's beliefs about the death penalty. Counsel should be familiar with techniques:

1. for exposing those prospective jurors who would automatically impose the death penalty following a murder conviction or finding that the client is death-eligible, regardless of the individual circumstances of the case;

2. for uncovering those prospective jurors who are unable to give meaningful consideration to mitigating evidence; and 3. for rehabilitating potential jurors whose initial indications of opposition to the death penalty make them possibly excludable.
**(c)** Counsel should consider seeking expert assistance in the jury selection process.

**Standard 2-15: Defense Case Concerning Penalty**
**(a)** As set out in Standard 2-7, counsel at every stage of the case has a continuing duty to investigate issues bearing upon penalty and to seek information that supports mitigation or rebuts the prosecution's case in aggravation.
**(b)** Counsel should discuss with the client early in the case the sentencing alternatives available and the relationship between the strategy for thesentencing phase and for the guilt/innocence phase.
**(c)** Prior to the sentencing phase, trial counsel should discuss with the client thespecific sentencing phase procedures of the jurisdiction and advise the client of steps being taken in preparation for sentencing.
**(d)** Counsel at every stage of the case should discuss with the client the content and purpose of the information concerning penalty that they intend to present to the sentencing or reviewing body or individual, means by which the mitigation presentation might be strengthened, and the strategy for meeting the prosecution's case in aggravation.
**(e)** Counsel should consider, and discuss with the client, the possible consequences of having the client testify or make a statement to the sentencing or reviewing body or individual.
**(f)** In deciding which witnesses and evidence to prepare concerning penalty, the areas counsel should consider include the following:
1. witnesses familiar with and evidence relating to the client's life and development, from conception to the time of sentencing, that would be explanatory of the offense(s) for which the client is being sentenced, would rebut or explain evidence presented by the prosecutor, would present positive aspects of the client's life, or would otherwise support a sentence less than death;
2. expert and lay witnesses along with supporting documentation (e.g., school records, military records) to provide medical, psychological, sociological, cultural, or other insights into the client's mental and/or emotional state and life history that

may explain or lessen the client's culpability for the underlying offense(s); to give a favorable opinion as to the client's capacity for rehabilitation or adaptation to prison; to explain possible treatment programs; or otherwise support a sentence less than death; and/or to rebut or explain evidence presented by the prosecutor;

3. witnesses who can testify about the applicable alternative to a death sentence and/or the conditions under which the alternative sentence would be served;

4. witnesses who can testify about the adverse impact of the client's execution on the client's family and loved ones; and

5. demonstrative evidence, such as photos, videos, and physical objects (e.g., trophies, artwork, military medals), and documents that humanize the client or portray him positively, such as certificates of earned awards, favorable press accounts, and letters of praise or reference.

**(g)** In determining what presentation to make concerning penalty, counsel should consider whether any portion of the defense case will open the door to the prosecution's presentation of otherwise inadmissible aggravating evidence. Counsel should pursue all appropriate means (e.g., motions in limine) to ensure that the defense case concerning penalty is constricted as little as possible by this consideration and should make a full record in order to support any subsequent challenges.

**(h)** Trial counsel should determine at the earliest possible time what aggravating factors the prosecution will rely upon in seeking the death penalty and what evidence will be offered in support thereof. If the jurisdiction has rules regarding notification of these factors, counsel at all stages of the case should object to any noncompliance, and if such rules are inadequate, counsel at all stages of the case should challenge the adequacy of the rules.

**(i)** Counsel at all stages of the case should carefully consider whether all or part of the aggravating evidence may appropriately be challenged as improper, inaccurate, misleading, or not legally admissible.

**(j)** If the prosecution is granted leave at any stage of the case to have the client interviewed by witnesses associated with the government, defense counsel should:

1. consider what legal challenges may appropriately be made to the interview or the conditions surrounding it;

2. consider the legal and strategic issues implicated by the client's cooperation or noncooperation;
3. ensure that the client understands the significance of any statements made during such an interview; and
4. attend the interview.

**(k)** Trial counsel should request jury instructions and verdict forms that ensure that jurors will be able to consider and give effect to all relevant mitigating evidence. Trial counsel should object to instructions or verdict forms that are constitutionally flawed, inaccurate, or confusing and should offer alternative instructions. Post-conviction counsel should pursue these issues through factual investigation and legal argument.

**(l)** While taking into consideration all ethical and legal requirements, counsel at every stage of the case should take advantage of all appropriate opportunities to argue why death is not suitable punishment for their particular client.

**Standard 2-16: Official Presentence Report**

If an official presentence report or similar document may or will be presented to the court at any time, counsel should become familiar with the procedures governing preparation, submission, and verification of the report. In addition, counsel should:

**(a)** where preparation of the report is optional, consider the strategic implications of requesting that a report be prepared;

**(b)** provide to the report preparer information favorable to the client. In this regard, counsel should consider whether the client should speak with the person preparing the report; if the determination is made to do so, counsel should discuss the interview in advance with the client and attend it;

**(c)** review the completed report;

**(d)** take appropriate steps to ensure that improper, incorrect, or misleading information that may harm the client is deleted from the report; and

**(e)** take steps to preserve and protect the client's interests where the defense considers information in the presentence report to be improper, inaccurate, or misleading.

**Standard 2-17: Duty to Facilitate the Work of Successor Counsel**

In accordance with professional norms, all persons who are or have been members of the defense team have a continuing duty to safeguard the interests of the client and should cooperate fully with successor counsel. This duty includes, but is not limited to:

**(a)** maintaining the records of the case in a manner that will inform successor counsel of all significant developments relevant to the litigation;

**(b)** providing the client's files, as well as information regarding all aspects of the representation, to successor counsel;

**(c)** sharing potential further areas of legal and factual research with successor counsel; and

**(d)** cooperating with such professionally appropriate legal strategies as may be chosen by successor counsel.

**Standard 2-18: Duties of Trial Counsel After Conviction**

Trial counsel should:

**(a)** be familiar with all state and federal post-conviction options available to the client. Trial counsel should discuss with the client the post-conviction procedures that will or may follow imposition of the death sentence;

**(b)** While considering all ethical and legal requirements, take whatever action(s), such as filing a notice of appeal and/or motion for a new trial, will maximize the client's ability to obtain post-conviction relief;

**(c)** not cease acting on the client's behalf until successor counsel has entered the case or trial counsel's representation has been formally terminated. Until that time, Standard 2-17 applies in its entirety; and

**(d)** take all appropriate action to ensure that the client obtains successor counsel as soon as possible.

**Standard 2-19: Duties of Post-Conviction Counsel**

**(a)** Counsel representing a capital client at any point after conviction should be familiar with the jurisdiction's procedures for setting execution dates and providing notice of them. Post-conviction counsel should also be thoroughly familiar with all available procedures for seeking a stay of execution.

**(b)** If an execution date is set, post-conviction counsel should immediately take all appropriate steps to secure a stay of execution and pursue those efforts through all available forms.

**(c)** Post-conviction counsel should seek to litigate all issues, whether or not previously presented, that are arguably meritorious under the standards applicable to competent capital defense representation, including challenges to any overly restrictive procedural rules. Counsel should make every professionally appropriate effort to present issues in a manner that will preserve them for subsequent review.

**(d)** The duties of the counsel representing the client on direct appeal should include, where appropriate, filing a petition for certiorari in the Supreme Court of the United States. If appellate counsel does not intend to file such a petition, he or she should immediately notify successor counsel if known and the responsible agency.

**(e)** Post-conviction counsel should fully discharge the ongoing obligations imposed by these standards, including the obligations to:

1. maintain close contact with the client regarding litigation developments;
2. continually monitor the client's mental, physical, and emotional condition for effects on the client's legal position;
3. keep under continuing review the desirability of modifying prior counsel's theory of the case in light of subsequent developments; and
4. continue an aggressive investigation of all aspects of the case.

**Standard 2-20: Duties of Clemency Counsel**

Clemency counsel should:

1. be familiar with the procedures for and permissible substantive content of a request for clemency;
2. conduct a reasonable investigation in accordance with Standard 2-7;
3. ensure that clemency is sought in as timely and persuasive a manner as possible, tailoring the presentation to the characteristics of the particular client, case, and jurisdiction; and
4. ensure that the process governing consideration of the client's application is substantively and procedurally just, and if not, should seek appropriate redress.

## APPELLATE AND POST-CONVICTION REPRESENTATION

**Standard 3-1: Role of Appellate Defense Counsel**

The paramount obligation of appellate criminal defense counsel is to provide zealous and competent representation to their clients at all stages of the appellate process. Attorneys also have an obligation to abide by ethical norms and act in accordance with the rules of the court. Trial counsel should advise the client of his or her right to appeal and any limits on that right, pursuant to then-existing case law. If the client instructs the attorney to proceed with an appeal, even if the attorney believes that the appeal is without merit or is not cognizable, trial counsel will assure that a Notice of Appeal is filed. If the client wishes to proceed with the appeal, against the advice of counsel, counsel should present the case, so long as such advocacy does not involve deception of the court and complies with the Nevada Rules of Appellate Procedure.

**Standard 3-2: Identification of issues on appeal**

In selecting issues to be presented on appeal, counsel should:

**(a)** conduct a thorough review of the trial transcript, the pleadings, and docket entries in the case;

**(b)** investigate potentially meritorious unpreserved claims of error.;

**(c)** assert claims of error that are supported by facts of record that will benefit the client if successful, that possess arguable legal merit, and that should be recognizable by a practitioner familiar with criminal law and procedure who engages in diligent legal research;

**(d)** not hesitate to assert claims that may be complex, unique, or controversial in nature, such as issues of first impression or arguments for change in the existing law;

**(e)** inform the client when counsel has decided not to raise issues that the client desires to be raised and the reasons why the issues were not raised; and

**(f)** consider whether there are federal constitutional claims that, in the event that relief is denied in the state appellate court, would form the basis for a writ of habeas corpus in federal district court. Such claims should raise and argue the federal

constitutional claims, unless counsel concludes that there is a tactical basis for not including such claims.

**Standard 3-3: Diligence and Accuracy**

In presenting the appeal, counsel should:

**(a)** be diligent in perfecting appeals and expediting prompt submission to the appellate court;

**(b)** be accurate in referring to the record and the authorities upon which counsel relies in the presentation to the court of briefs and oral argument; and

**(c)** not intentionally refer to or argue on the basis of facts outside the record on appeal, unless such facts are matters of common public knowledge based on ordinary human experience or matters of which the court may take judicial notice.

**Standard 3-4: Duty to Meet With Trial Lawyers**

In preparing the appeal, counsel should consult trial counsel in order to assist appellate counsel in understanding and presenting the client's issues on appeal.

**Standard 3-5: Duty to Confer and Communicate With Client**

In preparing and processing the appeal, counsel should:

**(a)** assure that the client is able to contact appellate counsel telephonically during the pendency of the appeal including arrangements for the acceptance of collect telephone calls. Promptly after appointment or assignment to the appeal, counsel shall provide advice to the client, in writing, as to the method(s) which the client can employ to discuss the appeal with counsel;

**(b)** discuss the merits, strategy, and ramifications of the proposed appeal with each client prior to the perfection and completion thereof. When possible, appellate counsel should meet in person with the client, and in all instances, counsel should provide a written summary of the merits and strategy to be employed in the appeal along with a statement of the reasons certain issues will not be raised, if any. It is the obligation of the appellate counsel to provide the client with his or her best professional judgment as to whether the appeal should be pursued in view of the possible consequences and strategic considerations;

**(c)** inform the client of the status of the case at each step in the appellate process, explain any delays, and provide general information to the client regarding the process and procedures that will be taken in the matter, and the anticipated timeframe for such processing;
**(d)** provide the client with a copy of each substantive document filed in the case by both the prosecution and defense;
**(e)** respond in a timely manner to all correspondence from clients, provided that the client correspondence is of a reasonable number and at a reasonable interval; and
**(f)** promptly and accurately inform the client of the courses of action that may be pursued as a result of any disposition of the appeal and the scope of any further representation counsel will provide.

**Standard 3-6: Duty to Seek Release during Appeal**
Appellate counsel should file appropriate motions seeking release pending appeal when the granting of such motions is reasonably possible.

**Standard 3-7: Responsibilities in "Fast Track" Appeals**
If the conviction qualifies for "fast track" treatment under NRAP 3C, counsel shall fulfill the responsibilities set forth in the rule. In preparing the "fast track" statement, counsel should:
**(a)** order a rough draft of those portions of the transcript provided for in NRAP 3C(d) in all cases in which trial counsel is not handling the appeal and in all other cases in which information from the proceedings is necessary for a fair determination of the issues to be raised on appeal;
**(b)** thoroughly research the issues in the case and shall set forth all viable issues in the "fast track" statement provided for by NRAP 3C(e); and
**(c)** consult, if possible within the "fast track" deadlines, with the client as to which issues should be presented in the statement.

**Standard 3-8: Post-Decision Responsibilities**
If the decision of the appellate court is adverse to the client, appellate counsel should:

**(a)** promptly inform the client of the decision and confer with the client with regard to the availability of rehearing or en banc reconsideration and the benefits or disadvantages of filing such a motion;
**(b)** file a Motion for Rehearing and/or Request for en banc reconsideration if grounds for such a motion and/or request exist;
**(c)** advise the client whether a petition for writ of certiorari to the United States Supreme Court is warranted and determine whether such a petition will be filed;
**(d)** promptly advise the client of any remedies that are available in state or federal court for post-conviction review and shall advise the client of the applicable statute of limitations for filing for such relief;
**(e)** advise the client of any claims such as ineffective assistance of counsel that may be available to the client but that will not be pursued by appellate counsel;
**(f)** provide the client with any available forms for post-conviction relief and appointment of counsel; and
**(g)** cooperate with the client and with post-conviction counsel in securing the trial and appellate record and investigation of potential claims for postconviction relief.

**Standard 3-9: Post-Conviction Representation**
Counsel appointed to represent a client in post-conviction proceedings should:
**(a)** assure that the client is able to contact post-conviction counsel telephonically during the pendency of the appeal including arrangements for the acceptance of collect telephone calls. Promptly after appointment or assignment to the post-conviction case, counsel shall provide advice to the client, in writing, as to the method(s) that the client can employ to discuss the post-conviction proceeding with counsel;
**(b)** consult with trial/appellate counsel and secure the entire trial and appeal file;
**(c)** seek to litigate all issues, whether or not previously presented, that are arguably meritorious;
**(d)** maintain close contact with the client and consult with the client on all decisions with regard to the content of any pleadings seeking collateral or post-conviction relief prior to the filing of any petition for post-conviction relief. When possible, post-conviction counsel should meet in person with the client and in all instances, counsel

should provide a written summary of the merits and strategy to be employed in the post-conviction proceeding along with a statement of the reasons certain issues will not be raised, if any;

**(e)** investigate all potentially meritorious claims that require factual support;

**(f)** secure the services of investigators or experts where necessary to develop claims to be raised in the post-conviction petition;

**(g)** raise all federal constitutional claims, along with appropriate citations, that are arguably meritorious; and

**(h)** advise the client of remedies that may be available should post-conviction relief not be granted, including appeal from the denial and federal habeas corpus along with any applicable time limits for seeking such relief. Postconviction counsel shall advise the client in writing if counsel will not be representing the client in any subsequent proceedings and shall provide advice on the steps that must be taken and the time limits that are applicable to appeals or the seeking of relief in the federal courts.

## FELONY AND MISDEMEANOR TRIAL CASES

### Standard 4-1: Role of Defense Counsel

**(a)** The paramount obligation of criminal defense counsel is to provide zealous and competent representation to their clients at all stages of the criminal process. Attorneys also have an obligation to abide by ethical norms and act in accordance with the rules of the court.

**(b)** Counsel at every stage of the case has an obligation to take all steps that may be appropriate in the exercise of professional judgment in accordance with these standards to achieve an agreed-upon disposition.

### Standard 4-2: Education, Training, and Experience of Defense Counsel

**(a)** To provide competent representation, counsel must be familiar with the substantive criminal law and the law of criminal procedure and its application in the courts of Nevada. Counsel has a continuing obligation to stay abreast of changes and developments in the law. Where appropriate, counsel should also be informed of the practice of the specific judge before whom a case is pending.

slow, distressful death and be hazardous to other animals and to personnel. (3) Most of these agents are hazardous to personnel because of the risk of explosions (eg, ether), narcosis (eg, halothane), hypoxemia (eg, nitrogen and carbon monoxide), addiction (eg, nitrous oxide), or health effects resulting from chronic exposure (eg, nitrous oxide and carbon monoxide). (4) Alveolar concentrations rise slowly in an animal with decreased ventilation, making agitation more likely during induction. Other noninhalant methods of euthanasia should be considered for such animals. (5) Neonatal animals appear to be resistant to hypoxia, and because all inhalant agents ultimately cause hypoxia, neonatal animals take longer to die than adults. Glass et al,[44] reported that newborn dogs, rabbits, and guinea pigs survived a nitrogen atmosphere much longer than did adults. Dogs, at 1 week old, survived for 14 minutes compared with a 3-minute survival time after a few weeks of age. Guinea pigs survived for 4.5 minutes at 1 day old, compared with 3 minutes at 8 days or older. Rabbits survived for 13 minutes at 6 days old, 4 minutes at 14 days, and 1.5 minutes at 19 days and older. The panel recommends that inhalant agents not be used alone in animals less than 16 weeks old except to induce loss of consciousness, followed by the use of some other method to kill the animal. (6) Rapid gas flows can produce a noise that frightens animals. If high flows are required, the equipment should be designed to minimize noise. (7) Animals placed together in chambers should be of the same species, and, if needed, should be restrained so that they will not hurt themselves or others. Chambers should not be overloaded and need to be kept clean to minimize odors that might distress animals subsequently euthanatized. (8) Reptiles, amphibians, and diving birds and mammals have a great capacity for holding their breath and anaerobic metabolism. Therefore, induction of anesthesia and time to loss of consciousness when using inhalants may be greatly prolonged. Other techniques may be more appropriate for these species.

## Inhalant anesthetics

Inhalant anesthetics (eg, ether, halothane, methoxyflurane, isoflurane, sevoflurane, desflurane, and enflurane) have been used to euthanatize many species.[45] Halothane induces anesthesia rapidly and is the most effective inhalant anesthetic for euthanasia. Enflurane is less soluble in blood than halothane, but, because of its lower vapor pressure and lower potency, induction rates may be similar to those for halothane. At deep anesthetic planes, animals may seizure. It is an effective agent for euthanasia, but the associated seizure activity may be disturbing to personnel. Isoflurane is less soluble than halothane, and it should induce anesthesia more rapidly. However, it has a slightly pungent odor and animals often hold their breath, delaying onset of loss of consciousness. Isoflurane also may require more drug to kill an animal, compared with halothane. Although isoflurane is acceptable as a euthanasia agent, halothane is preferred. Sevoflurane is less soluble than halothane and does not have an objectionable odor. It is less potent than isoflurane or halothane and has a lower vapor pressure. Anesthetic concentrations can be achieved and maintained rapidly. Desflurane is currently the least soluble potent inhalant anesthetic, but the vapor is quite pungent, which may slow induction. This drug is so volatile that it could displace oxygen ($O_2$) and induce hypoxemia during induction if supplemental $O_2$ is not provided. Methoxyflurane is highly soluble, and slow anesthetic induction with its use may be accompanied by agitation. It is a conditionally acceptable agent for euthanasia in rodents.[46] Ether has high solubility in blood and induces anesthesia slowly. It is irritating to the eyes and nose, poses serious risks associated with its flammability and explosiveness, and has been used to create a model for stress.[47-50]

With inhalant anesthetics, the animal can be placed in a closed receptacle containing cotton or gauze soaked with an appropriate amount of the anesthetic,[51] or the anesthetic can be introduced from a vaporizer. The latter method may be associated with a longer induction time. Vapors are inhaled until respiration ceases and death ensues. Because the liquid state of most inhalant anesthetics is irritating, animals should be exposed only to vapors. Also, sufficient air or $O_2$ must be provided during the induction period to prevent hypoxemia.[51] In the case of small rodents placed in a large container, there will be sufficient $O_2$ in the chamber to prevent hypoxemia. Larger species placed in small containers may need supplemental air or $O_2$.[51]

Nitrous oxide ($N_2O$) may be used with other inhalants to speed the onset of anesthesia, but alone it does not induce anesthesia in animals, even at 100% concentration. When used by itself, $N_2O$ produces hypoxemia before respiratory or cardiac arrest. As a result, animals may become distressed prior to loss of consciousness.

Occupational exposure to inhalant anesthetics constitutes a human health hazard. Spontaneous abortion and congenital abnormalities have been associated with exposure of women to trace amounts of inhalation anesthetic agents during early stages of pregnancy.[52] Regarding human exposure to inhalant anesthetics, the concentrations of halothane, enflurane, and isoflurane should be less than 2 ppm, and less than 25 ppm for nitrous oxide.[52] There are no controlled studies proving that such concentrations of anesthetics are safe, but these concentrations were established because they were found to be attainable under hospital conditions. Effective procedures must be used to protect personnel from anesthetic vapors.

*Advantages*—(1) Inhalant anesthetics are particularly valuable for euthanasia of smaller animals (< 7 kg) or for animals in which venipuncture may be difficult. (2) Halothane, enflurane, isoflurane, sevoflurane, desflurane, methoxyflurane, and $N_2O$ are nonflammable and nonexplosive under ordinary environmental conditions.

*Disadvantages*—(1) Animals may struggle and become anxious during induction of anesthesia because anesthetic vapors may be irritating and can induce excitement. (2) Ether is flammable and explo-

sive. Explosions have occurred when animals, euthanatized with ether, were placed in an ordinary (not explosion proof) refrigerator or freezer and when bagged animals were placed in an incinerator. (3) Induction with methoxyflurane is unacceptably slow in some species. (4) Nitrous oxide will support combustion. (5) Personnel and animals can be injured by exposure to these agents. (6) There is a potential for human abuse of some of these drugs, especially $N_2O$.

*Recommendations*—In order of preference, halothane, enflurane, isoflurane, sevoflurane, methoxyflurane, and desflurane, with or without nitrous oxide, are acceptable for euthanasia of small animals (< 7 kg). Ether should only be used in carefully controlled situations in compliance with state and federal occupational health and safety regulations. It is conditionally acceptable. Nitrous oxide should not be used alone, pending further scientific studies on its suitability for animal euthanasia. Although acceptable, these agents are generally not used in larger animals because of their cost and difficulty of administration.

## Carbon dioxide

Room air contains 0.04% carbon dioxide ($CO_2$), which is heavier than air and nearly odorless. Inhalation of $CO_2$ at a concentration of 7.5% increases the pain threshold, and higher concentrations of $CO_2$ have a rapid anesthetic effect.[53-58]

Leake and Waters[56] reported the experimental use of $CO_2$ as an anesthetic agent for dogs. At concentrations of 30% to 40% $CO_2$ in $O_2$, anesthesia was induced within 1 to 2 minutes, usually without struggling, retching, or vomiting. For cats, inhalation of 60% $CO_2$ results in loss of consciousness within 45 seconds, and respiratory arrest within 5 minutes.[59] Signs of effective $CO_2$ anesthesia are those associated with deep surgical anesthesia, such as loss of withdrawal and palpebral reflexes.[60] Time to loss of consciousness is decreased by use of higher concentrations of $CO_2$ with an 80 to 100% concentration providing anesthesia in 12 to 33 seconds in rats and 70% $CO_2$ in $O_2$ inducing anesthesia in 40 to 50 seconds.[61,62] Time to loss of consciousness will be longer if the concentration is increased slowly rather than immersing the animal in the full concentration immediately.

Several investigators have suggested that inhalation of high concentrations of $CO_2$ may be distressing to animals,[63-66] because the gas dissolves in moisture on the nasal mucosa. The resulting product, carbonic acid, may stimulate nociceptors in the nasal mucosa. Some humans exposed to concentrations of around 50% $CO_2$ report that inhaling the gas is unpleasant and that higher concentrations are noxious.[67,68] A brief study of swine examined the aversive nature of $CO_2$ exposure[69] and found that 90% $CO_2$ was aversive to pigs while 30% was not. For rats, exposure to increasing concentrations of $CO_2$ (33% achieved after 1 minute) in their home cage produced no evident stress as measured by behavior and ACTH, glucose, and corticosterone concentrations in serum.[70]

Carbon dioxide has been used to euthanatize groups of small laboratory animals, including mice, rats, guinea pigs, chickens, and rabbits,[5,71-76] and to render swine unconscious before humane slaughter.[22,63,64] The combination of 40% $CO_2$ and approximately 3% CO has been used experimentally for euthanasia of dogs.[65] Carbon dioxide has been used in specially designed chambers to euthanatize individual cats[77,78] and other small laboratory animals.[51,72,79]

Studies of 1-day-old chickens have revealed that $CO_2$ is an effective euthanatizing agent. Inhalation of $CO_2$ caused little distress to the birds, suppressed nervous activity, and induced death within 5 minutes.[73] Because respiration begins during embryonic development, the unhatched chicken's environment may normally have a $CO_2$ concentration as high as 14%. Thus, $CO_2$ concentrations for euthanasia of newly hatched chickens and neonates of other species should be especially high. A $CO_2$ concentration of 60% to 70% with a 5-minute exposure time appears to be optimal.[73]

In studies of mink, high concentrations of $CO_2$ would kill them quickly, but a 70% $CO_2$ concentration induced loss of consciousness without killing them.[80] Some burrowing animals, such as rabbits of the species *Oryctolagus*, also have prolonged survival times when exposed to $CO_2$.[81] Some burrowing and diving animals have physiologic mechanisms for coping with hypercapnia. Therefore, it is necessary to have a sufficient concentration of $CO_2$ to kill the animal by hypoxemia following induction of anesthesia with $CO_2$.

*Advantages*—(1) The rapid depressant, analgesic, and anesthetic effects of $CO_2$ are well established. (2) Carbon dioxide is readily available and can be purchased in compressed gas cylinders. (3) Carbon dioxide is inexpensive, nonflammable, nonexplosive, and poses minimal hazard to personnel when used with properly designed equipment. (4) Carbon dioxide does not result in accumulation of tissue residues in food-producing animals. (5) Carbon dioxide euthanasia does not distort murine cholinergic markers[82] or corticosterone concentrations.[83]

*Disadvantages*—(1) Because $CO_2$ is heavier than air, incomplete filling of a chamber may permit animals to climb or raise their heads above the higher concentrations and avoid exposure. (2) Some species, such as fish and burrowing and diving mammals, may have extraordinary tolerance for $CO_2$. (3) Reptiles and amphibians may breathe too slowly for the use of $CO_2$. (4) Euthanasia by exposure to $CO_2$ may take longer than euthanasia by other means.[61] (5) Induction of loss of consciousness at lower concentrations (< 80%) may produce pulmonary and upper respiratory tract lesions.[67,84] (6) High concentrations of $CO_2$ may be distressful to some animals.

*Recommendations*—Carbon dioxide is acceptable for euthanasia in appropriate species (**Tables 1 and 2**). Compressed $CO_2$ gas in cylinders is the only recommended source of carbon dioxide because the inflow to the chamber can be regulated precisely. Carbon dioxide generated by other methods such as from dry ice, fire extinguishers, or chemical means (eg, antacids) is unacceptable. Species should be separated and cham-

bers should not be overcrowded. With an animal in the chamber, an optimal flow rate should displace at least 20% of the chamber volume per minute.[85] Loss of consciousness may be induced more rapidly by exposing animals to a $CO_2$ concentration of 70% or more by prefilling the chamber for species in which this has not been shown to cause distress. Gas flow should be maintained for at least 1 minute after apparent clinical death.[86] It is important to verify that an animal is dead before removing it from the chamber. If an animal is not dead, $CO_2$ narcosis must be followed with another method of euthanasia. Adding $O_2$ to the $CO_2$ may or may not preclude signs of distress.[67,87] Additional $O_2$ will, however, prolong time to death and may complicate determination of consciousness. There appears to be no advantage to combining $O_2$ with carbon dioxide for euthanasia.[87]

### Nitrogen, argon

Nitrogen ($N_2$) and argon (Ar) are colorless, odorless gases that are inert, nonflammable, and nonexplosive. Nitrogen comprises 78% of atmospheric air, whereas Ar comprises less than 1%.

Euthanasia is induced by placing the animal in a closed container that has been prefilled with $N_2$ or Ar or into which the gas is then rapidly introduced. Nitrogen/Ar displaces $O_2$, thus inducing death by hypoxemia.

In studies by Herin et al,[88] dogs became unconscious within 76 seconds when a $N_2$ concentration of 98.5% was achieved in 45 to 60 seconds. The electroencephalogram (EEG) became isoelectric (flat) in a mean time of 80 seconds, and arterial blood pressure was undetectable at 204 seconds. Although all dogs hyperventilated prior to loss of consciousness, the investigators concluded that this method induced death without pain. Following loss of consciousness, vocalization, gasping, convulsions, and muscular tremors developed in some dogs. At the end of a 5-minute exposure period, all dogs were dead.[88] These findings were similar to those for rabbits[89] and mink.[80,90]

With $N_2$ flowing at a rate of 39% of chamber volume per minute, rats collapsed in approximately 3 minutes and stopped breathing in 5 to 6 minutes. Regardless of flow rate, signs of panic and distress were evident before the rats collapsed and died.[85] Insensitivity to pain under such circumstances is questionable.[91]

Tranquilization with acepromazine, in conjunction with $N_2$ euthanasia of dogs, was investigated by Quine et al.[92] Using ECG and EEG recordings, they found these dogs had much longer survival times than dogs not given acepromazine before administration of $N_2$. In one dog, ECG activity continued for 51 minutes. Quine also addressed distress associated with exposure to $N_2$ by removing cats and dogs from the chamber following loss of consciousness and allowing them to recover. When these animals were put back into the chamber, they did not appear afraid or apprehensive.

Investigations into the aversiveness of Ar to swine and poultry have revealed that these animals will tolerate breathing 90% Ar with 2% $O_2$.[69,71] Swine voluntarily entered a chamber containing this mixture, for a food reward, and only withdrew from the chamber as they became ataxic. They reentered the chamber immediately to continue eating. Poultry also entered a chamber containing this mixture for a food reward and continued eating until they collapsed.[71] When Ar was used to euthanatize chickens, exposure to a chamber prefilled with Ar, with an $O_2$ concentration of < 2%, led to EEG changes and collapse in 9 to 12 seconds. Birds removed from the chamber at 15 to 17 seconds failed to respond to comb pinching. Continued exposure led to convulsions at 20 to 24 seconds. Somatosensory-evoked potentials were lost at 24 to 34 seconds, and the EEG became isoelectric at 57 to 66 seconds. Convulsion onset was after loss of consciousness (collapse and loss of response to comb pinch), so this would appear to be a humane method of euthanasia for chickens.[93] Despite the availability of some information, there is still much about the use of $N_2$/Ar that needs to be investigated.

*Advantages*—(1) Nitrogen and Ar are readily available as compressed gases. (2) Hazards to personnel are minimal.

*Disadvantages*—(1) Loss of consciousness is preceded by hypoxemia and ventilatory stimulation, which may be distressing to the animal. (2) Reestablishing a low concentration of $O_2$ (ie, 6% or greater) in the chamber before death will allow immediate recovery.[69]

*Recommendations*—Nitrogen and Ar can be distressful to some species (eg, rats).[85] Therefore, this technique is conditionally acceptable only if $O_2$ concentrations < 2% are achieved rapidly, and animals are heavily sedated or anesthetized. With heavy sedation or anesthesia, it should be recognized that death may be delayed. Although $N_2$ and Ar are effective, other methods of euthanasia are preferable.

### Carbon monoxide

Carbon monoxide (CO) is a colorless, odorless gas that is nonflammable and nonexplosive unless concentrations exceed 10%. It combines with hemoglobin to form carboxyhemoglobin and blocks uptake of $O_2$ by erythrocytes, leading to fatal hypoxemia.

In the past, mass euthanasia has been accomplished by use of 3 methods for generating CO: (1) chemical interaction of sodium formate and sulfuric acid, (2) exhaust fumes from idling gasoline internal combustion engines, and (3) commercially compressed CO in cylinders. The first 2 techniques are associated with problems such as production of other gases, achieving inadequate concentrations of carbon monoxide, inadequate cooling of the gas, and maintenance of equipment. Therefore, the only acceptable source is compressed CO in cylinders.

In a study by Ramsey and Eilmann,[94] 8% CO caused guinea pigs to collapse in 40 seconds to 2 minutes, and death occurred within 6 minutes. Carbon monoxide has been used to euthanatize mink[80,90] and chinchillas. These animals collapsed in 1 minute, breathing ceased in 2 minutes, and the heart stopped beating in 5 to 7 minutes.

In a study evaluating the physiologic and behavioral characteristics of dogs exposed to 6% CO in air, Chalifoux and Dallaire[95] could not determine the precise time of loss of consciousness. Electroencephalographic recordings revealed 20 to 25 seconds of abnormal cortical function prior to loss of consciousness. It was during this period that the dogs became agitated and vocalized. It is not known whether animals experience distress; however, humans in this phase reportedly are not distressed.[96] Subsequent studies have revealed that tranquilization with acepromazine significantly decreases behavioral and physiologic responses of dogs euthanatized with CO.[97]

In a comparative study, CO from gasoline engine exhaust and 70% $CO_2$ plus 30% $O_2$ were used to euthanatize cats. Euthanasia was divided into 3 phases. Phase I was the time from initial contact to onset of clinical signs (eg, yawning, staggering, or trembling). Phase II extended from the end of phase I until recumbency, and phase III from the end of phase II until death.[54] The study revealed that signs of agitation before loss of consciousness were greatest with $CO_2$ plus $O_2$. Convulsions occurred during phases II and III with both methods. However, when the euthanasia chamber was prefilled with CO (ie, exhaust fumes), convulsions did not occur in phase III. Time to complete immobilization was greater with $CO_2$ plus $O_2$ (approximately 90 seconds) than with CO alone (approximately 56 seconds).[54] In neonatal pigs, excitation was more likely to precede loss of consciousness if the pigs were exposed to a rapid rise in CO concentration. This agitation was reduced at lower flow rates, or when CO was combined with nitrogen.[98]

In people, the most common symptoms of early CO toxicosis are headache, dizziness, and weakness. As concentrations of carboxyhemoglobin increase, these signs may be followed by decreased visual acuity, tinnitus, nausea, progressive depression, confusion, and collapse.[99] Because CO stimulates motor centers in the brain, loss of consciousness may be accompanied by convulsions and muscular spasms.

Carbon monoxide is a cumulative poison.[96] Distinct signs of CO toxicosis are not evident until the CO concentration is 0.05% in air, and acute signs do not develop until the CO concentration is approximately 0.2% in air. In humans, exposure to 0.32% CO and 0.45% CO for one hour will induce loss of consciousness and death, respectively.[100] Carbon monoxide is extremely hazardous for personnel because it is highly toxic and difficult to detect. Chronic exposure to low concentrations of carbon monoxide may be a health hazard, especially with regard to cardiovascular disease and teratogenic effects.[101-103] An efficient exhaust or ventilatory system is essential to prevent accidental exposure of humans.

*Advantages*—(1) Carbon monoxide induces loss of consciousness without pain and with minimal discernible discomfort. (2) Hypoxemia induced by CO is insidious, so that the animal appears to be unaware. (3) Death occurs rapidly if concentrations of 4 to 6% are used.

*Disadvantages*—(1) Safeguards must be taken to prevent exposure of personnel. (2) Any electrical equipment exposed to CO (eg, lights and fans) must be explosion proof.

*Recommendations*—Carbon monoxide used for individual animal or mass euthanasia is acceptable for dogs, cats, and other small mammals, provided that commercially compressed CO is used and the following precautions are taken: (1) personnel using CO must be instructed thoroughly in its use and must understand its hazards and limitations; (2) the CO chamber must be of the highest quality construction and should allow for separation of individual animals; (3) the CO source and chamber must be located in a well-ventilated environment, preferably out of doors; (4) the chamber must be well lit and have view ports that allow personnel direct observation of animals; (5) the CO flow rate should be adequate to rapidly achieve a uniform CO concentration of at least 6% after animals are placed in the chamber, although some species (eg, neonatal pigs) are less likely to become agitated with a gradual rise in CO concentration;[98] and (6) if the chamber is inside a room, CO monitors must be placed in the room to warn personnel of hazardous concentrations. It is essential that CO use be in compliance with state and federal occupational health and safety regulations.

## NONINHALANT PHARMACEUTICAL AGENTS

The use of injectable euthanasia agents is the most rapid and reliable method of performing euthanasia. It is the most desirable method when it can be performed without causing fear or distress in the animal. When the restraint necessary for giving an animal an intravenous injection would impart added distress to the animal or pose undue risk to the operator, sedation, anesthesia, or an acceptable alternate route of administration should be employed. Aggressive, fearful, wild, or feral animals should be sedated or given a nonparalytic immobilizing agent prior to intravenous administration of the euthanasia agent.

When intravenous administration is considered impractical or impossible, intraperitoneal administration of a nonirritating euthanasia agent is acceptable, provided the drug does not contain neuromuscular blocking agents. Intracardiac injection is acceptable only when performed on heavily sedated, anesthetized, or comatose animals. It is not considered acceptable in awake animals, owing to the difficulty and unpredictability of performing the injection accurately. Intramuscular, subcutaneous, intrathoracic, intrapulmonary, intrahepatic, intrarenal, intrasplenic, intrathecal, and other nonvascular injections are not acceptable methods of administering injectable euthanasia agents.

When injectable euthanasia agents are administered into the peritoneal cavity, animals may be slow to pass through stages I and II of anesthesia. Accordingly, they should be placed in small cages in a quiet area to minimize excitement and trauma.

### Barbituric acid derivatives

Barbiturates depress the central nervous system in descending order, beginning with the cerebral cortex,

with loss of consciousness progressing to anesthesia. With an overdose, deep anesthesia progresses to apnea, owing to depression of the respiratory center, which is followed by cardiac arrest.

All barbituric acid derivatives used for anesthesia are acceptable for euthanasia when administered intravenously. There is a rapid onset of action, and loss of consciousness induced by barbiturates results in minimal or transient pain associated with venipuncture. Desirable barbiturates are those that are potent, long-acting, stable in solution, and inexpensive. Sodium pentobarbital best fits these criteria and is most widely used, although others such as secobarbital are also acceptable.

*Advantages*—(1) A primary advantage of barbiturates is speed of action. This effect depends on the dose, concentration, route, and rate of the injection. (2) Barbiturates induce euthanasia smoothly, with minimal discomfort to the animal. (3) Barbiturates are less expensive than many other euthanasia agents.

*Disadvantages*—(1) Intravenous injection is necessary for best results and requires trained personnel. (2) Each animal must be restrained. (3) Current federal drug regulations require strict accounting for barbiturates and these must be used under the supervision of personnel registered with the US Drug Enforcement Administration (DEA). (4) An aesthetically objectionable terminal gasp may occur in unconscious animals. (5) These drugs tend to persist in the carcass and may cause sedation or even death of animals that consume the body.

*Recommendations*—The advantages of using barbiturates for euthanasia in small animals far outweigh the disadvantages. Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, other small animals, and horses. Intraperitoneal injection may be used in situations when an intravenous injection would be distressful or even dangerous. Intracardiac injection must only be used if the animal is heavily sedated, unconscious, or anesthetized.

### Pentobarbital combinations

Several euthanasia products are formulated to include a barbituric acid derivative (usually sodium pentobarbital), with added local anesthetic agents or agents that metabolize to pentobarbital. Although some of these additives are slowly cardiotoxic, this pharmacologic effect is inconsequential. These combination products are listed by the DEA as Schedule III drugs, making them somewhat simpler to obtain, store, and administer than Schedule II drugs such as sodium pentobarbital. The pharmacologic properties and recommended use of combination products that combine sodium pentobarbital with lidocaine or phenytoin are interchangeable with those of pure barbituric acid derivatives.

A combination of pentobarbital with a neuromuscular blocking agent is not an acceptable euthanasia agent.

### Chloral hydrate

Chloral hydrate depresses the cerebrum slowly; therefore, restraint may be a problem for some animals. Death is caused by hypoxemia resulting from progressive depression of the respiratory center, and may be preceded by gasping, muscle spasms, and vocalization.

*Recommendations*—Chloral hydrate is conditionally acceptable for euthanasia of large animals only when administered intravenously, and only after sedation to decrease the aforementioned undesirable side effects. Chloral hydrate is not acceptable for dogs, cats, and other small animals because the side effects may be severe, reactions can be aesthetically objectionable, and other products are better choices.

### T-61

T-61 is an injectable, nonbarbiturate, non-narcotic mixture of 3 drugs used for euthanasia. These drugs provide a combination of general anesthetic, curariform, and local anesthetic actions. T-61 has been withdrawn from the market and is no longer manufactured or commercially available in the United States. It is available in Canada and other countries. T-61 should be used only intravenously and at carefully monitored rates of injection, because there is some question as to the differential absorption and onset of action of the active ingredients when administered by other routes.[1]

### Tricaine methane sulfonate (MS 222, TMS)

MS 222 is commercially available as tricaine methane sulfonate (TMS), which can be used for the euthanasia of amphibians and fish. Tricaine is a benzoic acid derivative and, in water of low alkalinity (< 50 mg/L as $CaCo_3$); the solution should be buffered with sodium bicarbonate.[104] A 10 g/L stock solution can be made, and sodium bicarbonate added to saturation, resulting in a pH between 7.0 and 7.5 for the solution. The stock solution should be stored in a dark brown bottle, and refrigerated or frozen if possible. The solution should be replaced monthly and any time a brown color is observed.[105] For euthanasia, a concentration ≥ 250 mg/L is recommended and fish should be left in this solution for at least 10 minutes following cessation of opercular movement.[104] In the United States, there is a 21-day withdrawal time for MS 222; therefore, it is not appropriate for euthanasia of animals intended for food.

### Potassium chloride in conjunction with prior general anesthesia

Although unacceptable and condemned when used in unanaesthetized animals, the use of a supersaturated solution of potassium chloride injected intravenously or intracardially in an animal under general anesthesia is an acceptable method to produce cardiac arrest and death. The potassium ion is cardiotoxic, and rapid intravenous or intracardiac administration of 1 to 2 mmol/kg of body weight will cause cardiac arrest. This is a preferred injectable technique for euthanasia of livestock or wildlife species to reduce the risk of toxicosis for predators or scavengers in situations where carcasses of euthanatized animals may be consumed.[106,107]

*Advantages*—(1) Potassium chloride is not a controlled substance. It is easily acquired, transported, and mixed in the field. (2) Potassium chloride, when used with appropriate methods to render an animal unconscious, results in a carcass that is potentially less toxic for scavengers and predators in cases where carcass disposal is impossible or impractical.

*Disadvantage*—Rippling of muscle tissue and clonic spasms may occur on or shortly after injection.

*Recommendations*—It is of utmost importance that personnel performing this technique are trained and knowledgeable in anesthetic techniques, and are competent in assessing anesthetic depth appropriate for administration of potassium chloride intravenously. Administration of potassium chloride intravenously requires animals to be in a surgical plane of anesthesia characterized by loss of consciousness, loss of reflex muscle response, and loss of response to noxious stimuli. Saturated potassium chloride solutions are effective in causing cardiac arrest following rapid intracardiac or intravenous injection. Residual tissue concentrations of general anesthetics after anesthetic induction have not been documented. Whereas no scavenger toxicoses have been reported with potassium chloride in combination with a general anesthetic, proper carcass disposal should always be attempted to prevent possible toxicosis by consumption of a carcass contaminated with general anesthetics.

### Unacceptable injectable agents

When used alone, the injectable agents listed in **Appendix 4** (strychnine, nicotine, caffeine, magnesium sulfate, potassium chloride, cleaning agents, solvents, disinfectants and other toxins or salts, and all neuromuscular blocking agents) are unacceptable and are absolutely condemned for use as euthanasia agents.

## PHYSICAL METHODS

Physical methods of euthanasia include captive bolt, gunshot, cervical dislocation, decapitation, electrocution, microwave irradiation, kill traps, thoracic compression, exsanguination, stunning, and pithing. When properly used by skilled personnel with well-maintained equipment, physical methods of euthanasia may result in less fear and anxiety and be more rapid, painless, humane, and practical than other forms of euthanasia. Exsanguination, stunning, and pithing are not recommended as a sole means of euthanasia, but should be considered adjuncts to other agents or methods.

Some consider physical methods of euthanasia aesthetically displeasing. There are occasions, however, when what is perceived as aesthetic and what is most humane are in conflict. Physical methods may be the most appropriate method for euthanasia and rapid relief of pain and suffering in certain situations. Personnel performing physical methods of euthanasia must be well trained and monitored for each type of physical technique performed. That person must also be sensitive to the aesthetic implications of the method and inform onlookers about what they should expect when possible.

Since most physical methods involve trauma, there is inherent risk for animals and humans. Extreme care and caution should be used. Skill and experience of personnel is essential. If the method is not performed correctly, animals and personnel may be injured. Inexperienced persons should be trained by experienced persons and should practice on carcasses or anesthetized animals to be euthanatized until they are proficient in performing the method properly and humanely. When done appropriately, the panel considers most physical methods conditionally acceptable for euthanasia.

### Penetrating captive bolt

A penetrating captive bolt is used for euthanasia of ruminants, horses, swine, laboratory rabbits, and dogs.[108] Its mode of action is concussion and trauma to the cerebral hemisphere and brainstem.[109,110] Captive bolt guns are powered by gunpowder or compressed air and must provide sufficient energy to penetrate the skull of the species on which they are being used.[109] Adequate restraint is important to ensure proper placement of the captive bolt. A cerebral hemisphere and the brainstem must be sufficiently disrupted by the projectile to induce sudden loss of consciousness and subsequent death. Accurate placement of captive bolts for various species has been described.[109-112] A multiple projectile has been suggested as a more effective technique, especially for large cattle.[109]

A nonpenetrating captive bolt only stuns animals and should not be used as a sole means of euthanasia (see "Stunning" under "Adjunctive Methods").

*Advantage*—The penetrating captive bolt is an effective method of euthanasia for use in slaughterhouses, in research facilities, and on the farm when use of drugs is inappropriate.

*Disadvantages*—(1) It is aesthetically displeasing. (2) Death may not occur if equipment is not maintained and used properly.

*Recommendations*—Use of the penetrating captive bolt is an acceptable and practical method of euthanasia for horses, ruminants, and swine. It is conditionally acceptable in other appropriate species. The nonpenetrating captive bolt must not be used as a sole method of euthanasia.

### Euthanasia by a blow to the head

Euthanasia by a blow to the head must be evaluated in terms of the anatomic features of the species on which it is to be performed. A blow to the head can be a humane method of euthanasia for neonatal animals with thin craniums, such as young pigs, if a single sharp blow delivered to the central skull bones with sufficient force can produce immediate depression of the central nervous system and destruction of brain tissue. When properly performed, loss of consciousness is rapid. The anatomic features of neonatal calves, however, make a blow to the head in this species unacceptable. Personnel performing euthanasia by use of a blow to the head must be properly trained and monitored for proficiency with this method of euthanasia, and they must be aware of its aesthetic implications.

## Gunshot

A properly placed gunshot can cause immediate insensibility and humane death. In some circumstances, a gunshot may be the only practical method of euthanasia. Shooting should only be performed by highly skilled personnel trained in the use of firearms and only in jurisdictions that allow for legal firearm use. Personnel, public, and nearby animal safety should be considered. The procedure should be performed outdoors and away from public access.

For use of a gunshot to the head as a method of euthanasia in captive animals, the firearm should be aimed so that the projectile enters the brain, causing instant loss of consciousness.[51,112-114] This must take into account differences in brain position and skull conformation between species, as well as the energy requirement for skull bone and sinus penetration.[109,115] Accurate targeting for a gunshot to the head in various species has been described.[114,116-119] For wildlife and other freely roaming animals, the preferred target area should be the head. The appropriate firearm should be selected for the situation, with the goal being penetration and destruction of brain tissue without emergence from the contralateral side of the head.[120] A gunshot to the heart or neck does not immediately render animals unconscious and thus is not considered to meet the panel's definition of euthanasia.[121]

*Advantages*—(1) Loss of consciousness is instantaneous if the projectile destroys most of the brain. (2) Given the need to minimize stress induced by handling and human contact, gunshot may at times be the most practical and logical method of euthanasia of wild or free-ranging species.

*Disadvantages*—(1) Gunshot may be dangerous to personnel. (2) It is aesthetically unpleasant. (3) Under field conditions, it may be difficult to hit the vital target area. (4) Brain tissue may not be able to be examined for evidence of rabies infection or chronic wasting disease when the head is targeted.

*Recommendations*—When other methods cannot be used, an accurately delivered gunshot is a conditionally acceptable method of euthanasia.[114,122-125] When an animal can be appropriately restrained, the penetrating captive bolt is preferred to a gunshot. Prior to shooting, animals accustomed to the presence of humans should be treated in a calm and reassuring manner to minimize anxiety. In the case of wild animals, gunshots should be delivered with the least amount of prior human contact necessary. Gunshot should not be used for routine euthanasia of animals in animal control situations, such as municipal pounds or shelters.

## Cervical dislocation

Cervical dislocation is a technique that has been used for many years and, when performed by well-trained individuals, appears to be humane. However, there are few scientific studies to confirm this observation. This technique is used to euthanatize poultry, other small birds, mice, and immature rats and rabbits. For mice and rats, the thumb and index finger are placed on either side of the neck at the base of the skull or, alternatively, a rod is pressed at the base of the skull. With the other hand, the base of the tail or the hind limbs are quickly pulled, causing separation of the cervical vertebrae from the skull. For immature rabbits, the head is held in one hand and the hind limbs in the other. The animal is stretched and the neck is hyperextended and dorsally twisted to separate the first cervical vertebra from the skull.[72,111] For poultry, cervical dislocation by stretching is a common method for mass euthanasia, but loss of consciousness may not be instantaneous.[134]

Data suggest that electrical activity in the brain persists for 13 seconds following cervical dislocation,[127] and unlike decapitation, rapid exsanguination does not contribute to loss of consciousness.[128,129]

*Advantages*—(1) Cervical dislocation is a technique that may induce rapid loss of consciousness.[84,127] (2) It does not chemically contaminate tissue. (3) It is rapidly accomplished.

*Disadvantages*—(1) Cervical dislocation may be aesthetically displeasing to personnel. (2) Cervical dislocation requires mastering technical skills to ensure loss of consciousness is rapidly induced. (3) Its use is limited to poultry, other small birds, mice, and immature rats and rabbits.

*Recommendations*—Manual cervical dislocation is a humane technique for euthanasia of poultry, other small birds, mice, rats weighing < 200 g, and rabbits weighing < 1 kg when performed by individuals with a demonstrated high degree of technical proficiency. In lieu of demonstrated technical competency, animals must be sedated or anesthetized prior to cervical dislocation. The need for technical competency is greater in heavy rats and rabbits, in which the large muscle mass in the cervical region makes manual cervical dislocation physically more difficult.[130] In research settings, this technique should be used only when scientifically justified by the user and approved by the Institutional Animal Care and Use Committee.

Those responsible for the use of this technique must ensure that personnel performing cervical dislocation techniques have been properly trained and consistently apply it humanely and effectively.

## Decapitation

Decapitation can be used to euthanatize rodents and small rabbits in research settings. It provides a means to recover tissues and body fluids that are chemically uncontaminated. It also provides a means of obtaining anatomically undamaged brain tissue for study.[131]

Although it has been demonstrated that electrical activity in the brain persists for 13 to 14 seconds following decapitation,[132] more recent studies and reports indicate that this activity does not infer the ability to perceive pain, and in fact conclude that loss of consciousness develops rapidly.[127-129]

Guillotines that are designed to accomplish decapitation in adult rodents and small rabbits in a uniformly instantaneous manner are commercially available.

Guillotines are not commercially available for neonatal rodents, but sharp blades can be used for this purpose.

*Advantages*—(1) Decapitation is a technique that appears to induce rapid loss of consciousness.[127-129] (2) It does not chemically contaminate tissues. (3) It is rapidly accomplished.

*Disadvantages*—(1) Handling and restraint required to perform this technique may be distressful to animals.[83] (2) The interpretation of the presence of electrical activity in the brain following decapitation has created controversy and its importance may still be open to debate.[127-129,132] (3) Personnel performing this technique should recognize the inherent danger of the guillotine and take adequate precautions to prevent personal injury. (4) Decapitation may be aesthetically displeasing to personnel performing or observing the technique.

*Recommendations*—This technique is conditionally acceptable if performed correctly, and it should be used in research settings when its use is required by the experimental design and approved by the Institutional Animal Care and Use Committee. The equipment used to perform decapitation should be maintained in good working order and serviced on a regular basis to ensure sharpness of blades. The use of plastic cones to restrain animals appears to reduce distress from handling, minimizes the chance of injury to personnel, and improves positioning of the animal in the guillotine. Decapitation of amphibians, fish, and reptiles is addressed elsewhere in this report.

Those responsible for the use of this technique must ensure that personnel who perform decapitation techniques have been properly trained to do so.

## Electrocution

Electrocution, using alternating current, has been used as a method of euthanasia for species such as dogs, cattle, sheep, swine, foxes, and mink.[113,133-138] Electrocution induces death by cardiac fibrillation, which causes cerebral hypoxia.[135,137,139] However, animals do not lose consciousness for 10 to 30 seconds or more after onset of cardiac fibrillation. It is imperative that animals be unconscious before being electrocuted. This can be accomplished by any acceptable means, including electrical stunning.[25] Although an effective, 1-step stunning and electrocution method has been described for use in sheep and hogs, euthanasia by electrocution in most species remains a 2-step procedure.[25,63,140]

*Advantages*—(1) Electrocution is humane if the animal is first rendered unconscious. (2) It does not chemically contaminate tissues. (3) It is economical.

*Disadvantages*—(1) Electrocution may be hazardous to personnel. (2) When conventional single-animal probes are used, it may not a useful method for mass euthanasia because so much time is required per animal. (3) It is not a useful method for dangerous, intractable animals. (4) It is aesthetically objectionable because of violent extension and stiffening of the limbs, head, and neck. (5) It may not result in death in small animals (< 5 kg) because ventricular fibrillation and circulatory collapse do not always persist after cessation of current flow.

*Recommendations*—Euthanasia by electrocution requires special skills and equipment that will ensure passage of sufficient current through the brain to induce loss of consciousness and cardiac fibrillation in the 1-step method for sheep and hogs, or cardiac fibrillation in the unconscious animal when the 2-step procedure is used. Although the method is conditionally acceptable if the aforementioned requirements are met, its disadvantages far outweigh its advantages in most applications. Techniques that apply electric current from head to tail, head to foot, or head to moistened metal plates on which the animal is standing are unacceptable.

## Microwave irradiation

Heating by microwave irradiation is used primarily by neurobiologists to fix brain metabolites *in vivo* while maintaining the anatomic integrity of the brain.[141] Microwave instruments have been specifically designed for use in euthanasia of laboratory mice and rats. The instruments differ in design from kitchen units and may vary in maximal power output from 1.3 to 10 kw. All units direct their microwave energy to the head of the animal. The power required to rapidly halt brain enzyme activity depends on the efficiency of the unit, the ability to tune the resonant cavity and the size of the rodent head.[142] There is considerable variation among instruments in the time required for loss of consciousness and euthanasia. A 10 kw, 2,450 MHz instrument operated at a power of 9 kw will increase the brain temperature of 18 to 28 g mice to 79 C in 330 ms, and the brain temperature of 250 to 420 g rats to 94 C in 800 ms.[143]

*Advantages*—(1) Loss of consciousness is achieved in less than 100 ms, and death in less than 1 second. (2) This is the most effective method to fix brain tissue *in vivo* for subsequent assay of enzymatically labile chemicals.

*Disadvantages*—(1) Instruments are expensive. (2) Only animals the size of mice and rats can be euthanatized with commercial instruments that are currently available.

*Recommendations*—Microwave irradiation is a humane method for euthanatizing small laboratory rodents if instruments that induce rapid loss of consciousness are used. Only instruments that are designed for this use and have appropriate power and microwave distribution can be used. Microwave ovens designed for domestic and institutional kitchens are absolutely unacceptable for euthanasia.

## Thoracic (cardiopulmonary, cardiac) compression

Thoracic (cardiopulmonary, cardiac) compression is used to euthanatize small- to medium-sized free-ranging birds when alternate techniques described in this report are not practical.[144]

*Advantages*—(1) This technique is rapid. (2) It is apparently painless. (3) It maximizes carcass use for analytical/contaminant studies.

*Disadvantages*—(1) It may be considered aesthetically unpleasant by onlookers. (2) The degree of distress is unknown.

*Recommendations*—Thoracic (cardiopulmonary, cardiac) compression is a physical technique for avian euthanasia that has applicability in the field when other methods cannot be used. It is accomplished by bringing the thumb and forefinger of one hand under the bird's wing from the posterior and placing them against the ribs.[144] The forefinger of the other hand is placed against the ventral edge of the sternum, just below the furculum. All fingers are brought together forcefully and held under pressure to stop the heart and lungs. Loss of consciousness and death develop quickly. Proper training is needed in the use of this technique to avoid trauma to the bird. Cardiopulmonary compression is not appropriate for laboratory settings, for large or diving birds,[144] or for other species.

## Kill traps

Mechanical kill traps are used for the collection and killing of small, free-ranging mammals for commercial purposes (fur, skin, or meat), scientific purposes, to stop property damage, and to protect human safety. Their use remains controversial, and the panel recognizes that kill traps do not always render a rapid or stress-free death consistent with criteria for euthanasia found elsewhere in this document. For this reason, use of live traps followed by other methods of euthanasia is preferred. There are a few situations when that is not possible or when it may actually be more stressful to the animals or dangerous to humans to use live traps. Although newer technologies are improving kill trap performance in achieving loss of consciousness quickly, individual testing is recommended to be sure the trap is working properly.[145] If kill traps must be used, the most humane available must be chosen,[146-148] as evaluated by use of International Organization for Standardization (ISO) testing procedures,[149] or by the methods of Gilbert,[150] Proulx et al,[151,152] or Hiltz and Roy.[153]

To reach the required level of efficiency, traps may need to be modified from manufacturers production standards. In addition, as specified in scientific studies, trap placement (ground versus tree sets), bait type, set location, selectivity apparatus, body placement modifying devices (eg, sidewings, cones), trigger sensitivity, and trigger type, size, and conformation are essential considerations that could affect a kill trap's ability to reach these standards.

Several kill traps, modifications, and set specifics have been scientifically evaluated and found to meet the aforereferenced standards for various species.[151,152,154-167]

*Advantage*—Free-ranging small mammals may be killed with minimal distress associated with handling and human contact.

*Disadvantages*—(1) Traps may not afford death within acceptable time periods. (2) Selectivity and efficiency is dependent on the skill and proficiency of the operator.

*Recommendations*—Kill traps do not always meet the panel's criteria for euthanasia. At the same time, it is recognized that they can be practical and effective for scientific animal collection when used in a manner that ensures selectivity, a swift kill, no damage to body parts needed for field research, and minimal potential for injury of nontarget species.[168,169] Traps need to be checked at least once daily. In those instances when an animal is wounded or captured but not dead, the animal must be killed quickly and humanely. Kill traps should be used only when other acceptable techniques are impossible or have failed. Traps for nocturnal species should not be activated during the day to avoid capture of diurnal species.[168] Trap manufacturers should strive to meet their responsibility of minimizing pain and suffering in target species.

## Adjunctive methods

Stunning and pithing, when properly done, induce loss of consciousness but do not ensure death. Therefore, these methods must be used only in conjunction with other procedures,[123] such as pharmacologic agents, exsanguination, or decapitation to euthanatize the animal.

### Exsanguination

Exsanguination can be used to ensure death subsequent to stunning, or in otherwise unconscious animals. Because anxiety is associated with extreme hypovolemia, exsanguination must not be used as a sole means of euthanasia.[170] Animals may be exsanguinated to obtain blood products, but only when they are sedated, stunned, or anesthetized.[171]

### Stunning

Animals may be stunned by a blow to the head, by use of a nonpenetrating captive bolt, or by use of electric current. Stunning must be followed immediately by a method that ensures death. With stunning, evaluating loss of consciousness is difficult, but it is usually associated with a loss of the menace or blink response, pupillary dilatation, and a loss of coordinated movements. Specific changes in the electroencephalogram and a loss of visually evoked responses are also thought to indicate loss of consciousness.[60,172]

**Blow to the head**—Stunning by a blow to the head is used primarily in small laboratory animals with thin craniums.[9,173-175] A single sharp blow must be delivered to the central skull bones with sufficient force to produce immediate depression of the central nervous system. When properly done, consciousness is lost rapidly.

**Nonpenetrating captive bolt**—A nonpenetrating captive bolt may be used to induce loss of consciousness in ruminants, horses, and swine. Signs of effective stunning by captive bolt are immediate collapse and a several second period of tetanic spasm, followed by slow hind limb movements of increasing frequency.[60,176]

Other aspects regarding use of the nonpenetrating captive bolt are similar to the use of a penetrating captive bolt, as previously described.

**Electrical stunning**—Alternating electrical current has been used for stunning species such as dogs, cattle, sheep, goats, hogs, fish and chickens.[133,134,140,177,178] Experiments with dogs have identified a need to direct the electrical current through the brain to induce rapid loss of consciousness. In dogs, when electricity passes only between fore- and hind limbs or neck and feet, it causes the heart to fibrillate but does not induce sudden loss of consciousness.[139] For electrical stunning of any animal, an apparatus that applies electrodes to opposite sides of the head, or in another way directs electrical current immediately through the brain, is necessary to induce rapid loss of consciousness. Attachment of electrodes and animal restraint can pose problems with this form of stunning. Signs of effective electrical stunning are extension of the limbs, opisthotonos, downward rotation of the eyeballs, and tonic spasm changing to clonic spasm, with eventual muscle flaccidity.

Electrical stunning should be followed promptly by electrically induced cardiac fibrillation, exsanguination, or other appropriate methods to ensure death. Refer to the section on electrocution for additional information.

### Pithing

In general, pithing is used as an adjunctive procedure to ensure death in an animal that has been rendered unconscious by other means. For some species, such as frogs, with anatomic features that facilitate easy access to the central nervous system, pithing may be used as a sole means of euthanasia, but an anesthetic overdose is a more suitable method.

## SPECIAL CONSIDERATIONS

### Equine euthanasia

Pentobarbital or a pentobarbital combination is the best choice for equine euthanasia. Because a large volume of solution must be injected, use of an intravenous catheter placed in the jugular vein will facilitate the procedure. To facilitate catheterization of an excitable or fractious animal, a tranquilizer such as acepromazine, or an alpha-2 adrenergic agonist can be administered, but these drugs may prolong time to loss of consciousness because of their effect on circulation and may result in varying degrees of muscular activity and agonal gasping. Opioid agonists or agonist/antagonists in conjunction with alpha-2 adrenergic agonists may further facilitate restraint.

In certain emergency circumstances, such as euthanasia of a horse with a serious injury at a racetrack, it may be difficult to restrain a dangerous horse or other large animal for intravenous injection. The animal might cause injury to itself or to bystanders before a sedative could take effect. In such cases, the animal can be given a neuromuscular blocking agent such as succinylcholine, but the animal must be euthanatized with an appropriate technique as soon as the animal can be controlled. Succinylcholine alone or without sufficient anesthetic must not be used for euthanasia.

Physical methods, including gunshot, are considered conditionally acceptable techniques for equine euthanasia. The penetrating captive bolt is acceptable with appropriate restraint.

### Animals intended for human or animal food

In euthanasia of animals intended for human or animal food, chemical agents that result in tissue residues cannot be used, unless they are approved by the US Food and Drug Administration.[179] Carbon dioxide is the only chemical currently used for euthanasia of food animals (primarily swine) that does not result in tissue residues. Physical techniques are commonly used for this reason. Carcasses of animals euthanatized by barbituric acid derivatives or other chemical agents may contain potentially harmful residues. These carcasses should be disposed of in a manner that will prevent them from being consumed by human beings or animals.

Selection of a proper euthanasia technique for free-ranging wildlife must take into account the possibility of consumption of the carcass of the euthanatized animal by nontarget predatory or scavenger species. Numerous cases of toxicosis and death attributable to ingestion of pharmaceutically contaminated carcasses in predators and scavengers have been reported.[107] Proper carcass disposal must be a part of any euthanasia procedure under free-range conditions where there is potential for consumption toxicity. When carcasses are to be left in the field, a gunshot to the head, penetrating captive bolt, or injectable agents that are nontoxic (potassium chloride in combination with a nontoxic general anesthetic) should be used so that the potential for scavenger or predator toxicity is lessened.

### Euthanasia of nonconventional species: zoo, wild, aquatic, and ectothermic animals

Compared with objective information on companion, farm, and laboratory animals, euthanasia of species such as zoo, wild, aquatic, and ectothermic animals has been studied less, and guidelines are more limited. Irrespective of the unique or unusual features of some species, whenever it becomes necessary to euthanatize an animal, death must be induced as painlessly and quickly as possible.

When selecting a means of euthanasia for these species, factors and criteria in addition to those previously discussed must be considered. The means selected will depend on the species, size, safety aspects, location of the animals to be euthanatized, and experience of personnel. Whether the animal to be euthanatized is in the wild, in captivity, or free-roaming are major considerations. Anatomic differences must be considered. For example, amphibians, fish, reptiles, and marine mammals differ anatomically from domestic species. Veins may be difficult to locate. Some species have a carapace or other defensive anatomic adaptations (eg, quills, scales, spines). For physical methods, access to the central nervous system may be difficult because the brain may be small and difficult to locate by inexperienced persons.

### Zoo Animals

For captive zoo mammals and birds with related domestic counterparts, many of the means described previously are appropriate. However, to minimize injury to persons or animals, additional precautions such as handling and physical or chemical restraint are important considerations.[16]

### Wildlife

For wild and feral animals, many recommended means of euthanasia for captive animals are not feasible. The panel recognizes there are situations involving free-ranging wildlife when euthanasia is not possible from the animal or human safety standpoint, and killing may be necessary. Conditions found in the field, although more challenging than those that are controlled, do not in any way reduce or minimize the ethical obligation of the responsible individual to reduce pain and distress to the greatest extent possible during the taking of an animal's life. Because euthanasia of wildlife is often performed by lay personnel in remote settings, guidelines are needed to assist veterinarians, wildlife biologists, and wildlife health professionals in developing humane protocols for euthanasia of wildlife.

In the case of free-ranging wildlife, personnel may not be trained in the proper use of remote anesthesia, proper delivery equipment may not be available, personnel may be working alone in remote areas where accidental exposure to potent anesthetic medications used in wildlife capture would present a risk to human safety, or approaching the animal within a practical darting distance may not be possible. In these cases, the only practical means of animal collection may be gunshot and kill trapping.[13,180-184] Under these conditions, specific methods chosen must be as age-, species-, or taxonomic/class-specific as possible. The firearm and ammunition should be appropriate for the species and purpose. Personnel should be sufficiently skilled to be accurate, and they should be experienced in the proper and safe use of firearms, complying with laws and regulations governing their possession and use.

Behavioral responses of wildlife or captive nontraditional species (zoo) in close human contact are very different from those of domestic animals. These animals are usually frightened and distressed. Thus, minimizing the amount, degree, and/or cognition of human contact during procedures that require handling is of utmost importance. Handling these animals often requires general anesthesia, which provides loss of consciousness and which relieves distress, anxiety, apprehension, and perception of pain. Even though the animal is under general anesthesia, minimizing auditory, visual, and tactile stimulation will help ensure the most stress-free euthanasia possible. With use of general anesthesia, there are more methods for euthanasia available.

A 2-stage euthanasia process involving general anesthesia, tranquilization, or use of analgesics, followed by intravenous injectable pharmaceuticals, although preferred, is often not practical. Injectable anesthetics are not always legally or readily available to those working in nuisance animal control, and the distress to the animal induced by live capture, transport to a veterinary facility, and confinement in a veterinary hospital prior to euthanasia must be considered in choosing the most humane technique for the situation at hand. Veterinarians providing support to those working with injured or live-trapped, free-ranging animals should take capture, transport, handling distress, and possible carcass consumption into consideration when asked to assist with euthanasia. Alternatives to 2-stage euthanasia using anesthesia include a squeeze cage with intraperitoneal injection of sodium pentobarbital, inhalant agents ($CO_2$ chamber, CO chamber), and gunshot. In cases where preeuthanasia anesthetics are not available, intraperitoneal injections of sodium pentobarbital, although slower in producing loss of consciousness, should be considered preferable over intravenous injection, if restraint will cause increased distress to the animal or danger to the operator.

Wildlife species may be encountered under a variety of situations. Euthanasia of the same species under different conditions may require different techniques. Even in a controlled setting, an extremely fractious large animal may threaten the safety of the practitioner, bystanders, and itself. When safety is in question and the fractious large animal, whether wild, feral, or domestic, is in close confinement, neuromuscular blocking agents may be used immediately prior to the use of an acceptable form of euthanasia. For this technique to be humane, the operator must ensure they will gain control over the animal and perform euthanasia before distress develops. Succinylcholine is not acceptable as a method of restraint for use in free-ranging wildlife because animals may not be retrieved rapidly enough to prevent neuromuscular blocking agent-induced respiratory distress or arrest.[185]

### Diseased, Injured, or Live-Captured Wildlife or Feral Species

Euthanasia of diseased, injured, or live-trapped wildlife should be performed by qualified professionals. Certain cases of wildlife injury (eg, acute, severe trauma from automobiles) may require immediate action, and pain and suffering in the animal may be best relieved most rapidly by physical methods including gunshot or penetrating captive bolt followed by exsanguination.

### Birds

Many techniques discussed previously in this report are suitable for euthanasia of captive birds accustomed to human contact. Free-ranging birds may be collected by a number of methods, including nets and live traps, with subsequent euthanasia. For collection by firearm, shotguns are recommended. The bird should be killed outright by use of ammunition loads appropriate for the species to be collected. Wounded birds should be killed quickly by appropriate techniques previously described. Large birds should be anesthetized prior to euthanasia, using general anesthetics.

## Amphibians, Fish, and Reptiles

Euthanasia of ectothermic animals must take into account differences in their metabolism, respiration, and tolerance to cerebral hypoxia. In addition, it is often more difficult to ascertain when an animal is dead. Some unique aspects of euthanasia of amphibians, fishes, and reptiles have been described.[13,51,186,187]

**Injectable agents**—Sodium pentobarbital (60 to 100 mg/kg of body weight) can be administered intravenously, intraabdominally, or intrapleuroperitoneally in most ectothermic animals, depending on anatomic features. Subcutaneous lymph spaces may also be used in frogs and toads. Time to effect may be variable, with death occurring in up to 30 minutes.[1,187,188] Barbiturates other than pentobarbital can cause pain on injection.[189]

**Clove oil**—Because adequate and appropriate clinical trials have not been performed on fish to evaluate its effects, use of clove oil is not acceptable.

**External or topical agents**—Tricaine methane sulfonate (TMS, MS-222) may be administered by various routes to euthanatize. For fish and amphibians, this chemical may be placed in water.[190-193] Large fish may be removed from the water, a gill cover lifted, and a concentrated solution from a syringe flushed over the gills. MS 222 is acidic and in concentrations ≥ 500 mg/L should be buffered with sodium bicarbonate to saturation resulting in a solution pH of 7.0 to 7.5.[105] MS 222 may also be injected into lymph spaces and pleuroperitoneal cavities.[194] These are effective but expensive means of euthanasia.

Benzocaine hydrochloride, a compound similar to TMS, may be used as a bath or in a recirculation system for euthanasia of fish[184] or amphibians.[13] Benzocaine is not water soluble and therefore is prepared as a stock solution (100 g/L), using acetone or ethanol, which may be irritating to fish tissues. In contrast, benzocaine hydrochloride is water soluble and can be used directly for anesthesia or euthanasia.[105] A concentration ≥ 250 mg/L can be used for euthanasia. Fish should be left in the solution for at least 10 minutes following cessation of opercular movement.[104]

The anesthetic agent 2-phenoxyethanol is used at concentrations of 0.5 to 0.6 ml/L or 0.3 to 0.4 mg/L for euthanasia of fish. Death is caused by respiratory collapse. As with other agents, fish should be left in solution for 10 minutes following cessation of opercular movement.[195,196]

**Inhalant agents**—Many reptiles and amphibians, including chelonians, are capable of holding their breath and converting to anaerobic metabolism, and can survive long periods of anoxia (up to 27 hours for some species).[197-202] Because of this ability to tolerate anoxia, induction of anesthesia and time to loss of consciousness may be greatly prolonged when inhalants are used. Death in these species may not occur even after prolonged inhalant exposure.[203] Lizards, snakes, and fish do not hold their breath to the same extent and can be euthanatized by use of inhalant agents.

**Carbon dioxide**—Amphibians,[1] reptiles,[1] and fish[203-205] may be euthanatized with $CO_2$. Loss of consciousness develops rapidly, but exposure times required for euthanasia are prolonged. This technique is more effective in active species and those with less tendency to hold their breath.

**Physical methods**—Line drawings of the head of various amphibians and reptiles, with recommended locations for captive bolt or firearm penetration, are available.[13] Crocodilians and other large reptiles can also be shot through the brain.[51]

Decapitation with heavy shears or a guillotine is effective for some species that have appropriate anatomic features. It has been assumed that stopping blood supply to the brain by decapitation causes rapid loss of consciousness. Because the central nervous system of reptiles, fish, and amphibians is tolerant to hypoxic and hypotensive conditions,[13] decapitation must be followed by pithing.[188]

**Two-stage euthanasia procedures**—Propofol and ultrashort-acting barbiturates may be used for these species to produce rapid general anesthesia prior to final administration of euthanasia.

In zoos and clinical settings, neuromuscular blocking agents are considered acceptable for restraint of reptiles if given immediately prior to administration of a euthanatizing agent.

Most amphibians, fishes, and reptiles can be euthanatized by cranial concussion (stunning) followed by decapitation, pithing, or some other physical method.

Severing the spinal cord behind the head by pithing is an effective method of killing some ectotherms. Death may not be immediate unless both the brain and spinal cord are pithed. For these animals, pithing of the spinal cord should be followed by decapitation and pithing of the brain or by another appropriate procedure. Pithing requires dexterity and skill and should only be done by trained personnel. The pithing site in frogs is the foramen magnum, and it is identified by a slight midline skin depression posterior to the eyes with the neck flexed.[187]

**Cooling**—It has been suggested that, when using physical methods of euthanasia in ectothermic species, cooling to 4 C will decrease metabolism and facilitate handling, but there is no evidence that whole body cooling reduces pain or is clinically efficacious.[206] Local cooling in frogs does reduce nociception, and this may be partly opioid mediated.[207] Immobilization of reptiles by cooling is considered inappropriate and inhumane even if combined with other physical or chemical methods of euthanasia. Snakes and turtles, immobilized by cooling, have been killed by subsequent freezing. This method is not recommended.[13] Formation of ice crystals on the skin and in tissues of an animal may cause pain or distress. Quick freezing of deeply anesthetized animals is acceptable.[208]

## Marine Mammals

Barbiturates or potent opioids (eg, etorphine hydrochloride [M 99] and carfentanil) are the agents of choice for euthanasia of marine mammals,[209] although it is recognized their use is not always possible and can

be potentially dangerous to personnel. An accurately placed gunshot may also be a conditionally acceptable method of euthanasia for some species and sizes of stranded marine mammals.[51,209,210]

For stranded whales or other large cetaceans or pinnipeds, succinylcholine chloride in conjunction with potassium chloride, administered intravenously or intraperitoneally, has been used.[211] This method, which is not an acceptable method of euthanasia as defined in this report, leads to complete paralysis of the respiratory musculature and eventual death attributable to hypoxemia.[209] This method may be more humane than allowing the stranded animal to suffocate over a period of hours or days if no other options are available.

### Euthanasia of animals raised for fur production

Animals raised for fur are usually euthanatized individually at the location where they are raised. Although any handling of these species constitutes a stress, it is possible to minimize this by euthanatizing animals in or near their cages. For the procedures described below, please refer to previous sections for more detailed discussion.

**Carbon monoxide**—For smaller species, CO appears to be an adequate method for euthanasia. Compressed CO is delivered from a tank into an enclosed cage that can be moved adjacent to holding cages. Using the apparatus outside reduces the risk to humans; however, people using this method should still be made aware of the dangers of CO. Animals introduced into a chamber containing 4% CO lost consciousness in 64 ± 14 seconds and were dead within 215 ± 45 seconds.[80] In a study involving electroencephalography of mink being euthanatized with 3.5% CO, the mink were comatose in 21 ± 7 seconds.[212] Only 1 animal should be introduced into the chamber at a time, and death should be confirmed in each case.

**Carbon dioxide**—Administration of $CO_2$ is also a good euthanasia method for smaller species and is less dangerous than CO for personnel operating the system. When exposed to 100% $CO_2$, mink lost consciousness in 19 ± 4 seconds and were dead within 153 ± 10 seconds. When 70% $CO_2$ was used with 30% $O_2$, mink were unconscious in 28 seconds, but they were not dead after a 15-minute exposure.[80] Therefore, if animals are first stunned by 70% $CO_2$, they should be killed by exposure to 100% $CO_2$ or by some other means. As with carbon monoxide, only one animal should be introduced into the chamber at a time.

**Barbiturates**—Barbiturate overdose is an acceptable procedure for euthanasia of many species of animals raised for fur. The drug is injected intraperitoneally and the animal slowly loses consciousness. It is important that the death of each animal be confirmed following barbiturate injection. Barbiturates will contaminate the carcass; therefore the skinned carcass cannot be used for animal food.

**Electrocution**—Electrocution has been used for killing foxes and mink.[135] The electric current must pass through the brain to induce loss of consciousness before electricity is passed through the rest of the body. Electrical stunning should be followed by euthanasia, using some other technique. Cervical dislocation has been used in mink and other small animals and should be done within 20 seconds of electrical stunning.[213] Use of a nose-to-tail or nose-to-foot method[135] alone may kill the animal by inducing cardiac fibrillation, but the animal may be conscious for a period of time before death. Therefore, these techniques are unacceptable.

### Prenatal and neonatal euthanasia

When ovarian hysterectomies are performed, euthanasia of feti should be accomplished as soon as possible after removal from the dam. Neonatal animals are relatively resistant to hypoxia.[44,214]

### Mass euthanasia

Under unusual conditions, such as disease eradication and natural disasters, euthanasia options may be limited. In these situations, the most appropriate technique that minimizes human and animal health concerns must be used. These options include, but are not limited to, $CO_2$ and physical methods such as gunshot, penetrating captive bolt, and cervical dislocation.

## POSTFACE

This report summarizes contemporary scientific knowledge on euthanasia in animals and calls attention to the lack of scientific reports assessing pain, discomfort, and distress in animals being euthanatized. Many reports on various methods of euthanasia are either anecdotal, testimonial narratives, or unsubstantiated opinions and are, therefore, not cited in this report. The panel strongly endorses the need for well-designed experiments to more fully determine the extent to which each procedure meets the criteria used for judging methods of euthanasia.

Each means of euthanasia has advantages and disadvantages. It is unlikely that, for each situation, any means will meet all desirable criteria. It is also impractical for this report to address every potential circumstance in which animals are to be euthanatized. Therefore, the use of professional judgment is imperative.

Failure to list or recommend a means of euthanasia in this report does not categorically condemn its use. There may occasionally be special circumstances or situations in which other means may be acceptable. For research animals, these exceptions should be carefully considered by the attending veterinarian and the Institutional Animal Care and Use Committee. In other settings, professional judgment should be used.

The panel discourages the use of unapproved products for euthanasia, unless the product has a clearly understood mechanism of action and pharmacokinetics, and studies published in the literature that scientifically verify and justify its use. Those responsible for euthanasia decisions have a critically important responsibility to carefully assess any new technique, method, or device, using the panel's criteria. In the absence of definitive proof or reasonable expectation, the best interest of the animal should guide the decision process.

References cited in this report do not represent a comprehensive bibliography on all methods of euthanasia. Persons interested in additional information on a particular aspect of animal euthanasia are encouraged to contact the Animal Welfare Information Center, National Agricultural Library, 10301 Baltimore Blvd, Beltsville, MD 20705.

The Panel on Euthanasia is fully committed to the concept that, whenever it becomes necessary to kill any animal for any reason whatsoever, death should be induced as painlessly and quickly as possible. It has been our charge to develop workable guidelines for veterinarians needing to address this problem, and it is our sincere desire that these guidelines be used conscientiously by all animal care providers. We consider this report to be a work in progress with new editions warranted as results of more scientific studies are published.

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## Appendix 1

Agents and methods of euthanasia by species (refer to Appendix 4 for unacceptable agents and methods.)

| Species | Acceptable* (refer to Appendix 2 and text for details) | Conditionally acceptable† (refer to Appendix 3 and text for details) |
|---|---|---|
| Amphibians | Barbiturates, inhalant anesthetics (in appropriate species), $CO_2$, CO, tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, double pithing | Penetrating captive bolt, gunshot, stunning and decapitation, decapitation and pithing |
| Birds | Barbiturates, inhalant anesthetics, $CO_2$, CO, gunshot (free-ranging only) | $N_2$, Ar, cervical dislocation, decapitation, thoracic compression (small, free-ranging only) |
| Cats | Barbiturates, inhalant anesthetics, $CO_2$, CO, potassium chloride in conjunction with general anesthesia | $N_2$, Ar |
| Dogs | Barbiturates, inhalant anesthetics, $CO_2$, CO, potassium chloride in conjunction with general anesthesia | $N_2$, Ar, penetrating captive bolt, electrocution |
| Fish | Barbiturates, inhalant anesthetics, $CO_2$, tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, 2-phenoxyethanol | Decapitation and pithing, stunning and decapitation/pithing |
| Horses | Barbiturates, potassium chloride in conjunction with general anesthesia, penetrating captive bolt | Chloral hydrate (IV, after sedation), gunshot, electrocution |
| Marine mammals | Barbiturates, etorphine hydrochloride | Gunshot (cetaceans < 4 meters long) |
| Mink, fox, and other mammals produced for fur | Barbiturates, inhalant anesthetics, $CO_2$ (mink require high concentrations for euthanasia without supplemental agents), CO, potassium chloride in conjunction with general anesthesia | $N_2$, Ar, electrocution followed by cervical dislocation |
| Nonhuman primates | Barbiturates | Inhalant anesthetics, $CO_2$, CO, $N_2$, Ar |
| Rabbits | Barbiturates, inhalant anesthetics, $CO_2$, CO, potassium chloride in conjunction with general anesthesia | $N_2$, Ar, cervical dislocation (< 1 kg), decapitation, penetrating captive bolt |
| Reptiles | Barbiturates, inhalant anesthetics (in appropriate species), $CO_2$ (in appropriate species) | Penetrating captive bolt, gunshot, decapitation and pithing, stunning and decapitation |
| Rodents and other small mammals | Barbiturates, inhalant anesthetics, $CO_2$, CO, potassium chloride in conjunction with general anesthesia, microwave irradiation | Methoxyflurane, ether, $N_2$, Ar, cervical dislocation (rats < 200 g), decapitation |
| Ruminants | Barbiturates, potassium chloride in conjunction with general anesthesia, penetrating captive bolt | Chloral hydrate (IV, after sedation), gunshot, electrocution |
| Swine | Barbiturates, $CO_2$, potassium chloride in conjunction with general anesthesia, penetrating captive bolt | Inhalant anesthetics, CO, chloral hydrate (IV, after sedation), gunshot, electrocution, blow to the head (< 3 weeks of age) |
| Zoo animals | Barbiturates, inhalant anesthetics, $CO_2$, CO, potassium chloride in conjunction with general anesthesia | $N_2$, Ar, penetrating captive bolt, gunshot |
| Free-ranging wildlife | Barbiturates IV or IP, inhalant anesthetics, potassium chloride in conjunction with general anesthesia | $CO_2$, CO, $N_2$, Ar, penetrating captive bolt, gunshot, kill traps (scientifically tested) |

*Acceptable methods are those that consistently produce a humane death when used as the sole means of euthanasia. †Conditionally acceptable methods are those that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature.

*Continued on next page.*

## Appendix 2

Acceptable agents and methods of euthanasia—characteristics and modes of action (refer to text for details)

| Agent | Classification | Mode of action | Rapidity | Ease of performance | Safety for personnel | Species suitability | Efficacy and comments |
|---|---|---|---|---|---|---|---|
| Barbiturates | Hypoxia attributable to depression of vital centers | Direct depression of cerebral cortex, subcortical structures, and vital centers; direct depression of heart muscle | Rapid onset of anesthesia | Animal must be restrained; personnel must be skilled to perform IV injection | Safe except human abuse potential; DEA-controlled substance | Most species | Highly effective when appropriately administered; acceptable IP in small animals and IV |
| Benzocaine hydrochloride | Hypoxia attributable to depression of vital centers | Depression of CNS | Very rapid, depending on dose | Easily used | Safe | Fish, amphibians | Effective but expensive |
| Carbon dioxide (bottled gas only) | Hypoxia attributable to depression of vital centers | Direct depression of cerebral cortex, subcortical structures, and vital centers; direct depression of heart muscle | Moderately rapid | Used in closed container | Minimal hazard | Small laboratory animals, birds, cats, small dogs, rabbits, mink (high concentrations required), zoo animals, amphibians, fish, some reptiles, swine | Effective, but time required may be prolonged in immature and neonatal animals |
| Carbon monoxide (bottled gas only) | Hypoxia | Combines with hemoglobin, preventing its combination with oxygen | Moderate onset time, but insidious so animal is unaware of onset | Requires appropriately maintained equipment | Extremely hazardous, toxic, and difficult to detect | Most small species including dogs, cats, rodents, mink, chinchillas, birds, reptiles, amphibians, zoo animals, rabbits | Effective; acceptable only when equipment is properly designed and operated |
| Inhalant anesthetics | Hypoxia attributable to depression of vital centers | Direct depression of cerebral cortex, subcortical structures, and vital centers | Moderately rapid onset of anesthesia, excitation may develop during induction | Easily performed with closed container; can be administered to large animals by means of a mask | Must be properly scavenged or vented to minimize exposure to personnel | Some amphibians, birds, cats, dogs, furbearing animals, rabbits, some reptiles, rodents and other small mammals, zoo animals, fish, free-ranging wildlife | Highly effective provided that subject is sufficiently exposed; either is conditionally acceptable |
| Microwave irradiation | Brain enzyme inactivation | Direct inactivation of brain enzymes by rapid heating of brain | Very rapid | Requires training and highly specialized equipment | Safe | Mice, rats | Highly effective for special needs |
| Penetrating captive bolt | Physical damage to brain | Direct concussion of brain tissue | Rapid | Requires skill, adequate restraint, and proper placement of captive bolt | Safe | Horses, ruminants, swine | Instant loss of consciousness, but motor activity may continue |
| 2-Phenoxyethanol | Hypoxia attributable to depression of vital centers | Depression of CNS | Very rapid, depending on dose | Easily used | Safe | Fish | Effective but expensive |
| Potassium chloride (intracardially or intravenously in conjunction with general anesthesia only) | Hypoxia | Direct depression of cerebral cortex, subcortical structures, and vital centers secondary to cardiac arrest. | Rapid | Requires training and specialized equipment for remote injection anesthesia, and ability to give IV injection of potassium chloride | Anesthetics may be hazardous with accidental human exposure | Most species | Highly effective, some clonic muscle spasms may be observed |
| Tricaine methane sulfonate (TMS, MS 222) | Hypoxia attributable to depression of vital centers | Depression of CNS | Very rapid, depending on dose | Easily used | Safe | Fish, amphibians | Effective but expensive |

## Appendix 3

Conditionally acceptable agents and methods of euthanasia—characteristics and modes of action (refer to text for details)

| Agent | Classification | Mode of action | Rapidity | Ease of performance | Safety | Species suitability | Efficacy and comments |
|---|---|---|---|---|---|---|---|
| Blow to the head | Physical damage to brain | Direct concussion of brain tissue | Rapid | Requires skill, adequate restraint, and appropriate force | Safe | Young pigs < 3 weeks old | Must be properly applied to be humane and effective |
| Carbon dioxide (bottled gas only) | Hypoxia due to depression of vital centers | Direct depression of cerebral cortex, subcortical structures and vital centers; direct depression of heart muscle | Moderately rapid | Used in closed container | Minimal hazard | Nonhuman primates, free-ranging wildlife | Effective, but time required may be prolonged in immature and neonatal animals |
| Carbon monoxide (bottled gas only) | Hypoxia | Combines with hemoglobin, preventing its combination with oxygen | Moderate onset time, but insidious so animal is unaware of onset | Requires appropriately maintained equipment | Extremely hazardous, toxic, and difficult to detect | Nonhuman primates, free-ranging wildlife | Effective; acceptable only when equipment is properly designed and operated |
| Cervical dislocation | Hypoxia due to disruption of vital centers | Direct depression of brain | Moderately rapid | Requires training and skill | Safe | Poultry, birds, laboratory mice, rats (< 200 g), rabbits (< 1 kg) | Irreversible; violent muscle contractions can occur after cervical dislocation |
| Chloral hydrate | Hypoxia from depression of respiratory center | Direct depression of brain | Rapid | Personnel must be skilled to perform IV injection | Safe | Horses, ruminants, swine | Animals should be sedated prior to administration |
| Decapitation | Hypoxia due to disruption of vital centers | Direct depression of brain | Rapid | Requires training and skill | Guillotine poses potential employee injury hazard | Laboratory rodents; small rabbits; birds; some fish, amphibians, and reptiles (latter 3 with pithing) | Irreversible; violent muscle contraction can occur after decapitation |
| Electrocution | Hypoxia | Direct depression of brain and cardiac fibrillation | Can be rapid | Not easily performed in all instances | Hazardous to personnel | Used primarily in sheep, swine, foxes, mink (with cervical dislocation), ruminants, animals > 5 kg | Violent muscle contractions occur at same time as loss of consciousness |
| Gunshot | Hypoxia due to disruption of vital centers | Direct concussion of brain tissue | Rapid | Requires skill and appropriate firearm | May be dangerous | Large domestic and zoo animals, reptiles, amphibians, wildlife, cetaceans (< 4 meters long) | Instant loss of consciousness, but motor activity may continue |
| Inhalant anesthetics | Hypoxia due to depression of vital centers | Direct depression of cerebral cortex, subcortical structures, and vital centers | Moderately rapid onset of anesthesia; excitation may develop during induction | Easily performed with closed container; can be administered to large animals by means of a mask | Must be properly scavenged or vented to minimize exposure to personnel; ether has explosive potential and exposure to ether may be stressful | Nonhuman primates, swine; ether is conditionally acceptable for rodents and small mamals; methoxyflurane is conditionally acceptable for rodents and small mammals. | Highly effective provided that subject is sufficiently exposed |
| Nitrogen, argon | Hypoxia | Reduces partial pressure of oxygen available to blood | Rapid | Used in closed chamber with rapid filling | Safe if used with ventilation | Cats, small dogs, birds, rodents, rabbits, other small species, mink, zoo animals, nonhuman primates, free-ranging wildlife | Effective except in young and neonates; an effective agent, but other methods are preferable |
| Penetrating captive bolt | Physical damage to brain | Direct concussion of brain tissue | Rapid | Requires skill, adequate restraint and proper placement of captive bolt | Safe | Dogs, rabbits, zoo animals, reptiles, amphibians, free-ranging wildlife | Instant loss of consciousness but motor activity may continue |
| Pithing | Hypoxia due to disrution of vital centers, physical damage to brain | Trauma of brain and spinal cord tissue | Rapid | Easily performed but requires skill | Safe | Some ectotherms | Effective, but death not immediate unless brain and spinal cord are pithed |
| Thoracic compresion | Hypoxia and cardiac arrest | Physical interference with cardiac and respiratory function | Moderately rapid | Requires training | Safe | Small- to medium-sized free-ranging birds | Apparently effective |

## Appendix 4

Some unacceptable agents and methods of euthanasia (refer to text for details)

| Agent or method | Comments |
|---|---|
| Air embolism | Air embolism may be accompanied by convulsions, opisthotonos, and vocalization. If used, it should be done only in anesthetized animals. |
| Blow to the head | Unacceptable for most species. |
| Burning | Chemical or thermal burning of an animal is not an acceptable method of euthanasia. |
| Chloral hydrate | Unacceptable in dogs, cats, and small mammals. |
| Chloroform | Chloroform is a known hepatotoxin and suspected carcinogen and, therefore, is extremely hazardous to personnel. |
| Cyanide | Cyanide poses an extreme danger to personnel and the manner of death is aesthetically objectionable. |
| Decompression | Decompression is unacceptable for euthanasia because of numerous disadvantages.<br>(1) Many chambers are designed to produce decompression at a rate 15 to 60 times faster than that recommended as optimum for animals, resulting in pain and distress attributable to expanding gases trapped in body cavities.<br>(2) Immature animals are tolerant of hypoxia, and longer periods of decompression are required before respiration ceases.<br>(3) Accidental recompression, with recovery of injured animals, can occur.<br>(4) Bleeding, vomiting, convulsions, urination, and defecation, which are aesthetically unpleasant, may develop in unconscious animals. |
| Drowning | Drowning is not a means of euthanasia and is inhumane. |
| Exsanguination | Because of the anxiety associated with extreme hypovolemia, exsanguination should be done only in sedated, stunned, or anesthetized animals. |
| Formalin | Direct immersion of an animal into formalin, as a means of euthanasia, is inhumane. |
| Household products and solvents | Acetone, quaternary compounds (including $CCl_4$), laxatives, clove oil, dimethylketone, quaternary ammonium products*, antacids, and other commercial and household products or solvents are not acceptable agents for euthanasia. |
| Hypothermia | Hypothermia is not an appropriate method of euthanasia. |
| Neuromuscular blocking agents (nicotine, magnesium sulafte, potassiumchloride, all curariform agents) | When used alone, these drugs all cause respiratory arrest before loss of consciousness, so the animal may perceive pain and distress after it is immobilized. |
| Rapid freezing | Rapid freezing as a sole means of euthanasia is not considered to be humane. If used, animals should be anesthetized prior to freezing. |
| Strychnine | Strychnine causes violent convulsions and painful muscle contractions. |
| Stunning | Stunning may render an animal unconscious, but it is not a method of euthanasia (except for neonatal animals with thin craniums). If used, it must be immediately followed by a method that ensures death. |
| Tricaine methane sulfonate (TMS, MS 222) | Should not be used for euthanasia of animals intended as food. |

*Roccal D Plus, Pharmacia & Upjohn, Kalamazoo, Mich.

Attachment C

## Practice Advisory for Intraoperative Awareness and Brain Function Monitoring

*A Report by the American Society of Anesthesiologists Task Force on Intraoperative Awareness*[*]

PRACTICE advisories are systematically developed reports that are intended to assist decision-making in areas of patient care. Advisories provide a synthesis and analysis of expert opinion, clinical feasibility data, open forum commentary, and consensus surveys. Advisories are not intended as standards, guidelines, or absolute requirements. They may be adopted, modified, or rejected according to clinical needs and constraints.

The use of practice advisories cannot guarantee any specific outcome. Practice advisories summarize the state of the literature and report opinions derived from a synthesis of task force members, expert consultants, open forums and public commentary. Practice advisories are not supported by scientific literature to the same degree as are standards or guidelines because sufficient numbers of adequately controlled studies are lacking. Practice advisories are subject to periodic revision as warranted by the evolution of medical knowledge, technology, and practice.

### Methodology

*A. Definitions*

Intraoperative awareness under general anesthesia is a rare occurrence, with a reported incidence of 0.1-0.2%.[1-4] Significant psychological sequelae (e.g., post traumatic stress disorder) may occur following an episode of intraoperative awareness, and affected patients may remain severely disabled

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[*] Developed by the American Society of Anesthesiologists Task Force on Intraoperative Awareness: Jeffrey L. Apfelbaum, M.D., (Chair), Chicago, Illinois; James F. Arens, M.D., Houston, Texas; Daniel J. Cole, M.D., Phoenix, Arizona; Richard T. Connis, Ph.D., Woodinville, Washington; Karen B. Domino, M.D., Seattle, Washington; John C. Drummond, M.D., San Diego, California; Cor J. Kalkman, M.D., Ph.D., Utrecht, the Netherlands; Ronald D. Miller, M.D., San Francisco, California; David G. Nickinovich, Ph.D., Bellevue, Washington; and Michael M. Todd, M.D., Iowa City, Iowa.

Supported by the American Society of Anesthesiologists under the direction of James F. Arens, M.D., Chair, Committee on Practice Parameters. A list of the references used to develop this Advisory is available by writing to the American Society of Anesthesiologists.

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for extended periods of time.[5] However, in some circumstances, intraoperative awareness may be unavoidable in order to achieve other critically important anesthetic goals.

The following terms or concepts discussed in this Advisory include: consciousness, general anesthesia, depth of anesthesia or depth of hypnosis, recall, amnesia, intraoperative awareness, and brain function monitors. Consistent definitions for these terms are not available in the literature. For purposes of this Advisory, these terms are operationally defined or identified as follows:

(1) Consciousness: Consciousness is a state in which a patient is able to process information from his or her surroundings. Consciousness is assessed by observing a patient's purposeful responses to various stimuli. Identifiers of purposeful responses include organized movements following voice commands or noxious/painful stimuli.† For example, opening of the eyes is one of several possible identifiers or markers of consciousness. Purposeful responses may be absent when paralysis is present as a consequence of neurological disease or the administration of a neuromuscular blocking drug.

(2) General anesthesia: General anesthesia is defined as a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation.‡ The ability to maintain ventilatory function independently is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

(3) Depth of anesthesia: Depth of anesthesia or depth of hypnosis refers to a continuum of progressive central nervous system depression and decreased responsiveness to stimulation.

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† Reflex withdrawal from a painful stimulus is NOT considered a purposeful response, as indicated by the "continuum of depth of sedation, definition of general anesthesia, and levels of sedation/analgesia;" American Society of Anesthesiologists, 2004.

‡ American Society of Anesthesiologists: Continuum of depth of sedation, definition of general anesthesia, and levels of sedation/analgesia;" ASA Standards, Guidelines and Statements, 2004.

(4) Recall: For the purpose of this Advisory, recall is the patient's ability to retrieve stored memories. Recall is assessed by a patient's report of previous events, in particular, events that occurred during general anesthesia. *Explicit memory* is assessed by the patient's ability to recall specific events that took place during general anesthesia. *Implicit memory* is assessed by changes in performance or behavior without the ability to recall specific events that took place during general anesthesia that led to those changes.[6] A report of recall may be spontaneous or it may only be elicited in a structured interview or questionnaire. This Advisory does not address implicit memory.

(5) Amnesia: Amnesia is the absence of recall. Many anesthetic drugs produce amnesia at concentrations well below those necessary for suppression of consciousness. Anterograde amnesia is intended when a drug with amnestic properties is administered before induction of anesthesia. Retrograde amnesia is intended when a drug such as a benzodiazepine is administered after an event that may have caused or been associated with intraoperative consciousness in the hope that it will suppress memory formation and "rescue" from recall.

(6) Intraoperative awareness: Intraoperative awareness occurs when a patient becomes conscious during a procedure performed under general anesthesia and subsequently has recall of these events. For the purpose of this Advisory, recall is limited to explicit memory, and does not include the time before general anesthesia is fully induced or the time of emergence from general anesthesia, when arousal and return of consciousness are intended. Dreaming is not considered intraoperative awareness.

(7) Brain function monitors: Brain function monitors are devices that record or process brain electrical activity and convert these signals mathematically into a continuous measure typically scaled from 0 to 100. In addition to spontaneous cortical electrical activity (electroencephalogram, EEG), these devices may also record and process evoked cortical and

subcortical activity (auditory evoked potentials, or AEP) as well as electromyographic (EMG) activity from scalp muscles. For the purpose of this Advisory, only monitors purported to measure depth of anesthesia or hypnosis will be considered. Other, non-EEG/AEP/EMG devices are also available, but are not addressed by this Advisory.

*B. Purposes of the Advisory*

Intraoperative awareness under general anesthesia is an important clinical problem that clearly is within the foundation of training and continuing medical education in anesthesiology. The purposes of this Advisory are to identify risk factors that may be associated with intraoperative awareness, provide decision tools that may enable the clinician to reduce the frequency of unintended intraoperative awareness, stimulate the pursuit and evaluation of strategies that may prevent or reduce the frequency of intraoperative awareness, and provide guidance for the intraoperative use of brain function monitors as they relate to intraoperative awareness.

*C. Focus*

This Advisory focuses on the perioperative management of patients who are undergoing a procedure during which general anesthesia is administered. This Advisory is not intended for the perioperative management of minimal, moderate, or deep sedation in the OR or ICU; regional or local anesthesia without general anesthesia; monitored anesthesia care; tracheal intubation of patients or those undergoing resuscitation in emergency trauma after the administration of a neuromuscular block, or intentional intraoperative wake-up testing (e.g., for the purposes of assessing intraoperative neurologic function). In addition, this Advisory is not intended to address the perioperative management of pediatric patients.

*D. Application*

This Advisory is intended for use by anesthesiologists, other physicians who supervise the administration of general anesthesia, and all other individuals who administer general anesthesia.

The Advisory may also serve as a resource for other physicians and health care professionals who are involved in the perioperative management of patients receiving general anesthesia.

*E. Task Force Members and Consultants*

The American Society of Anesthesiologists (ASA) appointed this Task Force of 10 members to (1) review and assess the currently available scientific literature on intraoperative awareness, (2) obtain expert consensus and public opinion, and (3) develop a practice advisory. The Task Force is comprised of anesthesiologists from various geographic areas of the United States, an anesthesiologist from the Netherlands, and two methodologists from the ASA Committee on Practice Parameters.

The ASA appointed the 10 members to the Task Force because of their knowledge or expertise in the medical specialty of anesthesiology, and the development of practice parameters. The members include but are not limited to anesthesiologists with specialized knowledge or expertise in the area of neuroanesthesiology. Two of the 10 members disclosed receipt of funds from or a financial interest in a company developing or manufacturing brain function monitors, which companies have a direct financial interest in the expanded use of such monitors. Other members may have received funds from or have a financial interest in other companies, such as developers or manufacturers of anesthetics, that may be indirectly affected by the expanded use of brain function monitors. The Task Force did not request its members to disclose such interests because they were deemed too remote and speculative to present conflicts of interest.

The Task Force, in turn, sought input from consultants, many of whom who had particularized knowledge, expertise and/or interest in intraoperative awareness and brain function monitors. Such knowledge or expertise is based in part in some cases on research or investigational activities funded by a company developing or manufacturing brain function monitors. Fifty-four percent of the consultants disclosed receipt of funds from or a financial interest in a company developing or

manufacturing brain function monitors. Consultants also may have received funds from or have a financial interest in other companies that may be indirectly affected by the use of brain function monitors. The Task Force did not request its consultants to disclose such interests because they were deemed too remote and speculative to present conflicts of interest.

The Task Force used a six-step process. First, the members reached consensus on the criteria for evidence of effective perioperative interventions for the prevention of intraoperative awareness. Second, they evaluated original articles published in peer-reviewed journals relevant to this issue. Third, consultants who had expertise or interest in intraoperative awareness and who practiced or worked in diverse settings (e.g., scientists and/or physicians in academic and private practice) were asked to participate in opinion surveys on the effectiveness of various perioperative management strategies, and to review and comment on a draft of the Advisory developed by the Task Force. Fourth, additional opinions were solicited from a random sample of active members of the ASA. Fifth, the Task Force held open forums at three national and international anesthesia meetings to solicit input on the key concepts of this Advisory. Sixth, all available information was used to build consensus within the Task Force on the Advisory.

The draft document was made available for review on the ASA website, and commentary was invited via e-mail announcement to all ASA members. All submitted comments were considered by the Task Force in preparing the final draft.

*F. Availability and Strength of Evidence*

Practice advisories are developed by a protocol similar to that of an ASA evidence-based practice guideline, including a systematic search and evaluation of the literature. However, practice advisories lack the support of a sufficient number of adequately controlled studies to permit aggregate analyses of data with rigorous statistical techniques such as meta-analysis. Nonetheless, literature-based evidence from case reports and other descriptive studies are considered during the

development of the Advisory. This literature often permits the identification of recurring patterns of clinical practice.

As with a practice guideline, formal survey information is collected from consultants and members of the ASA. The following terms describe survey responses for any specified issue. Responses are solicited on a 5-point scale; ranging from 1 (strongly disagree) to 5 (strongly agree) with a score of 3 being equivocal. Survey responses are summarized based on median values as follows:

| | |
|---|---|
| Strongly Agree: | Median score of 5 (At least 50% of the responses are 5) |
| Agree: | Median score of 4 (At least 50% of the responses are 4 or 4 and 5) |
| Equivocal: | Median score of 3 (At least 50% of the responses are 3, or no other response category or combination of similar categories contain at least 50% of the responses) |
| Disagree: | Median score of 2 (At least 50% of responses are 2 or 1 and 2) |
| Strongly Disagree: | Median score of 1 (At least 50% of responses are 1) |

Additional information is obtained from open forum presentations and other invited and public sources. The advisory statements contained in this document represent a distillation of the current spectrum of clinical opinion and literature-based findings.[§]

**Advisories**

*I. Preoperative Evaluation*

A preoperative evaluation includes (1) obtaining a focused history (i.e., medical records, laboratory reports, patient or patient and family interview), (2) conducting a physical examination, (3) identifying patients at risk for intraoperative awareness (e.g., planned anesthetics, type of surgery), and (4) informing selected patients of the possibility of intraoperative awareness.

Descriptive studies and case reports suggest that certain patient characteristics may be associated with intraoperative awareness, including age, gender, ASA status, and drug resistance or tolerance.[4,7-

[§] Refer to appendix 1 for a summary of the advisories.

[11] Descriptive studies and case reports suggest that certain procedures (e.g., cesarean section, cardiac surgery, trauma surgery) [4,8,12-29] as well as anesthetic techniques (e.g., rapid-sequence induction, reduced anesthetic doses with or without the presence of paralysis) [2,3,9,13,16,21, 23,30-33] may be associated with an increased risk of intraoperative awareness. No studies were found that examined the clinical impact of informing the patient prior to surgery of the possibility of intraoperative awareness.

The consultants and ASA members agree that a preoperative evaluation may be helpful in identifying patients at risk for intraoperative awareness.** In addition, they agree that a focused preoperative evaluation to identify patients at risk of intraoperative awareness should include review of a patient's medical record, a thorough physical examination, and a patient or patient and family interview. They agree that patient characteristics that may place a patient at risk for intraoperative awareness include: substance use or abuse, limited hemodynamic reserve, and ASA status of 4 or 5. The consultants strongly agree and the ASA members agree that a history of intraoperative awareness may place a patient at risk. The consultants disagree and the ASA members are equivocal regarding whether all patients should be informed of the possibility of intraoperative awareness. The consultants strongly agree and the ASA members agree that only patients considered to be at elevated risk of intraoperative awareness should be informed of the possibility of intraoperative awareness. Finally the consultants and the ASA members disagree that informing the patient preoperatively of the risk of intraoperative awareness increases the *actual* risk of intraoperative awareness.

**Advisory.** The Task Force believes that some components of the preoperative evaluation may be useful in identifying a patient at increased risk for awareness. An evaluation should include, if possible, a review of a patient's medical records for previous occurrences of awareness or other potential risk factors, a patient interview to assess level of anxiety or previous experiences with anesthesia, and a physical examination. Potential risk factors to consider for patients undergoing

** Refer to appendix 2 for complete results of the consultant and ASA membership surveys.

general anesthesia include substance use or abuse (e.g., opioids, benzodiazepines, cocaine), a history of awareness, a history of difficult intubation or anticipated difficult intubation, chronic pain patients on high doses of opioids, cardiac surgery, Cesarean section, trauma and emergency surgery, reduced anesthetic doses in the presence of paralysis, planned use of muscle relaxants during the maintenance phase of general anesthesia, total intravenous anesthesia, the planned use of nitrous oxide-opioid anesthesia, ASA status of 4 or 5, and limited hemodynamic reserve. The consensus of the Task Force is that patients whom the individual clinician considers to be at substantially increased risk of intraoperative awareness should be informed of the possibility of intraoperative awareness when circumstances permit.

*II. Preinduction Phase of Anesthesia*

Issues concerned with the preinduction phase of anesthesia related to the prevention of intraoperative awareness include checking the functioning of anesthesia delivery systems, and the prophylactic administration of benzodiazepines.

Although checking the functioning of anesthesia delivery systems is standard practice, some cases of intraoperative awareness have resulted from too low concentrations of inspired volatile anesthetics or drug errors, including drug delivery errors.[8,34-39] One double-blind randomized clinical trial evaluated the efficacy of the prophylactic administration of midazolam as an anesthetic adjuvant during ambulatory procedures under total intravenous anesthesiaand reported a lower frequency of intraoperative awareness in the midazolam groups compared to the placebo group.[40] Two randomized clinical trials examined anterograde amnesia by providing pictures as stimuli after administration of midazolam but before induction of general anesthesia. Although these studies reported reduced recall in patients administered midazolam, the presence of consciousness during general anesthesia and subsequent intraoperative awareness was not examined.[41,42]

The consultants and ASA members strongly agree that the functioning of anesthesia delivery systems (e.g., vaporizers, infusion pumps, fresh gas flow, IV lines) should be checked to reduce the risk of intraoperative awareness. The consultants disagree, and the ASA members are equivocal that a benzodiazepine or scopolamine should be used as a component of the anesthetic to reduce the risk of intraoperative awareness for *all* patients. The consultants agree that a benzodiazepine or scopolamine should be used for patients requiring smaller dosages of anesthetics, patients undergoing cardiac surgery, and patients undergoing trauma surgery. They are equivocal regarding patients undergoing Cesarean section, emergency surgery, and with total intravenous anesthesia. The ASA members agree that a benzodiazepine or scopolamine should be used for patients requiring smaller dosages of anesthetics, patients undergoing cardiac surgery, emergency surgery, trauma surgery, and total intravenous anesthesia. They are equivocal regarding patients undergoing Cesarean section.

**Advisory.** Since intraoperative awareness may be caused by equipment malfunction or misuse, the Task Force believes that there should be adherence to a checklist protocol for anesthesia machines and equipment to assure that the desired anesthetic drugs and doses will be delivered. These procedures should be extended to include verification of the proper functioning of intravenous access, infusion pumps and their connections. The Task Force consensus is that the decision to administer a benzodiazepine prophylactically should be made on a case-by-case basis for selected patients (e.g., patients requiring smaller dosages of anesthetics). The Task Force cautions that delayed emergence may accompany the use of benzodiazepines.

*III. Intraoperative Monitoring*

Intraoperative awareness cannot be measured during the intraoperative phase of general anesthesia, since the recall component of awareness can only be determined postoperatively by obtaining information directly from the patient. Therefore, the primary issue regarding intraoperative

monitoring addressed by this Advisory is whether the use of clinical techniques, conventional monitoring systems, or brain function monitors reduce the occurrence of intraoperative awareness.

The majority of literature obtained during the search and review process did not directly address whether these techniques, systems, or monitors reduce the frequency of intraoperative awareness. However, many studies were found that report intraoperative measures or index values from monitoring activities. This literature, while not directly assessing the impact of an intervention on awareness, often reported patterns or values that occurred at identifiable times during the perioperative period with the intention of describing or predicting variations in the depth of anesthesia. Therefore, commonly reported findings from this literature are summarized below.

The literature for each intervention is presented in the following order: (1) randomized clinical trials, (2) nonrandomized comparative studies (e.g., quasi-experimental, prospective cohort studies), (3) correlational studies (e.g., correlations of index values with end-tidal concentrations of hypnotic drugs or with movement in response to noxious stimuli), (4) descriptive reports of monitor index values at particular times during a procedure; and (5) case reports of unusual or unintended benefits or harms occurring during a monitoring activity. Correlational studies often report a measure of association between two continuous variables (e.g., the correlation between index values and anesthetic drug concentrations). Other correlational measures include a prediction probability (Pk) value that provides a measure of how well a monitor or technique can differentiate between two different clinical states (e.g., response versus no response to verbal command).[43] A Pk value of 1.0 indicates perfect association between an index value and a clinical state, while a Pk value of 0.50 indicates a prediction probability equal to chance.

*A. Clinical Techniques and Conventional Monitoring:*

Among the clinical techniques utilized to assess intraoperative consciousness are checking for movement, response to commands, opened eyes, eyelash reflex, pupillary responses or diameters,

perspiration and tearing. Conventional monitoring systems include ASA standard monitoring[††] as well as the end-tidal anesthetic analyzer.

No clinical trials or other comparative studies were found that examine the effect of clinical techniques or conventional monitoring on the incidence of intraoperative awareness. Correlational studies reported Pk values ranging from 0.74 to 0.76 for the association between reflex or purposeful movement and indicators for depth of anesthesia.[44] One study reported a significant association between response to command and memory when continuous infusions of propofol were used as the induction anesthetic.[45] Pk values for mean arterial pressure (MAP) ranged from 0.68 to 0.94 for distinguishing a responsive state from an unresponsive state, and from 0.81 to 0.89 for distinguishing an anesthetized state from emergence following anesthesia (i.e., first response). Pk values for heart rate (HR) ranged from 0.50 to 0.82 for distinguishing a responsive state from an unresponsive state, and from 0.54 to 0.67 for emergence.[46-48] Wide ranges of mean MAP and HR values were reported during various intraoperative times. Studies reported ranges of mean MAP values as follows: before induction or baseline, 90 to 103 mmHg; at induction, 58.4 to 88 mmHg; during surgery, 78 to 102 mmHg; at emergence or end of surgery, 58.7 to 97 mmHg; and during postoperative recovery, 86 to 104mmHg. Mean HR ranges were reported as follows: before induction or baseline, 61 to 82 bpm; at induction, 55 to 67 bpm; during surgery, 74 to 82 bpm; at emergence or end of surgery, 59 to 92 bpm; and during postoperative recovery, 82 to 89 bpm.[49-56] Awareness has been reported to occur in the absence of tachycardia or hypertension.[8,23,24]

The consultants and ASA members agree that clinical techniques (e.g., checking for purposeful or reflex movement) are valuable and should be used to assess intraoperative consciousness. In addition, the consultants and ASA members agree that conventional monitoring systems (e.g, ECG,

[††] American Society of Anesthesiologists: Standards for basic anesthetic monitoring. *In* ASA Standards, Guidelines and Statements; American Society of Anesthesiologists Publication: October, 2004.

BP, HR, end-tidal anesthetic analyzer, capnography) are valuable and should be used to help assess intraoperative consciousness.

*B. Brain Electrical Activity Monitoring:*

Most of the devices designed to monitor brain electrical activity for the purpose of assessing anesthetic effect record electroencephalographic (EEG) activity from electrodes placed on the forehead. Systems can be subdivided into those that process spontaneous EEG and electromyographic (EMG) activity and those that acquire evoked responses to auditory stimuli (auditory evoked potential, AEP). After amplification and conversion of the analog EEG signal to the digital domain, various signal processing algorithms are applied to the frequency, amplitude, latency and/or phase relationship data derived from the raw EEG or AEP to generate a single number, often referred to as an "index" typically scaled between 100 and zero. This index represents the progression of clinical states of consciousness ('awake', 'sedated', 'light anesthesia', 'deep anesthesia'), with a value of 100 being associated with the awake state, and values of zero occurring with an isoelectric EEG (or absent middle latency AEP). These processing algorithms may either be published and in the public domain or proprietary. Detailed descriptions of the various approaches to EEG signal processing, including bispectral analysis may be found elsewhere.[57] Artifact recognition algorithms intended to avoid contaminated, and therefore spurious, 'index' values are an important component of the software in most monitors.

Although EMG activity from scalp muscles can be considered an artifact from the viewpoint of pure EEG analysis, it may be an important source of clinically relevant information. Sudden appearance of frontal (forehead) EMG activity suggests somatic response to noxious stimulation resulting from inadequate analgesia and may give warning of impending arousal. For this reason, some monitors separately provide information on the level of EMG activity.

*1. Spontaneous EEG Activity Monitors.*

**Bispectral Index.** Bispectral index (BIS) is a proprietary algorithm (Aspect Medical Systems) that converts a single channel of frontal EEG into an index of hypnotic level (bispectral index; BIS). BIS is available either as a separate device (BIS monitor; Aspect Medical Systems) or incorporated - under license from Aspect Medical Systems - in 'BIS modules' made by various anesthesia equipment manufacturers. To compute the BIS, several variables derived from the EEG time domain (burst-suppression analysis), frequency domain (power spectrum, bispectrum: interfrequency phase relationships) are combined into a single index of hypnotic level. BIS values are scaled from 0 to 100, with specific ranges (e.g., 40-60) reported to reflect a low probability of consciousness under general anesthesia. The weight factors for the various components in the multivariate model that generates the BIS were empirically derived from a prospectively collected database of over 1500 anesthetics. The BIS model accounts for the nonlinear stages of EEG activity by allowing different parameters to dominate the resulting BIS as the EEG changes its character with increasing plasma concentrations of various anesthetics, resulting in a linear decrease in BIS. As more data have become available and as methods and algorithms to suppress artifacts have been improved, revised iterations of the algorithm and optimized hardware have been released.

Several RCTs have compared outcomes with BIS-guided anesthetic administration versus standard clinical practice without BIS. In one RCT that enrolled 2500 patients at high risk of intraoperative awareness, explicit recall occurred in 0.17% of patients when BIS monitors were used and in 0.91% of patients managed by routine clinical practice ($p < 0.02$).[58] A small ($N = 30$) single-blinded RCT (i.e., the anesthesiologists were blinded to the recorded BIS values) compared BIS monitoring with clinical signs during cardiac surgery), and reported one episode of recall in the clinical signs group compared to no episodes in the BIS-monitored group ($p > 0.50$).[59] In other RCTs, times to awakening, first response, or eye opening and consumption of anesthetic

drugs were reduced with the use of BIS.[8,60-68]

One nonrandomized comparison of the use of BIS monitoring versus a cohort of historical controls (N = 12,771) found explicit recall occurring in 0.04% of the BIS monitored patients versus 0.18% of the historical controls ($p < 0.038$).[68] Another prospective nonrandomized cohort study (N = 19,575) designed to establish the incidence of awareness with recall during routine general anesthesia and to determine BIS values associated with intraoperative awareness events reported no statistically significant difference when BIS was used (0.18% of patients) compared to when BIS was not used (0.10% of patients). Other nonrandomized comparative studies reported higher index values upon arrival in the PACU, shorter recovery times, and lower anesthetic usage among patients monitored with BIS compared to patients not monitored with BIS.[70,71] Numerous correlational studies reported Pk values for BIS ranging from 0.72 to 1.00 for awake versus loss of response following induction with propofol (with or without opioids); and from 0.79 to 0.97 for anesthetized versus first response.[46-48,72-78] One study reported a Pk value of 0.86 for movement from electrical stimulation.[44] Wide ranges of mean BIS values have been reported during various intraoperative times. Ranges of mean BIS values were as follows: before induction or baseline, 80 to 98; at or after induction, 37 to 70; during surgery, 20 to 58; at emergence or end of surgery, 42 to 96; and during postoperative recovery, 64 to 96.[50,51,54-56,79-110] Several case reports indicate that intraoperative events unrelated to titration of anesthetic agents can produce rapid changes in BIS values, e.g., cerebral ischemia or hypoperfusion, gas embolism, unrecognized hemorrhage, inadvertent blockage of anesthesia drug delivery.[111-119] Other case reports suggest that routine intraoperative events (e.g., administration of depolarizing muscle relaxants, activation of electromagnetic equipment or devices, patient warming or planned hypothermia) may interfere with BIS functioning.[120-128] Two case reports were found that reported patients experiencing intraoperative awareness in spite of monitored values indicating an

adequate depth of anesthesia.[129,130] Finally, still other case reports suggested that certain patient conditions may affect BIS values.[131-133]

**Entropy.** Entropy (GE Healthcare Technologies) describes the irregularity, complexity, or unpredictability characteristics of a signal. A single sine wave represents a completely predictable signal (entropy = 0), whereas noise from a random number generator represents entropy = 1. The algorithm for calculation of entropy in the EEG signal (as incorporated in the Datex-Ohmeda S/5 entropy Module) is in the public domain and detailed descriptions have recently been published.[134]

Entropy is independent of absolute scales such as the amplitude or the frequency of the signal. The commercially available Datex-Ohmeda module calculates entropy over time windows of variable duration and reports two separate entropy values. State entropy (SE) is an index ranging from zero to 91 (awake), computed over the frequency range from 0.8 Hz to 32 Hz, reflecting the cortical state of the patient. Response Entropy (RE) is an index ranging from zero to 100 (awake) computed over a frequency range from 0.8 Hz to 47 Hz, containing the higher EMG-dominated frequencies, and will thus also respond to the increased EMG activity resulting from inadequate analgesia. No clinical trials or other comparative studies were found that examine the impact of entropy monitoring on the incidence of intraoperative awareness. One clinical trial reported reduced times to eye opening, response to command, and consumption of anesthetic drugs with the use of entropy monitoring.[135]

Correlational studies report the following Pk values for loss of consciousness: for RE, 0.83 to 0.97; for SE, 0.81 to 0.90.[45,136-137] For anesthetized versus first response, the following Pk values are reported: for RE, 0.85; and for SE, 0.82.[46] Ranges of mean RE and SE values were as follows: before induction or baseline, 98 (RE) and 89 to 91 (SE); during surgery, 34 to 52 (RE) and 50 to 63 (SE); and at emergence or end of surgery, 96 (RE) and 85 (SE).[52,135,138,139]

**Narcotrend.** The Narcotrend (MonitorTechnik) is derived from a system developed for the visual classification of the EEG patterns associated with various stages of sleep. After artifact exclusion and Fourier transformation, the original electronic algorithm classified the raw (frontal) EEG according to the following system: A (awake), B (sedated), C (light anesthesia), D (general anesthesia), E (general anesthesia with deep hypnosis), F (general anesthesia with increasing burst suppression). The system included a series of sub-classifications resulting in a total of 14 possible sub-stages: A, B0–2, C0–2, D0–2, E0–1, and F0–1.[140] In the most recent iteration of the Narcotrend software (version 4.0), the alphabet-based scale has been "translated" into a dimensionless index, the Narcotrend index, scaled from zero (deeply anesthetized) to 100 (awake), with the stated intention of producing a scale quantitatively similar to the BIS index.

No clinical trials or other comparative studies were found that examine the impact of Narcotrend monitoring on the incidence of intraoperative awareness. One RCT has compared the use of Narcotrend-controlled versus clinically controlled anesthetic administration and found a shorter recovery time in the Narcotrend group (i.e., opened eyes) after termination of anesthesia.[63] Pk values for Narcotrend ranged from 0.93 to 0.99 for awake versus loss of response following induction with propofol combined with an opioid, and from 0.94 to 0.99 for anesthetized versus first response.[47,48] Reported mean Narcotrend values are as follows: after induction (loss of response), 72 to 80; and at emergence or end of surgery (spontaneously opened eyes), 80.[73]

**Patient State Analyzer.** The Patient State Index, or PSI (Physiometrix) is derived from a 4-channel EEG. The derivation of the PSI is based on the observation that there are reversible spatial changes in power distribution of quantitative EEG at loss and return of consciousness. The Patient State Index (PSI) has a range of 0 to 100, with decreasing values indicating decreasing levels of consciousness or increasing levels of sedation, similar to BIS, Entropy and Narcotrend. The PSI algorithm was constructed using stepwise, discriminant analysis based on

multivariate combinations of quantitative EEG variables, derived after Fourier transformation of the raw EEG, and found to be sensitive to changes in the level of anesthesia.

No clinical trials or other comparative studies were found that examine the impact of PSI monitoring on the incidence of intraoperative awareness. One correlational study reported a Pk value of 0.70 for predicting response to command, with a sensitivity of 85.6% and specificity of 38.8%,[77] and another study reported a significant correlation of the PSI with unconsciousness.[141] Reported mean PSI values are as follows: before induction or baseline, 92; during surgery, 32; at emergence or end of surgery, 53; and during postoperative recovery, 81.[141]

**SNAP index.** The SNAPII (Everest Biomedical Instruments) calculates a "SNAP index" from a single channel of EEG. The index calculation is based on a spectral analysis of EEG activity in the 0-18 Hz and 80-420 Hz frequency ranges, and a burst suppression algorithm. There are no published data on the actual algorithm used to calculate the SNAP index, which is based on a composite of both low (0-40 Hz) and high (80-420 Hz) frequency components.

No clinical trials or other comparative studies were found that examine the impact of SNAP monitoring on the incidence of intraoperative awareness. One correlational study was found that reported a mean SNAP index of 71 to be predictive of a loss of consciousness in 95% of elective surgery patients.[142]

**Danmeter Cerebral State Monitor/Cerebral State Index.** The Danmeter CSM is a handheld device that analyzes a single channel EEG and presents a cerebral state 'index' scaled from 0-100. In addition, it also provides EEG suppression percentage and a measure of EMG activity (75-85 Hz).

No published literature was found that examined the impact of Danmeter CSM monitoring on the incidence of intraoperative awareness.

*2. Evoked Brain Electrical Activity Monitors.*

**AEP Monitor/2** (Danmeter). Auditory evoked potentials (AEP) are the electrical responses of the brainstem, the auditory radiation and the auditory cortex to auditory sound stimuli (clicks) delivered via headphones. The effects of anesthetics on AEP have been studied since the early 1980s.[143-145] The brainstem response is relatively insensitive to anesthetics while early cortical responses, known as the middle-latency AEP (MLAEP) change predictably with increasing concentrations of both volatile and intravenous anesthetics. The typical AEP response to increasing anesthetic concentrations is increased latency and decreased amplitude of the various waveform components. These signals are extremely small (less than one microvolt) necessitating extraction from the spontaneous EEG using signal averaging techniques. Prior to recent innovations, signal averaging was relatively time consuming (several minutes per averaged waveform). More recent signal filtering advances have resulted in an instrument (A-Line) that can record and rapidly update a single channel of AEP from forehead electrodes. From a mathematical analysis of the AEP waveform, the device generates an 'AEP-index' that provides a correlate of anesthetic concentration. The AEP index, or AAI, is scaled from 0 to 100. In contrast to many EEG indices, the AAI corresponding with low probability of consciousness is less than 25, rather than the higher numeric thresholds associated with the other monitors. The device is FDA approved but is not currently marketed in North America.

RCTs that compared MLAEP monitoring (e.g., to titrate anesthetics) to standard clinical practice without MLAEP reported reduced times to eye opening or orientation.[63,64,146] A Pk value of 0.79 was reported for loss of eyelash reflex following induction with propofol and an opioid,[74] and Pk values of 0.63 and 0.66 were reported for responsiveness following discontinuation of remifentanil or sevoflurane, respectively.[147] One study reported a Pk value of 0.87 for movement,[148] and another study reported a Pk value of 0.99 for awareness after LMA insertion,[149] Descriptive studies reported ranges of mean values as follows: before induction or baseline, 73.5

to 85; at or after induction, 33.4 to 61; during surgery, 21.1 to 37.8; at emergence or end of surgery, 24.6 to 40; and during postoperative recovery, 89.7.[74,80,144,150-151]

*C. Consultant and ASA Member Survey Findings.*

Consultants who participated in this Advisory typically either had a particular knowledge or an expressed interest in intraoperative awareness and brain function monitors. The majority of these consultants disclosed receipt of funds from or a financial interest in a company developing or manufacturing brain function monitors. Consultants were not asked to disclose similar relationships with other companies that may be indirectly affected by the use of brain function monitors. ASA members were randomly selected from a list of active members of the society.

The consultants and ASA members disagree that a brain electrical activity monitor is valuable and should be used to reduce the risk of *intraoperative awareness* for *all* patients. The consultants and ASA members disagree that a brain electrical activity monitor is valuable and should be used to reduce the risk of intraoperative awareness for *no* patient. The consultants agree that a brain electrical activity monitor should be used for patients with conditions that may place them at risk, patients requiring smaller doses of general anesthetics, trauma surgery, Cesarean section, and total intravenous anesthesia. They are equivocal regarding the use of brain electrical activity monitoring for cardiac surgery and emergency surgery. The ASA members agree with the use of such monitors for patients with conditions that may place them at risk, patients requiring smaller doses of general anesthetics, and patients undergoing cardiac surgery. They are equivocal regarding the use of these monitors for patients undergoing Cesarean section, emergency surgery, trauma surgery, and total intravenous anesthesia.

The consultants and ASA members disagree that a brain electrical activity monitor is valuable and should be used to assess intraoperative *depth of anesthesia* for *all* patients. The consultants and ASA members disagree with the statement that "a brain electrical activity monitor is valuable and

should be used to assess intraoperative depth of anesthesia for *no* patient." The consultants agree that a brain electrical activity monitor should be used to assess intraoperative depth of anesthesia for selected patients. The ASA members agree with the use of brain electrical activity monitors for patients with conditions that may place them at risk and patients requiring smaller doses of general anesthetics. They are equivocal regarding the use of such monitors for patients undergoing cardiac surgery, Cesarean section, emergency surgery, trauma surgery, and total intravenous anesthesia.

**Advisory.** Intraoperative monitoring of depth of anesthesia, for the purpose of minimizing the occurrence of awareness, should rely on multiple modalities, including clinical techniques (e.g., checking for clinical signs such as purposeful or reflex movement) and conventional monitoring systems (e.g., ECG, BP, HR, end-tidal anesthetic analyzer, capnography). The use of neuromuscular blocking drugs may mask purposeful or reflex movements, and adds additional importance to the use of monitoring methods that assure the adequate delivery of anesthesia.

Brain function monitors are dedicated to the assessment of the effects of anesthetics on the brain, and provide information that correlates with some depth of anesthesia indicators, such as plasma concentrations of certain anesthetics (e.g., propofol). In general, the indices generated by these monitors vary in parallel with other established correlates of depth of anesthesia, although the values generated by individual devices in any given anesthetic state differ among the various monitoring technologies. In addition, the values generated by individual devices in the face of a given depth of anesthesia achieved by different combinations of anesthetic drugs (e.g., with or without opioids) will also differ. In other words, a specific numerical value may not correlate with a specific depth of anesthesia. Furthermore, the measured values do not have uniform sensitivity across different anesthetic drugs or types of patients. As with other monitors, common occurrences in the OR may introduce artifacts into the values derived by these monitors (e.g., electrocautery, lasers, warming devices).

The general clinical applicability of these monitors in the prevention of intraoperative awareness has not been established. While a single randomized clinical trial reported a decrease in the frequency of awareness in high-risk patients, there is insufficient evidence to justify a standard, guideline, or absolute requirement that these devices be used to reduce the occurrence of intraoperative awareness in high-risk patients undergoing general anesthesia. In addition, there is insufficient evidence to justify a standard, guideline, or absolute requirement that these devices be used to reduce the occurrence of intraoperative awareness for any other group of patients undergoing general anesthesia.

It is the consensus of the Task Force that brain function monitoring is not routinely indicated for patients undergoing general anesthesia, either to reduce the frequency of intraoperative awareness or to monitor depth of anesthesia. This consensus is based, in part, on the state of the literature and survey responses from the consultants and ASA membership, who generally disagree with the following statements: "Brain function monitors are valuable and should be used to reduce the risk of intraoperative awareness for all patients under general anesthesia," and "Brain function monitors are valuable and should be used when possible to assess intraoperative depth of anesthesia for all patients under general anesthesia" (see above and tables 1 and 2).

It is the consensus of the Task Force that the decision to use a brain function monitor should be made on a case-by-case basis by the individual practitioner for selected patients (e.g., light anesthesia). This consensus is based, in part, on the state of the literature and survey response patterns from consultants and ASA members regarding specific risk factors (see above and tables 1 and 2). The Task Force cautions that maintaining low brain function monitor values in an attempt to prevent intraoperative awareness may conflict with other important anesthesia goals (e.g., preservation of vital organ functions, minimizing the risks of aggravating existing co-morbidities [152]). It is the opinion of the Task Force that brain function monitors currently have the status of the many

other monitoring modalities that are currently used in selected situations at the discretion of individual clinicians.

*IV. Intraoperative and Postoperative Interventions*

Intraoperative and postoperative interventions include: (1) the intraoperative administration of benzodiazepines to patients who may have become conscious, (2) providing a postoperative structured interview to patients to define the nature of the episode after an episode of intraoperative awareness has been reported, (3) providing a postoperative questionnaire to patients to define the nature of the episode, and (4) offering postoperative counseling or psychological support.

No studies were found that evaluated the efficacy of the intraoperative administration of benzodiazepines to patients who have unexpectedly become conscious in reducing the occurrence of awareness. Two randomized clinical trials examined retrograde amnesia by providing pictures as stimuli to awake patients before administration of midazolam and induction of general anesthesia. The studies reported no evidence of retrograde amnesia.[41,42] However, these studies did not examine the effect of administering a benzodiazepine to patients after the apparent occurrence of consciousness during general anesthesia.

Although several studies have applied structured interviews and questionnaires to obtain additional information about reported incidences of intraoperative awareness,[4,11,26,28,153-157] no studies were found that demonstrated improvements in patient well-being or psychological state following such interactions. No studies were found that followed up on the efficacy of counseling or psychological support provided to patients who experienced a documented incidence of intraoperative awareness.

The consultants are equivocal and ASA members agree that benzodiazepines or scopolamine should be administered intraoperatively to prevent awareness after a patient has unexpectedly become conscious. The consultants strongly agree, and the ASA members agree that, once an episode of

intraoperative awareness has been reported, a structured interview should be conducted to define the nature of the episode. Both the consultants and ASA members are equivocal regarding whether a questionnaire should be given to define the nature of the episode. The consultants strongly agree, and the ASA members agree that, in documented cases of intraoperative awareness, patients should be offered counseling or psychological support. Finally, the consultants strongly agree, and the ASA members agree that, in documented cases of intraoperative awareness, an occurrence report concerning the event should be completed for the purpose of quality management.

**Advisory.** The Task Force consensus is that the decision to administer a benzodiazepine intraoperatively after a patient unexpectedly becomes conscious should be made on a case-by-case basis. . This consensus is based, in part, on the state of the literature and on responses from the Consultants and ASA members who generally agree with the following statement: "Benzodiazepines or scopolamine should be administered intraoperatively to prevent awareness after a patient has unexpectedly become conscious." However, the Task Force believes that evidence from the literature is not sufficient to provide guidance regarding this issue. Finally, the Task Force cautions that the use of scopolamine may result in unintended side-effects (e.g., emergence delirium).

Practitioners should speak with patients who report recall of intraoperative events to obtain details of the event and to discuss possible reasons for its occurrence.[‡‡] A questionnaire or structured interview may be used to obtain a detailed account of the patient's experience. Once an episode of intraoperative awareness has been reported, an occurrence report concerning the event should be completed for the purpose of quality management. Finally, the patient should be offered counseling or psychological support.

[‡‡] Refer to the ASA Director of Communications at 847-825-5586 for further information and guidance.

The following practice advisory was approved by the ASA House of Delegates on October 25, 2005. It should be considered final. This practice advisory will be published in a future issue of the journal *Anesthesiology*.

## Appendix 1: Summary of Practice Advisory

### Preoperative Evaluation

- Review patient medical records for potential risk factors
    - Substance use or abuse
    - Previous episode of intraoperative awareness
    - History of difficult intubation or anticipated difficult intubation
    - Chronic pain patients on high doses of opioids
    - ASA status 4-5
    - Limited hemodynamic reserve
- Interview patient
    - Assess level of anxiety
    - Obtain information regarding previous experiences with anesthesia
- Determine other potential risk factors
    - Cardiac surgery
    - Cesarean section
    - Trauma surgery
    - Emergency surgery
    - Reduced anesthetic doses in the presence of paralysis
    - Planned use of muscle relaxants during the maintenance phase of general anesthesia
    - Planned use of nitrous oxide-opioid anesthesia
- Patients whom the individual clinician considers to be at substantially increased risk of intraoperative awareness should be informed of the possibility of intraoperative awareness when circumstances permit

### Preinduction Phase of Anesthesia

- Adhere to a checklist protocol for anesthesia machines and equipment to assure that the desired anesthetic drugs and doses will be delivered
- Verifiy the proper functioning of intravenous access, infusion pumps and their connections, including the presence of appropriate back-flow check valves
- The decision to administer a benzodiazepine prophylactically should be made on a case-by-case basis for selected patients (e.g., patients requiring smaller dosages of anesthetics)

### Intraoperative Monitoring

- Use multiple modalities to monitor depth of anesthesia
    - Clinical techniques (i.e., checking for purposeful or reflex movement)
        - Neuromuscular blocking drugs may mask purposeful or reflex movement
    - Conventional monitoring systems (e.g., ECG, BP, HR, end-tidal anesthetic analyzer, capnography
    - Brain function monitoring
        - Not routinely indicated for general anesthesia patients
        - The decision to use a brain function monitor should be made on a case-by-case basis by the individual practitioner for selected patients (e.g., light anesthesia)

### Intraoperative and Postoperative Management

The following practice advisory was approved by the ASA House of Delegates on October 25, 2005. It should be considered final. This practice advisory will be published in a future issue of the journal *Anesthesiology*.

- The decision to administer a benzodiazepine intraoperatively after a patient unexpectedly becomes conscious should be made on a case-by-case basis
- Speak with patients who report recall of intraoperative events to obtain details of the event and to discuss possible reasons for its occurrence
- A questionnaire or structured interview may be used to obtain a detailed account of the patient's experience
- Once an episode of intraoperative awareness has been reported, an occurrence report concerning the event should be completed for the purpose of quality management
- Offer counseling or psychological support to those patients who report an episode of intraoperative awareness

**Appendix 2: Literature Review and Consensus-Based Evidence**

For this Advisory, a literature review was used in combination with opinions obtained from experts and other sources (e.g., professional society members, open forums, web-based postings) to provide guidance to practitioners regarding intraoperative awareness. Both the literature review and opinion data were based on *evidence linkages*, consisting of directional statements about relationships between specific perioperative interventions and intraoperative awareness. The interventions for the evidence linkages are listed below:

Preoperative Evaluation

- Focused history (i.e., medical records, patient interview, physical exam)
- Patient characteristics associated with risk of awareness
- Procedures associated with higher risk of intraoperative awareness
- Anesthetic techniques may be associated with higher risk of intraoperative awareness
- Informing patients of the possiblity of intraoperative awareness

Preinduction Phase of Anesthesia

- Check anesthesia delivery systems to reduce errors
- Prophylactic administration of benzodiazepines as co-anesthetics

Intraoperative Monitoring

- Commonly used clinical techniques
- Conventional monitoring systems
- Brain function monitors
  - Spontaneous electrical activity (EEG/EMG)
    - Bispectral index (BIS)
    - Danmeter Cerebral State Monitor/Cerebral State Index
    - Entropy
    - Narcotrend
    - Patient state analyzer (PSA)
    - SNAP index
  - Evoked electrical activity (auditory evoked potential monitoring)
    - AEP Monitor/2

Intraoperative and Postoperative Interventions

- Intraoperative use of benzodiazepines for unexpected consciousness
- Structured interview of patients who report recall of intraoperative events
- Questionnaire administered to patients who report recall of intraoperative events
- Patient counseling for patients who report recall of intraoperative events

*A. State of the Literature.*

A study or report that appears in the published literature is included in the development of an advisory if the study: (1) is related to one of the specified linkage statements, (2) reports a finding or set of findings that can be tallied or measured (e.g., articles that contain only opinion are not included), and (3) is the product of an original investigation or report (i.e., review articles or follow-up studies that summarize previous findings are not included).

For the literature review, potentially relevant studies were identified via electronic and manual searches of the literature. The electronic search covered a 40-year period from 1966 through 2005. The manual search covered a 36-year period of time from 1970 through 2005. Over 1500 citations were initially identified, yielding a total of 711 non-overlapping articles that addressed topics related to the evidence linkages and met our criteria for inclusion. Following review of the articles, 389 studies did not provide direct evidence, and were subsequently eliminated. A total of 322 articles contained direct linkage-related evidence. No evidence linkage contained enough studies with well-defined experimental designs and statistical information to conduct a quantitative analysis (i.e., meta-analysis).

Interobserver agreement among Task Force members and two methodologists was established by interrater reliability testing. Agreement levels using a kappa ($\kappa$) statistic for two-rater agreement pairs were as follows: (1) type of study design, $\kappa = 0.60$ to 0.85; (2) type of analysis, $\kappa = 0.60$ to 0.93; (3) evidence linkage assignment, $\kappa = 0.77$ to 0.88; and (4) literature inclusion for database, $\kappa = 0.76$ to 1.00. Three-rater chance-corrected agreement values were: (1) study design, Sav = 0.82, Var (Sav) = 0.007; (2) type of analysis, Sav =0.73, Var (Sav) = 0.008; (3) linkage assignment, Sav = 0.69 Var (Sav) = 0.012; (4) literature database inclusion, Sav = 0.84, Var (Sav) = 0.014. These values represent moderate-to-high levels of agreement.

The primary focus of this Advisory was to examine studies with hypothesis-driven research designs, such as RCTs, that examined the effect of an intervention (such as a brain function monitor) on reducing the occurrence or frequency of intraoperative awareness. To date, only two randomized controlled trials were found that reported intraoperative awareness as the primary study endpoint.[55,56] Additional controlled trials will be necessary before data from published literature can be aggregated to provide a basis for quantitative evidence (i.e., meta-analysis).

Several other RCTs were reviewed that reported primary outcomes other than intraoperative awareness, including emergence time, consumption of anesthetic drugs and recovery characteristics. In addition, many other published studies applied non-hypothesis driven research designs to obtain non-causal or indirect data. For example, descriptive literature (i.e., reports of frequency or incidence) may provide an indication of the scope of the problem. Correlational or predictive data provides information regarding the direction and strength of association of values obtained from patient monitoring devices with other intraoperative measures such as blood concentrations of anesthetic drugs, time to loss of eyelash reflex, and time to awakening. Case reports are typically employed as a forum for reporting and recognizing unusual or unintended benefits or harms. Often, case reports, as well as descriptive or correlational data provide useful hypotheses-generating information that may stimulate additional causal examination of the topic of intraoperative awareness.

Future studies should focus on prospective methodologies, when possible, that utilize traditional hypothesis testing techniques. Use of the following methodological procedures for assessing the impact of interventions for intraoperative awareness is recommended: (1) comparison studies assessing the efficacy of one technique versus other techniques; (2) random assignment to treatment groups with blinding if appropriate; and (3) full reporting of sample size, effect size estimates, test scores, measures of variability, and p-values. The Task Force recognizes that conducting such

studies may be difficult and expensive, because intraoperative awareness is a very low incidence event. The required sample size for a RCT to test the impact of an intervention (e.g., brain function monitor) on the incidence of intraoperative awareness is invariably large. The Task Force also recognizes that, with low incidence data, a difference in the recording of one or two cases of intraoperative awareness can affect the statistical significance of study findings.

Limiting the study to patient subgroups thought to have a higher risk for intraoperative awareness (e.g., cardiac surgery, cesarean section, emergency trauma surgery) may allow for a smaller sample size and provide useful information regarding these subgroups. However, the Task Force recognizes that the generalizability of these findings to the larger population of general anesthesia patients may be limited.

*B. Consensus-Based Evidence.*

Consensus was obtained from multiple sources, including: (1) survey opinion from Consultants who were selected based on their knowledge or expertise in intraoperative awareness, (2) survey opinions from a randomly selected sample of active members of the American Society of Anesthesiologists, (3) testimony from attendees of three open forums held at national anesthesia meetings,[§§] (4) internet commentary, and (5) Task Force opinion and interpretation. The survey rate of return was 60% (N = 57/95) for Consultants, and 30% (N=151/500) for the ASA membership. Survey results are presented in the text of the document and in tables 1 and 2.

Ninety-one percent of the consultants and 72% of the ASA members indicated that they had personally used a brain function device in the past. Fifty-seven percent of the consultants indicated that they make use in their current practice of a brain function device either always (11.1%), frequently (20.4%), or sometimes (25.9%). Thirty-six percent of the ASA members

[§§] American Society of Anesthesiologists, Annual Meeting, October 25, 2004 in Las Vegas, NV; International Anesthesia Research Society, 79th Clinical and Scientific Congress, March 12, 2005 in Honolulu, HI; and Association of University Anesthesiologists 52nd Annual Meeting, May 6, 2005 in Baltimore, MD.

indicated that they make use in their current practice of a brain function device either always (6.0%), frequently (13.4%), or sometimes (16.8%).

The Consultants were also asked to indicate which, if any, of the evidence linkages would change their clinical practices if the Advisory was instituted (table 3). The rate of return was 18% (N = 17/95). The percent of responding Consultants expecting *no change* associated with each linkage were as follows: preoperative evaluation - 82%; informing patients of the possibility of intraoperative awareness - 65%; check anesthesia delivery systems - 94%; prophylactic use of benzodiazepines as co-anesthetics - 100%; use of clinical techniques to monitor for intraoperative awareness - 94%; use of conventional monitoring systems to monitor for intraoperative awareness - 100%; use of brain function monitors to monitor for intraoperative awareness - 59%; intraoperative use of benzodiazepines for uuunexpected consciousness - 100%; use of a structured interview for patients who report recall of intraoperative events - 41%; use of a questionnaire for patients who report recall of intraoperative events - 53% and counseling for patients who report recall of intraoperative events - 76%. Seventy-one percent of the respondents indicated that the Advisory would have *no effect* on the amount of time spent on a typical case. Four respondents (24%) indicated that there would be an increase in the amount of time they would spend on a typical case with the implementation of this Advisory. The amount of increased time anticipated by these respondents ranged from 1 to 20 minutes.

The following practice advisory was approved by the ASA House of Delegates on October 25, 2005. It should be considered final. This practice advisory will be published in a future issue of the journal *Anesthesiology.*

Table 1. Consultant Survey Responses ***

| | | Percent Responding to Each Item | | | | |
|---|---|---|---|---|---|---|
| **Preoperative evaluation:** | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
| 1. Helpful to identify pts at risk of intraoperative awareness | 57 | 31.6 | 43.9* | 7.0 | 10.5 | 7.0 |
| 2. A preop eval should include: | | | | | | |
| Review of medical records | 48 | 41.7 | 45.8* | 4.2 | 6.3 | 2.1 |
| A physical examination | 47 | 21.3 | 34.0* | 17.0 | 25.5 | 2.1 |
| A patient/family interview | 48 | 39.6 | 35.4* | 14.6 | 8.3 | 2.1 |
| 3. Potential patient risk factors: | | | | | | |
| Substance use or abuse | 54 | 38.9 | 42.6* | 5.6 | 13.0 | 0.0 |
| Pt history of intraop awareness | 55 | 52.7* | 29.1 | 10.9 | 7.3 | 0.0 |
| Limited hemodynamic reserve | 54 | 38.9 | 40.7* | 13.0 | 7.4 | 0.0 |
| ASA status of 4 or 5 | 54 | 24.1 | 48.1* | 20.4 | 7.1 | 0.0 |
| 4. Procedures/ anesthetic techniques that may place a patient at risk for intraop awareness: | | | | | | |
| Cesarean section under GA, cardiac surgery, trauma, emergency surgery | 57 | 75.4* | 24.6 | 0.0 | 0.0 | 0.0 |
| Planned use of reduced doses of anesthetics in the presence of paralysis | 56 | 66.1* | 25.0 | 5.4 | 1.8 | 1.8 |
| Planned use of muscle relaxants for maintenance | 57 | 26.4 | 45.6* | 8.8 | 17.5 | 1.8 |
| Planned use of total intravenous anesthesia | 57 | 10.5 | 33.3 | 24.6* | 21.1 | 10.5 |
| Planned use of volatile anesthetics | 57 | 3.5 | 5.3 | 12.3 | 57.9* | 21.1 |
| Planned use of nitrous oxide-narcotic anesthesia | 57 | 29.8 | 35.1* | 14.0 | 19.3 | 1.8 |
| Preoperative or intraoperative use of beta-blockers under general anesthesia | 57 | 5.3 | 35.1 | 26.3* | 29.8 | 3.5 |
| Rapid-sequence induction | 57 | 5.3 | 29.8 | 19.3* | 42.1 | 3.5 |
| 5. All pts should be informed of the possibility of intraop awareness | 57 | 10.5 | 31.6 | 5.3 | 42.1* | 10.5 |
| 6. Only patients considered to be at elevated risk of intraop awareness should be informed of the possibility of intraop awareness | 40 | 17.5 | 60.0* | 5.0 | 7.5 | 10.0 |

*** N = the number of consultants who responded to each item. An astrisk beside a percentage score indicates the median.

| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 7. Informing the pt preoperatively of the risk of intraop awareness increases the actual risk of intraoperative awareness | 53 | 3.8 | 5.7 | 30.2 | 35.8* | 24.5 |
| **Preinduction activities:** | | | | | | |
| 8. The functioning of anesthesia delivery systems should be checked preoperatively to reduce the risk of intraop awareness | 57 | 77.2* | 17.5 | 1.8 | 3.5 | 0.0 |
| 9. A benzodiazepine or scopolamine should be used as a component of the anesthetic to reduce the risk of intraop awareness: | | | | | | |
| For all patients under GA | 54 | 7.4 | 24.1 | 1.9 | 33.3* | 33.3 |
| For no patients under GA | 54 | 3.7 | 3.7 | 3.7 | 46.3* | 42.6 |
| For pts with conditions that may place them at risk for intraop awareness | 53 | 20.8 | 58.5* | 7.5 | 7.5 | 5.7 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 53 | 17.0 | 43.4* | 11.3 | 20.8 | 7.5 |
| For patients undergoing cardiac surgery | 54 | 22.2 | 44.4* | 11.1 | 16.7 | 5.6 |
| For patients undergoing Cesarean section under GA | 54 | 7.4 | 29.6 | 20.4* | 31.5 | 11.1 |
| For patients undergoing emergency surgery under GA | 53 | 15.1 | 30.2 | 20.8* | 28.3 | 5.7 |
| For patients undergoing trauma surgery under GA | 54 | 16.7 | 35.2* | 20.4 | 22.2 | 5.6 |
| For patients undergoing total intravenous anesthesia | 54 | 16.7 | 31.5 | 18.5* | 24.1 | 9.3 |
| **Intraoperative Monitoring:** | | | | | | |
| 10. Commonly used clinical techniques (e.g., checking for purposeful or reflex movement) are valuable and should be used to detect intraop consciousness | 53 | 18.9 | 47.2* | 5.7 | 18.9 | 9.4 |
| 11. Conventional monitoring systems are valuable and should be used to detect intraoperative consciousness | 53 | 22.6 | 41.5* | 5.7 | 24.5 | 5.7 |

| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 12. Brain function monitors are valuable and should be used to reduce the risk of intraoperative awareness: | | | | | | |
| For all patients under GA | 57 | 7.0 | 21.1 | 19.3 | 15.8* | 36.8 |
| For no patients under GA | 56 | 3.6 | 7.1 | 14.3 | 35.7* | 39.3 |
| For pts with conditions that may place them at risk for intraop awareness | 57 | 36.8 | 26.3* | 14.0 | 14.0 | 8.8 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 56 | 26.8 | 32.1* | 14.3 | 19.6 | 7.1 |
| For patients undergoing cardiac surgery | 57 | 28.1 | 21.1 | 26.3* | 14.0 | 10.5 |
| For patients undergoing Cesarean section under GA | 57 | 31.6 | 21.1* | 21.1 | 17.5 | 8.8 |
| For patients undergoing emergency surgery under GA | 57 | 21.1 | 28.1 | 24.6* | 17.5 | 8.8 |
| For patients undergoing trauma surgery under GA | 57 | 26.3 | 24.6* | 24.6 | 15.8 | 8.8 |
| For patients undergoing total intravenous anesthesia | 56 | 16.1 | 39.3* | 23.2 | 14.3 | 7.1 |
| 13. Brain function monitors are valuable and should be used when possible to assess intraoperative depth of anesthesia: | | | | | | |
| For all patients under GA | 56 | 12.5 | 21.4 | 10.7 | 14.3* | 41.1 |
| For no patients under GA | 54 | 9.3 | 5.6 | 9.3 | 37.0* | 38.9 |
| For pts with conditions that may place them at risk for intraop awareness | 56 | 33.9 | 30.4* | 8.9 | 14.3 | 12.5 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 56 | 28.6 | 35.7* | 10.7 | 10.7 | 14.3 |
| For patients undergoing cardiac surgery | 56 | 26.8 | 28.6* | 16.1 | 14.3 | 14.3 |
| For patients undergoing Cesarean section under GA | 56 | 28.6 | 32.1* | 12.5 | 12.5 | 14.3 |

| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| For patients undergoing emergency surgery under GA | 57 | 21.1 | 36.8* | 10.5 | 17.5 | 14.0 |
| For patients undergoing trauma surgery under GA | 57 | 22.8 | 38.6* | 10.5 | 14.0 | 14.0 |
| For patients undergoing total intravenous anesthesia | 57 | 26.3 | 35.1* | 17.5 | 8.8 | 12.3 |
| **Intraoperative & Postoperative Interventions:** | | | | | | |
| 14. Benzodiazepines or scopolamine should be administered intraoperatively to prevent awareness after a pt has unexpectedly become conscious | 57 | 21.1 | 26.3 | 15.8* | 21.1 | 15.8 |
| 15. Once an episode of intraoperative awareness has been reported, a structured interview should be conducted to define the nature of the episode | 57 | 63.2* | 31.5 | 1.8 | 0.0 | 0.0 |
| 16. Once an episode of intraop awareness has been reported, a questionnaire should be given to define the nature of the episode | 57 | 10.5 | 19.3 | 36.8* | 28.1 | 5.3 |
| 17. Once an episode of intraop awareness has been reported and documented, the pt should be offered counseling or psychological support | 56 | 69.6* | 25.0 | 5.4 | 0.0 | 0.0 |
| 18. Once an episode of intraop awareness has been reported, an occurrence report concerning the event should be completed for the purpose of quality management | 57 | 54.4* | 40.4 | 0.0 | 5.3 | 0.0 |

Table 2. ASA Member Survey Responses[†††]

| | | Percent Responding to Each Item | | | | |
|---|---|---|---|---|---|---|
| **Preoperative evaluation:** | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
| 1. Helpful to identify pts at risk of intraoperative awareness | 146 | 27.4 | 46.6* | 14.4 | 10.3 | 1.4 |
| 2. A preop eval should include: | | | | | | |
| Review of medical records | 121 | 38.8 | 47.9* | 7.4 | 5.0 | 0.8 |
| A physical examination | 118 | 23.7 | 37.3* | 18.6 | 17.8 | 2.5 |
| A patient/family interview | 121 | 46.3 | 43.0* | 6.6 | 3.3 | 0.8 |
| 3. Potential patient risk factors: | | | | | | |
| Substance use or abuse | 147 | 31.3 | 44.2* | 16.3 | 6.8 | 1.4 |
| Pt history of intraop awareness | 146 | 45.2 | 31.5* | 11.0 | 11.6 | 0.7 |
| Limited hemodynamic reserve | 145 | 46.3 | 38.6* | 6.9 | 6.9 | 1.4 |
| ASA status of 4 or 5 | 145 | 33.1 | 40.7* | 11.0 | 13.1 | 2.1 |
| 4. Procedures/ anesthetic techniques that may place a patient at risk for intraop awareness: | | | | | | |
| Cesarean section under GA, cardiac surgery, trauma, emergency surgery | 151 | 70.2* | 27.2 | 0.7 | 1.3 | 0.7 |
| Planned use of reduced doses of anesthetics in the presence of paralysis | 148 | 48.6 | 44.6* | 4.1 | 2.7 | 0.0 |
| Planned use of muscle relaxants for maintenance | 147 | 21.1 | 34.7* | 16.3 | 26.5 | 1.4 |
| Planned use of total intravenous anesthesia | 146 | 13.0 | 26.7 | 24.0* | 32.2 | 4.1 |
| Planned use of volatile anesthetics | 148 | 0.7 | 10.1 | 10.1 | 63.5* | 15.5 |
| Planned use of nitrous oxide-narcotic anesthesia | 147 | 11.6 | 46.9* | 18.4 | 19.7 | 3.4 |
| Preoperative or intraoperative use of beta-blockers under general anesthesia | 148 | 4.7 | 31.1 | 23.0* | 36.5 | 4.7 |
| Rapid-sequence induction | 148 | 3.4 | 31.1 | 18.9* | 41.9 | 4.7 |
| 5. All pts should be informed of the possibility of intraop awareness | 147 | 15.0 | 28.6 | 10.9* | 40.1 | 5.4 |
| 6. Only patients considered to be at elevated risk of intraop awareness should be informed of the possibility of intraop awareness | 112 | 17.0 | 49.1* | 7.1 | 21.4 | 5.4 |

[†††] N = the number of members who responded to each item. An astrisk beside a percentage score indicates the median.

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| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 7. Informing the pt preoperatively of the risk of intraop awareness increases the *actual* risk of intraoperative awareness | 147 | 2.7 | 10.9 | 33.3 | 38.8* | 14.3 |
| **Preinduction activities:** | | | | | | |
| 8. The functioning of anesthesia delivery systems should be checked preoperatively to reduce the risk of intraop awareness | 148 | 60.8* | 37.8 | 0.7 | 0.7 | 0.0 |
| 9. A benzodiazepine or scopolamine should be used as a component of the anesthetic to reduce the risk of intraop awareness: | | | | | | |
| For all patients under GA | 150 | 15.3 | 34.0 | 6.0* | 30.7 | 14.0 |
| For no patients under GA | 144 | 0.7 | 2.8 | 3.5 | 50.7* | 42.4 |
| For pts with conditions that may place them at risk for intraop awareness | 148 | 37.8 | 56.1* | 3.4 | 2.7 | 0.0 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 150 | 31.3 | 60.7* | 4.7 | 3.3 | 0.0 |
| For patients undergoing cardiac surgery | 147 | 39.5 | 48.3* | 9.5 | 2.7 | 0.0 |
| For patients undergoing Cesarean section under GA | 151 | 13.2 | 23.2 | 27.8* | 28.5 | 7.3 |
| For patients undergoing emergency surgery under GA | 151 | 21.1 | 42.4* | 21.9 | 13.9 | 0.7 |
| For patients undergoing trauma surgery under GA | 150 | 24.0 | 44.7* | 22.7 | 8.7 | 0.0 |
| For patients undergoing total intravenous anesthesia | 150 | 23.3 | 48.0* | 14.0 | 12.7 | 2.0 |
| **Intraoperative Monitoring:** | | | | | | |
| 10. Commonly used clinical techniques (e.g., checking for purposeful or reflex movement) are valuable and should be used to detect intraop consciousness | 151 | 10.6 | 50.3* | 21.2 | 13.9 | 4.0 |
| 11. Conventional monitoring systems are valuable and should be used to detect intraoperative consciousness | 150 | 20.7 | 56.7* | 9.3 | 10.7 | 2.7 |

| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 12. Brain function monitors are valuable and should be used to reduce the risk of intraoperative awareness: | | | | | | |
| For all patients under GA | 149 | 10.7 | 10.7 | 16.1 | 37.6* | 24.8 |
| For no patients under GA | 146 | 2.7 | 3.4 | 24.7 | 44.5* | 24.7 |
| For pts with conditions that may place them at risk for intraop awareness | 147 | 21.1 | 48.3* | 19.0 | 10.2 | 1.4 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 147 | 19.7 | 38.8* | 24.5 | 13.6 | 3.4 |
| For patients undergoing cardiac surgery | 148 | 20.3 | 33.8* | 30.4 | 12.2 | 3.4 |
| For patients undergoing Cesarean section under GA | 148 | 12.8 | 34.5 | 25.0* | 23.0 | 4.7 |
| For patients undergoing emergency surgery under GA | 146 | 17.8 | 26.0 | 28.8* | 24.0 | 3.4 |
| For patients undergoing trauma surgery under GA | 148 | 18.9 | 29.7 | 28.4* | 19.6 | 3.4 |
| For patients undergoing total intravenous anesthesia | 148 | 13.5 | 35.1 | 25.7* | 20.3 | 5.4 |
| 13. Brain function monitors are valuable and should be used when possible to assess intraoperative depth of anesthesia: | | | | | | |
| For all patients under GA | 150 | 12.0 | 9.3 | 16.0 | 30.7* | 32.0 |
| For no patients under GA | 147 | 2.7 | 4.8 | 24.5 | 41.5* | 26.5 |
| For pts with conditions that may place them at risk for intraop awareness | 148 | 20.3 | 43.2* | 20.9 | 10.8 | 4.7 |
| For patients requiring smaller dosages of general anesthetics ("light anesthesia") | 149 | 20.1 | 37.6* | 20.8 | 15.4 | 6.0 |
| For patients undergoing cardiac surgery | 149 | 20.1 | 27.5 | 28.2* | 19.5 | 4.7 |
| For patients undergoing Cesarean section under GA | 149 | 13.4 | 30.2 | 22.8* | 26.2 | 7.4 |
| For patients undergoing emergency surgery under GA | 149 | 14.8 | 26.8 | 24.8* | 26.8 | 5.4 |
| For patients undergoing trauma surgery under GA | 149 | 16.1 | 28.9 | 25.5* | 24.2 | 5.4 |
| For patients undergoing total intravenous anesthesia | 149 | 15.4 | 32.9 | 24.8* | 20.1 | 6.7 |

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| | N | Strongly Agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| **Intraoperative & Postoperative Interventions:** | | | | | | |
| 14. Benzodiazepines or scopolamine should be administered intraoperatively to prevent awareness after a pt has unexpectedly become conscious | 151 | 33.1 | 49.7* | 9.9 | 7.3 | 0.0 |
| 15. Once an episode of intraoperative awareness has been reported, a structured interview should be conducted to define the nature of the episode | 151 | 49.0 | 43.0* | 7.3 | 0.7 | 0.0 |
| 16. Once an episode of intraop awareness has been reported, a questionnaire should be given to define the nature of the episode | 151 | 19.9 | 21.9 | 38.4* | 18.5 | 1.3 |
| 17. Once an episode of intraop awareness has been reported and documented, the pt should be offered counseling or psychological support | 151 | 44.4 | 39.1* | 14.6 | 1.3 | 0.7 |
| 18. Once an episode of intraop awareness has been reported, an occurrence report concerning the event should be completed for the purpose of quality management | 151 | 47.7 | 41.1* | 9.3 | 1.3 | 0.7 |

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[‡‡‡] The references listed here do not represent a complete bibliography of the literature reviewed. A complete bibliography is available by writing to the American Society of Anesthesiologists or by accessing the *Anesthesiology* Web site: http//www.anesthesiology.org

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Attachment D

# STANDARDS FOR BASIC ANESTHETIC MONITORING

(Approved by the ASA House of Delegates on October 21, 1986, and last amended on October 25, 2005)

These standards apply to all anesthesia care although, in emergency circumstances, appropriate life support measures take precedence. These standards may be exceeded at any time based on the judgment of the responsible anesthesiologist. They are intended to encourage quality patient care, but observing them cannot guarantee any specific patient outcome. They are subject to revision from time to time, as warranted by the evolution of technology and practice. They apply to all general anesthetics, regional anesthetics and monitored anesthesia care. This set of standards addresses only the issue of basic anesthetic monitoring, which is one component of anesthesia care. In certain rare or unusual circumstances, 1) some of these methods of monitoring may be clinically impractical, and 2) appropriate use of the described monitoring methods may fail to detect untoward clinical developments. Brief interruptions of continual† monitoring may be unavoidable. *Under extenuating circumstances, the responsible anesthesiologist may waive the requirements marked with an asterisk (*); it is recommended that when this is done, it should be so stated (including the reasons) in a note in the patient's medical record.* These standards are not intended for application to the care of the obstetrical patient in labor or in the conduct of pain management.

† Note that "continual" is defined as "repeated regularly and frequently in steady rapid succession" whereas "continuous" means "prolonged without any interruption at any time."

STANDARD I

Qualified anesthesia personnel shall be present in the room throughout the conduct of all general anesthetics, regional anesthetics and monitored anesthesia care.

OBJECTIVE

Because of the rapid changes in patient status during anesthesia, qualified anesthesia personnel shall be continuously present to monitor the patient and provide anesthesia care. In the event there is a direct known hazard, e.g., radiation, to the anesthesia personnel which might require intermittent remote observation of the patient, some provision for monitoring the patient must be made. In the event that an emergency requires the temporary absence of the person primarily responsible for the anesthetic, the best judgment of the anesthesiologist will be exercised in comparing the emergency with the anesthetized patient's condition and in the selection of the person left responsible for the anesthetic during the temporary absence.

STANDARD II

During all anesthetics, the patient's oxygenation, ventilation, circulation and temperature shall be continually evaluated.

OXYGENATION

OBJECTIVE

To ensure adequate oxygen concentration in the inspired gas and the blood during all anesthetics.

METHODS

1) Inspired gas: During every administration of general anesthesia using an anesthesia machine, the concentration of oxygen in the patient breathing system shall be measured by an oxygen analyzer with a low oxygen concentration limit alarm in use.*
2) Blood oxygenation: During all anesthetics, a quantitative method of assessing oxygenation such as pulse oximetry shall be employed.* When the pulse oximeter is utilized, the

variable pitch pulse tone and the low threshold alarm shall be audible to the anesthesiologist or the anesthesia care team personnel.* Adequate illumination and exposure of the patient are necessary to assess color.*

VENTILATION

OBJECTIVE

To ensure adequate ventilation of the patient during all anesthetics.

METHODS

1) Every patient receiving general anesthesia shall have the adequacy of ventilation continually evaluated. Qualitative clinical signs such as chest excursion, observation of the reservoir breathing bag and auscultation of breath sounds are useful. Continual monitoring for the presence of expired carbon dioxide shall be performed unless invalidated by the nature of the patient, procedure or equipment. Quantitative monitoring of the volume of expired gas is strongly encouraged.*

2) When an endotracheal tube or laryngeal mask is inserted, its correct positioning must be verified by clinical assessment and by identification of carbon dioxide in the expired gas. Continual end-tidal carbon dioxide analysis, in use from the time of endotracheal tube/laryngeal mask placement, until extubation/removal or initiating transfer to a postoperative care location, shall be performed using a quantitative method such as capnography, capnometry or mass spectroscopy.* When capnography or capnometry is utilized, the end tidal $CO_2$ alarm shall be audible to the anesthesiologist or the anesthesia care team personnel.*

3) When ventilation is controlled by a mechanical ventilator, there shall be in continuous use a device that is capable of detecting disconnection of components of the breathing system. The device must give an audible signal when its alarm threshold is exceeded.

4) During regional anesthesia and monitored anesthesia care, the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and/or monitoring for the presence of exhaled carbon dioxide.

CIRCULATION

OBJECTIVE

To ensure the adequacy of the patient's circulatory function during all anesthetics.

METHODS

1) Every patient receiving anesthesia shall have the electrocardiogram continuously displayed from the beginning of anesthesia until preparing to leave the anesthetizing location.*

2) Every patient receiving anesthesia shall have arterial blood pressure and heart rate determined and evaluated at least every five minutes.*

3) Every patient receiving general anesthesia shall have, in addition to the above, circulatory function continually evaluated by at least one of the following: palpation of a pulse, auscultation of heart sounds, monitoring of a tracing of intra-arterial pressure, ultrasound peripheral pulse monitoring, or pulse plethysmography or oximetry.

BODY TEMPERATURE

OBJECTIVE

To aid in the maintenance of appropriate body temperature during all anesthetics.

METHODS

Every patient receiving anesthesia shall have temperature monitored when clinically significant changes in body temperature are intended, anticipated or suspected.

[1]To become effective July 1, 1999

Attachment E

The Columbus Dispatch
*Ohio's Greatest Online Newspaper*

# IV fiasco led killer to ask for plan B

*Friday, May 12, 2006*

Andrew Welsh - Huggins
*ASSOCIATED PRESS*

A condemned inmate asked prison staffers to find another way to kill him after difficulty finding a vein delayed his execution by almost 90 minutes, state prison records show.

"Can you just give me something by mouth to end this? " convicted killer Joseph Clark asked members of the execution team as they struggled to find a way to insert an intravenous line after the first try failed.

Joseph Clark, 57, was executed on May 2 for killing a clerk while robbing a gas station in Toledo in 1984.

Clark's execution was plagued with problems from the beginning, when team members struggled for several minutes to find a vein to take the IV. After proceeding with a shunt in Clark's left arm, the vein collapsed and the execution team had to start over.

After finally attaching a shunt to Clark's right arm, the execution team apparently tried to administer the lethal drugs through the original IV line by mistake, according to written accounts of the execution obtained by the Associated Press.

A member of the execution team said he realized a problem "upon noticing the wrong reaction by Inmate Clark again," the member's statement said.

"I noticed I had picked up the wrong line. Once I switched to proper IV line, execution was completed successfully."

The team member noticed Clark moved his left foot, said prisons spokeswoman Andrea Dean.

During the first attempt to administer the drugs, Clark continued to move and then finally pushed himself up and said, "It don't work."

Clark, 57, sentenced to die in November 1984 for killing David Manning, had been facing execution longer than all but 11 of the 193 men on Ohio's Death Row.

The problems with the execution fueled a growing debate about lethal injection, with many Death Row inmates saying that their executions could be painful, either because of the drug combination or because the procedure is not handled by specially trained medical personnel.

A lawyer representing Clark's family said the records underscore the need for a thorough investigation.

"There's something drastically wrong with the procedures that are in place, and we hope that this leads to an honest evaluation and discussion of these problems," Alan Konop said. "This should never happen and hopefully will never happen again."

The Department of Rehabilitation and Correction is re- viewing the execution because of the problems but doesn't think its procedures are flawed.

"The vein simply collapsed; that wasn't a flaw in the process," Dean said.

The handwritten reports by members of the execution team, who volunteer for the job, provide an intimate though emotionless view of the execution process. No report indicated a team member was upset by what happened, and the reports do not include the prison employees' names.

"I assisted by holding the inmate's feet, patting them in an attempt to calm him down," one team member wrote.

The team appeared to anticipate problems early on. "As an observer for the insertion of the IV catheters, I noted that Mr. Clark's veins were not going to be easy to find," one member wrote.

Several team members said they didn't think Clark suffered during the ordeal, which began at 9:58 a.m. when members of the team entered a holding cell to insert the shunts.

"Clark showed no signs of suffering during this process," one report said.

But another report said the "inmate seemed to have some discomfort" where the left shunt was placed.

The same team member who picked up the wrong line wrote, "Inmate Clark was afraid, but not in any distress."

As the troubles finding Clark's vein continued, a team member standing with reporters, Clark's attorney and members of Manning's family decided to draw the curtain that blocked public view of the death chamber.

That decision elicited a protest from the American Civil Liberties Union, which previously sued to force the prison system to show more of the state's execution process.

The team member defended the decision, saying people were getting upset.

"I could feel the tension rising inside the viewing chamber, and upon that time closed the curtain," the team member wrote. "I personally felt this was a very wise decision to alleviate extra stress upon all witnesses until the team could determine what happened."

Dean, a witness of this and several other executions, gave a slightly different account.

"There was an air of apprehension because we didn't know what was going on because this had never happened before," she said.

The team, numbering between 15 and 18, consists mostly of guards with some medical technicians and other prison employees.

Every capital-punishment state but one uses lethal injection; Nebraska still uses the electric chair.

A North Carolina inmate was executed last month only after the state changed its procedures to

satisfy a federal judge.

In California, executions are on hold while a federal judge considers the constitutionality of that state's protocol. A hearing is scheduled in September.

Attachment F

## THE EXECUTION OF STANLEY TOOKIE WILLIAMS

### Eyewitness: Prisoner did not die meekly, quietly

- Kevin Fagan, Chronicle Staff Writer
Wednesday, December 14, 2005

It took 36 agonizing minutes to get to the defining moment of Stanley Tookie Williams' execution by lethal injection early Tuesday, and when it came it shot through the stuffy, crowded witness room like lightning.

Williams lay dead, strapped to his gurney. It was 12:35 a.m. The prison guards had just ordered the 39 witnesses to leave, and the first to go were three friends Williams had asked to watch his final moments. It was so quiet that when one man jangled his pocket change, it echoed off the walls.

Then, just as they crossed the doorway to the chilly outdoors, the three whipped their heads back and screamed in unison: "The state of California just killed an innocent man!" Across the room sat Lora Owens, stepmother of one of the murder victims -- and the stone face she'd worn for the entire execution dissolved. Her eyes filled with horror, and she burst into tears, pressing a tissue to her face.

And there it was: The twin emotions enveloping the execution of the 12th man put to death by California since capital punishment was revived in 1992 after a quarter-century hiatus.

On one side were the furious supporters of Williams, 51, who co-founded the Crips gang in the early 1970s but later renounced violence while in prison and wrote influential books advocating peace. On the other was the trail of survivors left grieving for the four people he was convicted of shotgunning to death in 1979 in Southern California.

The two sides never came to a meeting of the minds. Not even in the end.

The dramatics seemed far from anybody's mind when the execution began precisely at 11:59 p.m. Monday.

The oval door of the death chamber popped open -- it looks like a submarine hatch -- and Williams shuffled in with a green-uniformed guard on each side, loosely holding his arms, and three following behind. His wrists were handcuffed to a waist chain. His eyes were calm behind steel-frame glasses, lips set firmly above a gray beard.

It looked like it would be just like the nine lethal injections before it: controlled, noiseless, practically antiseptic.

With a chest like a barrel and bulging arms the size of toned thighs, Williams had to squeeze with his guards along the 7 1/2-foot-wide chamber's glass window just to get to the side of the gurney. There, he lay down slowly, and after the guards unlocked his wrists, he helpfully spread his arms along the gurney and became still. In two minutes, the team had him lashed down tight: black straps with buckles at his shoulders, chest, waist, knees and feet, and brown-leather Velcro straps at his wrists.

Williams stared straight up and his lips moved rapidly, praying quietly. At one point, a tiny tear slid down his cheek.

The three guards left, and five others walked in.

It was time to insert the needles.

Watching tensely the whole while were the 39 witnesses. They'd been marched into the witness room by a phalanx of guards a few minutes before midnight and placed in a half-circle around the death chamber -- 11 in chairs at the window, the rest on risers against three walls. It's impossible to tell who many witnesses are, because by prison rules nobody can move from their spot or talk, but they always consist of four groups: Supporters of the condemned man, supporters of his victims, 17 media representatives, and more than dozen law enforcement and legal officials.

In this execution, at least five were related to the four people Williams was convicted of killing -- convenience store clerk Albert Owens, 26, and motel owners Yen-I Yang, 76, Tsai-Shai Chen Yang, 63, and their daughter Yee-Chen Lin, 43. Prison sources said the victim witnesses were all from the Owens family.

The three who shouted on their way out were led by bushy-haired Barbara Becnel, co-author of his anti-gang books. Also witnessing on Williams' behalf were his attorney, Peter Fleming, and another lawyer.

Nobody said a word at first. Everybody stood rigidly.

The first catheter slid in messily at the crook of Williams' right elbow, taking just two minutes to seat but spurting so much blood at the needle point that a cotton swab was soaked, shining deep red before it was taped off.

Then came the real trouble. A medical technician, a woman with short black hair, had to poke for 11 minutes before her needle hit home.

At the first stick, at 12:04, Williams clenched his toes. At 12:05, he struggled mightily against the straps holding him down to look up at the press gallery behind him, dishing out a hard stare for six long seconds. By 12:10 a.m., the medical tech's lips were tight and white and sweat was pooling on her forehead as she probed Williams' arm.

"You guys doing that right?" Williams asked angrily, frustration clear on his face. The female guard whispered something back; it was hard to hear anything through the thick

glass walls of the death chamber. One guard, jaw clenched tightly, patted Williams' shoulder as if to comfort him.

Outside the chamber, Becnel stood with her two companions -- a woman and a man -- at the only window with a clear line of sight into Williams' eyes, and it was as if they were trying to will themselves right through the glass to stand alongside their friend. They thrust their fists up in what seemed to be a black power salute, and the man called out softly, "Tookie." They whispered "I love you" and "God bless you" as they looked adoringly into Williams' eyes.

Meanwhile, 10 feet away, Lora Owens sat stiffly, looking through the glass at the top of Williams' head. Her thick red hair never moved, and her mouth was a tight line. A blond woman sitting next to her put her arm around her, and then removed it and clasped her hands in her lap.

At 12:16 a.m., the second needle was inserted. His hands were taped, mummy-like, to the gurney arms. The guards hurried out the door and sealed it, leaving Williams alone with two clear intravenous lines snaking off his arms and into holes in the back wall of the death chamber.

At 12:18 a.m., a female prison guard loudly read off the warrant proclaiming that prisoner number C29300 had been sentenced to die and "the execution shall now proceed." Williams forced his head up one last time to stare into the eyes of his five friends -- and he kept it raised until he passed out 1 1/2 minutes later from the first salvo of chemicals, sodium pentothal to put him to sleep. Sorrow washed over the faces of Becnel and her female companion as his head sank, and they clasped their hands in prayer.

From there on it was a nail-biting vigil for everyone outside staring in. There was no way to know which chemicals were being administered because the plungers sending them into the intravenous tubes are pressed by unseen hands behind the chamber walls. Williams' chest heaved several times as he lay with his eyes closed, but somewhere in the 15 minutes from 12:20 to 12:35 a.m., the executioners filled his veins with pancuronium bromide to stop his breathing, then potassium chloride to stop his heart.

Finally, someone behind the walls called out, "He's flatlined," and it was over. A hand shoved a paper through a peephole in the witness room, a guard read off a quick statement affirming Williams' death, and 30 seconds later the room was cleared.

That's when the outburst happened. It was the first time since California restarted executions in 1992 that anybody had yelled or even spoken loudly during the grim procedure -- and as much as anything, that is what set this execution apart.

All of the other men killed by lethal injection lay so quietly on the gurney that, except for a few small movements, it was hard to tell if they were even awake. Even in the two gassings at San Quentin that preceded the injections, Robert Alton Harris and David Edwin Mason faced their ends stoically. The witnesses, too, have never done more than mouth a few silent words and cry quietly -- and the victim and prisoner advocates certainly never reacted to each other.

Williams and his friends were different.

It was like they were determined to get through his final minutes on Earth on their own terms -- even up to the tradition of the condemned man issuing a final statement. Williams, ever-defiant against the system he considered unfair, gave no final words to Warden Steve Ornoski, who said later that Williams chose instead to leave his final message with Becnel. Sources said she may reveal it at a funeral in Los Angeles on Tuesday.

The main complication in the death chamber this time was the excruciatingly long wait for the poisons to work. During the last execution, when triple-killer Donald Beardslee was killed in January, the actual injection process took four fewer minutes; injections for "Freeway Killer" William Bonin required only four minutes in 1996. But prison officials had an explanation.

He was a big man," Warden Steve Ornoski said in a post-execution briefing. The techs didn't have to administer extra shots of chemicals, he said; the poisons just needed time to work.

It made sense. Williams was the most muscular man put to death in the modern era of executions in California, and it appeared as if his bulky body was fighting off the inevitable, even after consciousness and the ability to move had fled.

This was not a man who went meekly.

---

*This was the sixth execution witnessed by Kevin Fagan. E-mail him at kfagan@sfchronicle.com.*

A look at California's 647 Death Row inmates

Here is a statistical summary of inmates sentenced to death in California.

By ethnicity

| | |
|---|---|
| White | 39.51% |
| Black | 35.34% |
| Hispanic | 18.98% |
| Other | 6.17% |

By age range

| | |
|---|---|
| 10-19 | 0% |
| 20-29 | 4.8% |
| 30-39 | 31.4% |
| 40-49 | 36.5% |
| 50-59 | 21.3% |
| 60-69 | 5.3% |
| 70-79 | 0.8% |
| 80-89 | 0% |
| 90 and above | 0% |

Figures as of December 2005. Numbers may not total 100% because of rounding

Executions Name, year executed and time spent on Death Row:

Robert Alton Harris (1992; 13 years, 1 month)

Keith Daniel Williams (1996; 17 years)
Robert Lee Massie (2001; 21 years, 10 months)
Darrell Keith Rich (2000; 19 years, 1 month)
Kelvin Malone* (1999; 15 years, 6 months)
Stephen Wayne Anderson (2002; 20 years, 6 months)
Donald Beardslee (2005; 20 years, 10 months)
Stanley Tookie Williams (2005; 24 years, 8 months)
William George Bonin (1996; 13 years, 1 month)
Manuel Babbitt (1999; 16 years, 10 months)
Jaturun Siripongs (1999; 15 years, 9 months)
David Edwin Mason (1993; 9 years, 7 months)
Thomas M. Thompson (1998; 14 years, 1 month)
* Extradited to Missouri and executed in that state.

By sentencing county

Bay Area totals

| County | Total | Percentage |
|---|---|---|
| Alameda | 86 | 13.3% |
| Santa Clara | 52 | 8.0 |
| Contra Costa | 34 | 5.3 |
| San Mateo | 28 | 4.3 |
| Sonoma | 8 | 1.2 |
| Napa | 4 | 0.6 |
| Solano | 4 | 0.6 |
| Marin | 2 | 0.3 |
| San Francisco | 2 | 0.3 |

Sources: California Department of Corrections, Associated Press

Page A - 12
URL: http://sfgate.com/cgi-bin/article.cgi?file=/c/a/2005/12/14/MNG05G7QMA1.DTL

# EXHIBIT 75

# EXHIBIT 75

# THE AMERICAN BOARD OF ANESTHESIOLOGY, INC.

**A Member Board of the American Board of Medical Specialties**

4208 Six Forks Road, Suite 900, Raleigh, North Carolina 27609-5753
Phone: (866) 999-7501 Fax: (866) 999-7503 Website: www.theABA.org


## Commentary (4/2/10)

## Anesthesiologists and Capital Punishment

The majority of states in the United States authorize capital punishment, and nearly all states utilize lethal injection as the means of execution. However, this method of execution is not always straightforward (1), and, therefore, some states have sought the assistance of anesthesiologists (2).

This puts anesthesiologists in an untenable position. They can assuredly provide effective anesthesia, but doing so in order to cause a patient's death is a violation of their fundamental duty as physicians to do no harm.

For decades the American Medical Association (AMA) has been opposed to physician involvement in capital punishment on the grounds that physicians are members of a profession dedicated to preserving life when there is hope of doing so (3). Effective February 15, 2010, the American Board of Anesthesiology (ABA) has incorporated the AMA's position on capital punishment into its professional standing requirements for all anesthesiologists who are candidates for or diplomates of the ABA (4). Thus, anesthesiologists may not participate in capital punishment if they wish to be certified by the ABA. What constitutes participation is clearly defined by the AMA's policy.

The ABA has not taken this action because of any position regarding the appropriateness of the death penalty. Anesthesiologists, like all physicians and all citizens, have different personal opinions about capital punishment. Nonetheless, the ABA, like the AMA, believes strongly that physicians should not be involved in capital punishment. The American Society of Anesthesiologists has also supported the AMA's position in this regard (5), as have others (6). Patients should never confuse the practice of anesthesiology with the injection of drugs to cause death. Physicians should not be expected to act in ways that violate the ethics of medical practice, even if these acts are legal.

In conclusion, the ABA's policy on capital punishment is intended to uphold the highest standards of medical practice and encourage anesthesiologists and other physicians to honor their professional obligations to patients and society.

Mark A. Rockoff, MD
Secretary, ABA

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3. American Medical Association Code of Medical Ethics, Opinion E-2.06 - Capital Punishment (June 2000). (Accessed March 9, 2010, at http://www.ama-assn.org/ama/pub/physician-resources/medical-ethics/code-medical-ethics/opinion206.shtml)

4. American Board of Anesthesiology professional standing policy: Anesthesiologists and capital punishment. (Accessed February 15, 2010, at http://www.theABA.org/Home/notices#punishment) and Newsletter of the American Society of Anesthesiologists 2010; 74(3): 49 (ASA Newsletter will be available online after April 1, 2010 at: http://www.asahq.org/Newsletters/NL%20Portal/march10.html)

5. Guidry OF. Message from the President: Observations regarding lethal injection. Newsletter of the American Society of Anesthesiologists. August, 2006. (Accessed March 9, 2010, at http://www.asahq.org/Newsletters/2006/08-06/guidry08-06.html)

6. Truog RD, Brennan TA. Participation of physicians in capital punishment. N Engl J Med 1993; 329: 1346-1350.

# E-2.06 Capital punishment

e-mail story | print story

An individual's opinion on capital punishment is the personal moral decision of the individual. A physician, as a member of a profession dedicated to preserving life when there is hope of doing so, should not be a participant in a legally authorized execution. Physician participation in execution is defined generally as actions which would fall into one or more of the following categories: (1) an action which would directly cause the death of the condemned; (2) an action which would assist, supervise, or contribute to the ability of another individual to directly cause the death of the condemned; (3) an action which could automatically cause an execution to be carried out on a condemned prisoner.

Physician participation in an execution includes, but is not limited to, the following actions: prescribing or administering tranquilizers and other psychotropic agents and medications that are part of the execution procedure; monitoring vital signs on site or remotely (including monitoring electrocardiograms); attending or observing an execution as a physician; and rendering of technical advice regarding execution.

In the case where the method of execution is lethal injection, the following actions by the physician would also constitute physician participation in execution: selecting injection sites; starting intravenous lines as a port for a lethal injection device; prescribing, preparing, administering, or supervising injection drugs or their doses or types; inspecting, testing, or maintaining lethal injection devices; and consulting with or supervising lethal injection personnel.

The following actions do not constitute physician participation in execution: (1) testifying as to medical history and diagnoses or mental state as they relate to competence to stand trial, testifying as to relevant medical evidence during trial, testifying as to medical aspects of aggravating or mitigating circumstances during the penalty phase of a capital case, or testifying as to medical diagnoses as they relate to the legal assessment of competence for execution; (2) certifying death, provided that the condemned has been declared dead by another person; (3) witnessing an execution in a totally nonprofessional capacity; (4) witnessing an execution at the specific voluntary request of the condemned person, provided that the physician observes the execution in a nonprofessional capacity; and (5) relieving the acute suffering of a condemned person while awaiting execution, including providing tranquilizers at the specific voluntary request of the condemned person to help relieve pain or anxiety in anticipation of the execution.

Physicians should not determine legal competence to be executed. A physician's medical opinion should be merely one aspect of the information taken into account by a legal decision maker such as a judge or hearing officer. When a condemned prisoner has been declared incompetent to be executed, physicians should not treat the prisoner for the purpose of restoring competence unless a commutation order is

Issued before treatment begins. The task of re-evaluating the prisoner should be performed by an independent physician examiner. If the incompetent prisoner is undergoing extreme suffering as a result of psychosis or any other illness, medical intervention intended to mitigate the level of suffering is



AA3471

ethically permissible. No physician should be compelled to participate in the process of establishing a prisoner's competence or be involved with treatment of an incompetent, condemned prisoner if such activity is contrary to the physician's personal beliefs. Under those circumstances, physicians should be permitted to transfer care of the prisoner to another physician.

Organ donation by condemned prisoners is permissible only if (1) the decision to donate was made before the prisoner's conviction, (2) the donated tissue is harvested after the prisoner has been pronounced dead and the body removed from the death chamber, and (3) physicians do not provide advice on modifying the method of execution for any individual to facilitate donation. (I)

Issued July 1980. Updated June 1994 based on the report "Physician Participation in Capital Punishment," adopted December 1992, (*JAMA*. 1993; 270: 365-368); updated June 1996 based on the report "Physician Participation in Capital Punishment: Evaluations of Prisoner Competence to be Executed; Treatment to Restore Competence to be Executed," adopted in June 1995; Updated December 1999; and Updated June 2000 based on the report "Defining Physician Participation in State Executions," adopted June 1998.

Last updated: Aug 15, 2005
Content provided by: Ethics





AA3472

# EXHIBIT 76

# EXHIBIT 76

IN THE SUPREME COURT OF THE STATE OF NEVADA

IN THE MATTER OF THE REVIEW OF ISSUES CONCERNING REPRESENTATION OF INDIGENT DEFENDANTS IN CRIMINAL AND JUVENILE DELINQUENCY CASES.

ADKT No. 411

FILED

OCT 16 2008

TRACIE K. LINDEMAN
CLERK OF SUPREME COURT
BY
CHIEF DEPUTY CLERK

ORDER

WHEREAS, the paramount obligation of criminal defense counsel is to provide zealous and competent representation at all stages of criminal proceedings, adhere to ethical norms, and abide by the rules of the court; and

WHEREAS, the performance standards attached as Exhibit A provide guidelines that will promote effective representation by both appointed and retained counsel;

IT IS HEREBY ORDERED that the performance standards contained in Exhibit A to this order are to be implemented effective April 1, 2009.

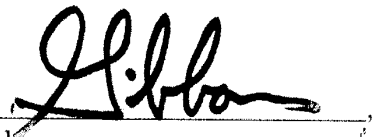
IT IS FURTHER ORDERED that an extension for Washoe County and Clark County to complete the weighted caseload studies is granted to May 15, 2009; and

IT IS FURTHER ORDERED that this court shall hold a public hearing at 2:00 p.m. on Tuesday, January 6, 2009, at which time the court will consider the final report from the Rural Issues Subcommittee; and

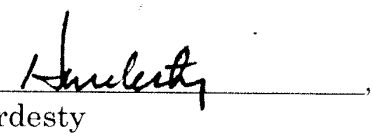
IT IS FURTHER ORDERED that representatives from Clark

County and Washoe County shall appear at the hearing scheduled for 2:00 p.m. on Tuesday, January 6, 2009, for a status report on the weighted caseload studies.

Dated this 15th day of October, 2008.



_____, C.J.
Gibbons



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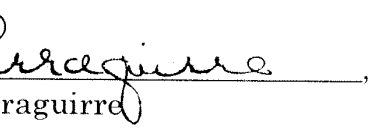

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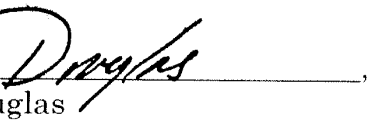
Parraguirre



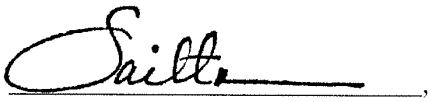
_____, J.
Douglas

cc: Members of the Indigent Defense Commission
Hon. Connie Steinheimer, Chief Judge, Second Judicial District
Howard W. Conyers, Washoe District Court Clerk
Hon. Kathy Hardcastle, Chief Judge, Eighth Judicial District
Ed Friedland, Court Executive Officer
All District Court Judges
All Justices of the Peace
All Justices' Court Administrators
All Municipal Court Judges
All District Attorneys
All Public Defenders
Washoe County Alternative Public Defender
Clark County Special Public Defender
All City Attorneys
Franny Forsman, Federal Public Defender
All County Managers
Administrative Office of the Courts

SAITTA, J., with whom, CHERRY, J., agrees, concurring in part and dissenting in part:

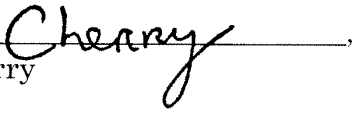
I concur with the majority's decision to adopt the performance standards but dissent, in part, with respect to the adoption of standards 2-11(b)(2), 4-9(e)(2) and 5-9(e)(2). It is well settled that deportation, as a consequence of conviction, does not affect the voluntariness of a guilty plea.[1] However, in my opinion, an attorney properly exercising his duty to the client is still obligated to advise of any and all consequences of a plea. Specifically, I believe that counsel should not only be required to advise the defendant of potential penalties in any criminal prosecution, but also circumstances involving forfeiture of assets, deportation and civil liabilities which may be affected by the acceptance of a plea offer. The majority standard fails to recognize the significance of this.

I also dissent from the majority with respect to the effective date of the adoption of these standards. I would make the standards effective January 1, 2009.



_____, J.
Saitta

I concur:



_____, J.
Cherry

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[1]Barajas v. State, 115 Nev. 440, 991 P.2d 474 (1999).

MAUPIN, J., concurring in part and dissenting in part:

I concur with the adoption of the revised performance standards[1] with three qualifications.

First, the adoption of performance standards 2-11(b)(2), 4-9(e)(2) and 5-9(e)(2) specifically omit any obligation to advise a criminal defendant of the collateral consequences of a plea of guilty to a criminal charge. This is seemingly based upon the notion, with which I disagree, that such an obligation would undermine case authority concerning the enforceability of such pleas. In any case, while collateral consequences do not of necessity affect the legal voluntariness of a guilty plea,[2] a criminal lawyer must still communicate with the client concerning any consequences of a guilty plea that are either known or should be known by the attorney in the reasonable exercise of his or her professional duties.[3] The standards adopted today by this court should acknowledge this fact.

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[1]This order revisits and revises the standards promulgated by our previous order in ADKT 411 entered January 4, 2008.

[2]See, e.g., Barajas v. State, 115 Nev. 440, 442, 991 P.2d 474, 475-76 (1999) (holding that potential deportation of criminal defendant is a collateral consequence that does not affect the voluntariness of a guilty plea).

[3]In Barajas, we also noted that "trial counsel's failure to provide such information does not fall below an objective standard of reasonableness" for the purposes of ineffective assistance of counsel. 115 Nev. at 442, 991 P.2d 475-76. While such failures do not compel the invalidation of guilty pleas for ineffective assistance of counsel under Strickland v. Washington, 466 U.S. 668 (1984), such failures still implicate a lawyer's general duty of care toward the client.

Second, with regard to performance standard 2-6, applicable to capital cases, it would seem fundamental that mitigation and psychological consultants should be part of any defense team in a capital case. Certainly, the absence of such support has been the repeated subject of prolonged and costly litigation in this court and in federal courts—much of which could be preempted by a performance standard mandating these consultants. Having said this, standard 2-6 does appear to be consistent with the United States Supreme Court case of Wiggins v Smith.[4]

Third, while the performance standards we adopt today could and probably should be made effective immediately, and while Justices Saitta and Cherry properly note that imposition should come sooner than later, the majority draws a reasonable compromise to allow providers of indigent defense services ample time to adjust to the impact of today's order.

Maupin, J.
Maupin

[4]539 U.S. 510 (2003).

# NEVADA INDIGENT DEFENSE
# STANDARDS OF PERFORMANCE

**Standard 1: Function of Performance Standards**

**(a)** These performance standards are designed to improve the quality of criminal defense representation in Nevada and provide objective guidelines for the allocation of resources for indigent defense.

**(b)** These standards are intended to serve as a guide for attorney performance in criminal cases at the trial, appellate and post-conviction level, and contain a set of considerations and recommendations to assist counsel in providing competent representation for criminal defendants. The standards also may be used as a training tool.

**(c)** Every attorney who defends persons accused of crime shall be familiar with these standards. The steps covered in these standards are not to be undertaken automatically in every case. Instead, the steps actually taken should be tailored to the requirements of a particular case. The standards recognize that the representation of criminal defendants is a difficult and complex responsibility. Attorneys must have the flexibility to choose a strategy and course of action that ethically "fits" the case, the client and the court proceeding.

**(d)** These standards are intended to facilitate the efficient and effective operation of indigent and other criminal defense programs and are to be used as a guide to professional conduct and performance. They are not intended to be used as criteria for the judicial evaluation of alleged misconduct of defense counsel to determine the validity of a conviction. Failure to adhere to the standards does not, in and of itself, constitute ineffective assistance of counsel. They may or may not be relevant in such judicial evaluation, depending upon all the circumstances. These standards are not intended to create substantive or procedural rights which might accrue either to the accused, or convicted persons, or to counsel. Nothing contained herein shall be construed to overrule, expand, or extend, whether directly or by analogy, the decision reached by the United States Supreme Court in Strickland v. Washington, 466 U.S. 668 (1984), nor its progeny as adopted by the Nevada Supreme Court.

## CAPITAL CASE REPRESENTATION

### Standard 2-1: The Defense Team and Services of Experts in Capital Cases

**(a)** The Defense Team

The defense team should:

1. consist of no fewer than two attorneys qualified in accordance with Standard 2-2.

**(b)** Expert and Ancillary Services

1. Counsel should:

(A) secure the assistance of all expert, investigative, and other ancillary professional services reasonably necessary or appropriate to provide competent legal representation at every stage of the proceedings, including but not limited to, an investigator, mitigation specialist and persons qualified by training and experience to screen individuals for the presence of mental or psychological disorders or impairments;

(B) have the right to have such services provided by persons independent of the government; and

(C) have the right to protect the confidentiality of communications with the persons providing such services to the same extent as would counsel paying such persons from private funds.

### Standard 2-2: Appointment, Retention, and Removal of Defense Counsel

**(a)** Qualifications of Defense Counsel

1. Consistent with Supreme Court Rules, the appointing authority should develop and publish qualification standards for defense counsel in capital cases. These standards should be construed and applied in such a way as to further the overriding goal of providing each client with competent legal representation.

2. In formulating qualification standards, the appointing authority should ensure that every attorney representing a capital client has:

(A) obtained a license or permission to practice in the jurisdiction;

(B) demonstrated a commitment to providing zealous advocacy and quality legal representation in the defense of capital cases; and

(C) satisfied the training requirements set forth in Standard 2-3.

3. The appointing authority should ensure that the pool of defense attorneys as a whole is such that each capital client within the jurisdiction receives competent legal representation. Accordingly, the qualification standards should ensure that the pool includes sufficient numbers of attorneys who have demonstrated:

(A) substantial knowledge and understanding of the relevant state, federal, and international law, both procedural and substantive, governing capital cases and skill in the management and conduct of complex negotiations and litigation;

(B) skill in legal research, analysis, and the drafting of litigation documents;

(C) skill in oral advocacy;

(D) skill in the use of expert witnesses and familiarity with common areas of forensic investigation, including fingerprints, ballistics, forensic pathology, and DNA evidence;

(E) skill in the investigation, preparation, and presentation of evidence bearing upon mental status;

(F) skill in the investigation, preparation, and presentation of mitigating evidence; and

(G) skill in the elements of trial advocacy, such as jury selection, cross-examination of witnesses, and opening and closing statements.

**(b)** Workload

The appointing authority should implement effectual mechanisms to ensure that the workload of attorneys representing clients in death penalty cases is maintained at a level that enables counsel to provide each client with competent legal representation in accordance with the Nevada Indigent Defense Standards of Performance.

**(c)** Monitoring; Removal

1. The appointing authority should monitor the performance of all defense counsel to ensure that the client is receiving competent legal representation. Where there is evidence that an attorney is not providing competent legal representation, the responsible agency should take appropriate action to protect the interests of the attorney's current and potential clients. The appointing authority shall not interfere with counsel's legal representation. Nor shall the appointing authority, if that is other than the judge, remove or attempt to remove an attorney from a specific case.

2. The appointing authority should establish and publicize a regular procedure for investigating and resolving any complaints made by judges, clients, attorneys, or others that defense counsel failed to provide competent legal representation.
3. The appointing authority should periodically review the rosters of attorneys who have been certified to accept appointments in capital cases to ensure that those attorneys remain capable of providing competent legal representation. Where there is evidence that an attorney has failed to provide competent legal representation, the attorney should not receive additional appointments and should be removed from the roster. Where there is evidence that a systemic defect in a defender office has caused the office to systemically fail to provide competent legal representation, the office should not receive additional appointments.
4. Before taking final action making an attorney or a defender office ineligible to receive additional appointments, the appointing authority should provide written notice that such action is being contemplated and give the attorney or defender office an opportunity to respond in writing.
5. An attorney or defender office sanctioned pursuant to this Standard should be restored to the roster only in exceptional circumstances.
6. The appointing authority should ensure that this standard is implemented consistently with standard 2-2, so that an attorney's zealous representation of a client cannot be cause for the imposition or threatened imposition of sanctions pursuant to this guideline.

**Standard 2-3: Training**

**(a)** Funds should be made available for the effective training, professional development, and continuing education of all members of the defense team who are employed by an institutional defender.
**(b)** Attorneys seeking to qualify to receive appointments should be required to satisfactorily complete a comprehensive training program in the defense of capital cases  Such a program should include, but not be limited to, presentations and training in the following areas:
1. relevant state, federal, and international law;
2. pleading and motion practice;

3. pretrial investigation, preparation, and theory development regarding guilt/innocence and penalty;

4. jury selection;

5. trial preparation and presentation, including the use of experts;

6. ethical considerations particular to capital defense representation;

7. preservation of the record and of issues for post-conviction review;

8. counsel's relationship with the client and his family;

9. post-conviction litigation in state and federal courts; and

10. the presentation and rebuttal of scientific evidence, and developments in mental health fields and other relevant areas of forensic and biological science.

**(c)** Attorneys seeking to remain on the appointment roster should be required to attend and successfully complete, at least once every 2 years, a specialized training program that focuses on the defense of death penalty cases.

**Standard 2-4: Funding and Compensation**

**(a)** The appointing authority must ensure funding for the full cost of competent legal representation by the defense team and outside experts selected by counsel, as defined by these guidelines,.

**(b)** Counsel in death penalty cases should be fully compensated at a rate that is commensurate with the provision of competent legal representation and reflects the extraordinary responsibilities inherent in death penalty representation.

1. Flat fees, caps on compensation, and lump-sum contracts are improper in death penalty cases.

2. Appointed counsel should be fully compensated for actual time and service performed at an hourly rate commensurate with the prevailing rates for similar services performed by retained counsel in the jurisdiction, with no distinction between rates for services performed in or out of court. Periodic billing and payment should be available.

**(c)** Non-attorney members of the defense team should be fully compensated at a rate that is commensurate with the provision of legal representation and reflects the specialized skills needed by those who assist counsel with the litigation of death penalty cases.

1. Mitigation specialists and experts retained by defender organizations should be compensated according to a salary scale that is commensurate with the salary scale for comparable expert services in the private sector.
2. Members of the defense team assisting private counsel should be fully compensated for actual time and service performed at an hourly rate commensurate with prevailing rates paid by retained counsel in the jurisdiction for similar services, with no distinction between rates for services performed in or out of court. Periodic billing and payment should be available.

**(d)** Additional compensation should be provided in unusually protracted or extraordinary cases.

**(e)** Counsel and members of the defense team should be fully reimbursed for reasonable incidental expenses.

**Standard 2-5: Obligations of Counsel Respecting Workload**

Counsel representing clients in death penalty cases should limit their caseloads to the level needed to provide each client with competent legal representation in compliance with the Nevada Indigent Defense Standards of Performance.

**Standard 2-6: Role of the Defense Team**

As soon as possible after appointment, counsel should assemble a defense team by selecting and making any appropriate contractual agreements with non-attorney team members in such a way that the team includes, if reasonably necessary and appropriate under the facts of the case and applicable case law:

**(a)** at least one mitigation specialist and one fact investigator;

**(b)** at least one member qualified by training and experience to screen individuals for the presence of mental or psychological disorders or impairments;

**(c)** any other members needed to provide competent legal representation; and

**(d)** at all stages demanding on behalf of the client all resources necessary to provide competent legal representation. If such resources are denied, counsel should make an adequate record to preserve the issue for further review.

**Standard 2-7: Relationship With the Client**

**(a)** Counsel at all stages of the case should:

IN THE SUPREME COURT OF THE STATE OF NEVADA
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|---|---|
| MARLO THOMAS,<br><br>Appellant,<br><br>v.<br><br>WILLIAM GITTERE, et al.,<br><br>Respondents. | No. 77345<br><br>District Court Case No. 96C136862-1<br><br>(Death Penalty Case) |

# APPELLANT'S APPENDIX

Volume 14 of 35

Appeal from Order Dismissing Petition for Writ of Habeas Corpus (Post-Conviction)
Eighth Judicial District Court, Clark County
The Honorable Stefany Miley, District Judge

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Federal Public Defender

JOANNE L. DIAMOND
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# INDEX

## CERTIFICATE OF SERVICE

I hereby certify that this document was filed electronically with the Nevada Supreme Court on June 14, 2019. Electronic Service of the foregoing APPELLANT'S APPENDIX shall be made in accordance with the Master Service List as follows:

Steven S. Owens
Chief Deputy District Attorney

/s/ *Jeremy Kip*
An Employee of the
Federal Public Defender,
District of Nevada

72. Instructions to the Jury (Penalty Phase), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862 (November 2, 2005)

73. Correspondence to Gary Taylor from Daniel Wong dated June 13, 2008, enclosing redacted copy of Confidential Execution Manual (Revised: October 2007)

74. Declaration of Mark J.S. Heath, M.D., including Attachments A-F

75. The American Board of Anesthesiology, Inc. Anesthesiologists and Capital Punishment (4/2/10); American Medical Association Policy E-2.06 Capital Punishment

76. Order, In the Matter of the Review of Issues Concerning Representation of Indigent Defendants in Criminal and Juvenile Delinquency Cases, In the Supreme Court of the State of Nevada ADKT No. 411 (October 16, 2008)

77. "Justice by the people", Jury Improvement Commission, Report of the Supreme Court of Nevada (October 2002)

78. 1977 Nevada Leg., 59th Sess., Senate Judiciary Committee, Minutes of Meeting (February 23, 1977)

79. Darrell Thomas Clark County School District Records

80. Information, State of Nevada v. Angela Colleen Love, District Court, Clark County, Nevada Case No. C121962 (August 8, 1994)

81. Judgment of Conviction, State of Nevada v. Angela Colleen Love, District Court, Clark County, Nevada Case No. C121962X (March 25, 1998)

82. U.S. Census Bureau, Profile of General Demographic Characteristics: 2000

83. 2010 Census Interactive Population Search: NV-Clark County

84. Editorial: Jury Pools are Shallow, The Las Vegas Sun (November 1, 2005)

85. The Jury's Still Out, The Las Vegas Sun, by Matt Pordum (October 30, 2005)

86. Editorial: Question of Fairness Lingers, The Las Vegas Sun (November 8, 2005)

87. Declaration of Adele Basye (June 29, 2017)

**Seated Jurors:**

88. Jury Questionnaire (Janet Cunningham), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

89. Jury Questionnaire (Janet Jones), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

90. Jury Questionnaire (Don McIntosh), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

91. Jury Questionnaire (Conne Kaczmarek), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

92. Jury Questionnaire (Rosa Belch), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

93. Jury Questionnaire (Philip Adona), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

94. Jury Questionnaire (Adele Basye), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

95. Jury Questionnaire (Jill McGrath), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

96. Jury Questionnaire (Ceasar Elpidio), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

97. Jury Questionnaire (Loretta Gillis), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

98. Jury Questionnaire (Joseph Delia), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

99. Jury Questionnaire (Christina Shaverdian), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

**Jury Alternates:**

100. Jury Questionnaire (Herbert Rice), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

101. Jury Questionnaire (Tamara Chiangi), State of Nevada v. Marlo Thomas, District Court, Clark County, Nevada Case No. C136862

**CERTIFICATE OF SERVICE**

In accordance with EDCR 7.26(a)(4) and 7.26(b)(5), the undersigned hereby certifies that on October 20, 2017, a true and accurate copy of the foregoing EXHIBITS IN SUPPORT OF PETITION FOR WRIT OF HABEAS CORPUS was filed electronically with the Eighth Judicial District Court and served by Odyssey EFileNV, addressed as follows:

Steven S. Owens
Chief Deputy District Attorney
motions@clarkcountyda.com
Eileen.davis@clarkcountyda.com

In accordance with EDCR 7.26(a)(1), the undersigned hereby certifies that on this October 20, 2017, a true and correct copy of the foregoing EXHIBITS IN SUPPORT OF PETITION FOR WRIT OF HABEAS CORPUS PURSUANT was served by United States Mail/UPS, postage prepaid, and addressed as follows:

Jeffrey M. Conner
Assistant Solicitor General
Office of the Nevada Attorney General
100 North Carson Street
Carson City, Nevada 8701-4717

Timothy Filson, Warden
Ely State Prison
P.O. Box 1989
Ely, Nevada 89301

*/s/ Jeremy Kip*
An Employee of the
Federal Public Defender,
District Of Nevada

# EXHIBIT 71

# EXHIBIT 71

MThomas-8JDC03783

INST

FILED IN OPEN COURT
JUN 18 1997
LORETTA BOWMAN, CLERK
BY Jean McKinley, Deputy

DISTRICT COURT
CLARK COUNTY, NEVADA

THE STATE OF NEVADA,

Plaintiff,

-vs-

MARLO THOMAS,
aka Marlow Demitrius Thomas,

Defendants.

Case No. C136862
Dept. No. VI
Docket B

INSTRUCTIONS TO THE JURY (INSTRUCTION NO. I)

MEMBERS OF THE JURY:

It is now my duty as judge to instruct you in the law that applies to this case. It is your duty as jurors to follow these instructions and to apply the rules of law to the facts as you find them from the evidence.

You must not be concerned with the wisdom of any rule of law stated in these instructions. Regardless of any opinion you may have as to what the law ought to be, it would be a violation of your oath to base a verdict upon any other view of the law than that given in the instructions of the Court.

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INSTRUCTION NO. 2

If, in these instructions, any rule, direction or idea is repeated or stated in different ways, no emphasis thereon is intended by me and none may be inferred by you. For that reason, you are not to single out any certain sentence or any individual point or instruction and ignore the others, but you are to consider all the instructions as a whole and regard each in the light of all the others.

The order in which the instructions are given has no significance as to their relative importance.

INSTRUCTION NO. 3

An Information is but a formal method of accusing a person of a crime and is not of itself any evidence of his guilt.

In this case, it is charged in an Information that on or between April 14, 1996, and April 15, 1996, the Defendant committed the following offenses:

COUNT I - CONSPIRACY TO COMMIT MURDER AND/OR ROBBERY

Defendants did, on or between April 14, 1996, and April 15, 1996, then and there meet with each other and between themselves, and each of them with the other, wilfully, unlawfully, and feloniously conspire to commit a crime, to-wit: murder and/or robbery, and in furtherance of said conspiracy, Defendants did commit the acts as set forth in Counts II, III, and IV, said acts being incorporated by this reference as though fully set forth herein.

COUNT II - MURDER WITH USE OF A DEADLY WEAPON (OPEN MURDER)

Defendants did, on or about April 15, 1996, then and there wilfully, feloniously, without authority of law, and with premeditation and deliberation, and with malice aforethought, kill CARL DIXON, a human being, by stabbing said CARL DIXON about the body with use of a deadly weapon , to-wit: a knife, the defendants being responsible under the following theories of criminal liability, to-wit: 1) premeditation: 2) felony murder during the perpetration or the attempted perpetration of the crime of robbery as set forth in Count IV; 3) by the defendants either directly committing the offense of murder and/or robbery, or aiding or abetting the commission of murder and/or robbery in the following manner, to-wit: both defendants confronting restaurant manger, VINCENT ODDO, with a firearm or with firearms and Defendant KENYA KEITA HALL, aka Kenya Love, taking money from VINCENT ODDO while Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, confronted restaurant employees CARL DIXON and MATTHEW GIANAKES to facilitate the taking of the money and thereafter Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, stabbing CARL DIXON and MATTHEW GIANAKES with a knife resulting in their deaths; each defendant being vicariously liable as members of a conspiracy to commit murder and/or robbery.

///

COUNT III - MURDER WITH USE OF A DEADLY WEAPON (OPEN MURDER)

Defendants did, on or about April 15, 1996, then and there wilfully, feloniously, without authority of law, and with premeditation and deliberation, and with malice aforethought, kill , MATTHEW GIANAKIS, a human being, by stabbing said MATTHEW GIANAKIS about the body with use of a deadly weapon , to-wit: a knife, the defendants being responsible under the following theories of criminal liability, to-wit: 1) premeditation: 2) felony murder during the perpetration or the attempted perpetration of the crime of robbery as set forth in Count IV; 3) by the defendants either directly committing the offense of murder and/or robbery, or aiding or abetting the commission of murder and/or robbery in the following manner, to-wit: both defendants confronting restaurant manger, VINCENT ODDO, with a firearm or with firearms and Defendant KENYA KEITA HALL, aka Kenya Love, taking money from VINCENT ODDO while Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, confronted restaurant employees CARL DIXON and MATTHEW GIANAKES to facilitate the taking of the money and thereafter Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, stabbing CARL DIXON and MATTHEW GIANAKES with a knife resulting in their deaths; each defendant being vicariously liable as members of a conspiracy to commit murder and/or robbery.

COUNT IV - ROBBERY WITH USE OF A DEADLY WEAPON

Defendants did, on or about April 15, 1996, then and there wilfully, unlawfully, and feloniously take personal property, to-wit: lawful money of the United States, from the person of VINCENT ODDO, or in his presence, by means of force or violence, or fear of injury to, and without the consent and against the will of the said VINCENT ODDO, said Defendants using a deadly weapon, to-wit: a firearm, during the commission of said crime; the defendants acting in concert with one another and the defendants directly committing the acts constituting the offense and/or the defendants aiding or abetting each other and/or the defendants directly or indirectly counseling, encouraging, hiring, commanding, inducing, or otherwise procuring each other to commit the acts constituting the offense, as evidenced by the conduct of the defendants before, during, and after the offense, wherein both defendants confronted restaurant manger VINCENT ODDO with a firearm or with firearms and Defendant KENYA KEITA HALL, aka

Kenya Love, taking money from VINCENT ODDO while Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, disabled two restaurant employees, thereby facilitating the taking of, and absconding with, the money; each Defendant being vicariously liable as members of a conspiracy to commit robbery.

COUNT V - BURGLARY WHILE IN POSSESSION OF A FIREARM

Defendants did, on or about April 15, 1996, then and there wilfully, unlawfully, and feloniously enter, while in possession of a firearm, with intent to commit larceny and/or robbery and/or murder and or some other felony, that certain building occupied by LONE STAR STEAKHOUSE, located at 3131 North Rainbow, Las Vegas, Clark County, Nevada.

COUNT VI - FIRST DEGREE KIDNAPPING WITH USE OF A DEADLY WEAPON

Defendants did, on or about April 15, 1996, wilfully, unlawfully, feloniously, and without authority of law, seize, confine, inveigle, entice, decoy, abduct, conceal, kidnap, or carry away CARL DIXON, a human being, with the intent to hold or detain the said CARL DIXON, against his will, and without his consent, for the purpose of committing robbery and/or murder and/or for the purpose of inflicting substantial bodily harm, said Defendants using a deadly weapon, to-wit: a firearm and/or a knife, during the commission of said crime; the defendants acting in concert with one another and the defendants directly committing the acts constituting the offense and/or the defendants aiding or abetting each other and/or the defendants directly or indirectly counseling, encouraging, hiring, commanding, inducing, or otherwise procuring each other to commit the acts constituting the offense, as evidenced by the conduct of the defendants before, during, and after the offense, wherein Defendant MARLO THOMAS, aka Marlow Demitrius Thomas, confined, or held, or detained CARL DIXON in the restroom of the Lone Star Steakhouse, 3131 North Rainbow, Las Vegas, Clark County, Nevada, while Defendant KENYA KEITA HALL, aka Kenya Love, was in the manager's office forcefully taking money from the restaurant manager, VINCENT ODDO; each defendant being vicariously liable as members of a conspiracy to commit murder and/or robbery and/or kidnapping.

It is the duty of the jury to apply the rules of law contained in these instructions to the facts of the case and determine whether or not the Defendant is guilty of one or more of the

offenses charged.

Each charge and the evidence pertaining to it should be considered separately. The fact that you may find the defendant guilty or not guilty as to one of the offenses charged should not control your verdict as to any other offense charged.

INSTRUCTION NO. 4

Conspiracy is an agreement or mutual understanding between two or more persons to commit a crime. To be guilty of conspiracy, a defendant must intend to commit, or to aid in the commission of, the specific crime agreed to. The crime is the agreement to do something unlawful; it does not matter whether it was successful or not.

A conspiracy to commit a crime does not end upon the completion of the crime. The conspiracy continues until the co-conspirators have successfully gotten away and concealed the crime.

INSTRUCTION NO. 5

It is not necessary in proving a conspiracy to show a meeting of the alleged conspirators or the making of an express or formal agreement. The formation and existence of a conspiracy may be inferred from all circumstances tending to show the common intent and may be proved in the same way as any other fact may be proved, either by direct testimony of the fact or by circumstantial evidence, or by both direct and circumstantial evidence.

INSTRUCTION NO. 6

Where several parties join together in a common design to commit any unlawful act, each is criminally responsible for the acts of his confederates committed in furtherance of the common design. In contemplation of law, the act of one is the act of all.

INSTRUCTION NO. 7

Any person who by day or night, enters any building with intent to commit larceny, Robbery, Kidnapping or Murder, is guilty of Burglary.

Every person who, in the commission of a burglary, commits any other crime, may be prosecuted for each crime separately.

INSTRUCTION NO. 8

Consent to enter is not a defense to the crime of burglary nor need there be a breaking into or a forced entry so long as it is shown that entry was made with the specific intent to commit a felony or with a larcenous intent.

The authority to enter a building extends only to those who enter with a purpose consistent with the reason the building is open to them. An entry with intent to commit a felony cannot be said to be within the authority granted customers or employees of a business establishment. The fact, therefore, that the establishment is open for business is not a defense to the charge of burglary so long as the defendant is shown to have made the entry with the specific intent to commit a felony. The intention with which entry was made is a question of fact, which may be inferred from the defendant's conduct and all other circumstances disclosed by the evidence.

INSTRUCTION NO. 9

You are instructed that if you find a defendant guilty of Burglary you must also determine whether or not the Defendant possessed a firearm during the commission of the Burglary.

INSTRUCTION NO. 10

If you find beyond a reasonable doubt that a defendant committed Burglary While in Possession of a Firearm, then you are instructed that the verdict of Burglary While in Possession of a Firearm is the appropriate verdict.

If, however, you find that a deadly weapon was not used in the commission of the Burglary, but you do find that a Burglary was committed, then you are instructed that the verdict of Burglary is the appropriate verdict.

You are instructed that you cannot return a verdict of both Burglary While in Possession of a Firearm and Burglary.

INSTRUCTION NO. 11

Robbery is the unlawful taking of personal property from the person of another, or in his presence, against his will, by means of force or violence or fear of injury, immediate or future, to his person or property, or the person or property of a member of his family, or of anyone in his company at the time of the robbery. A taking is by means of force or fear if force or fear is used to:

(a) Obtain or retain possession of the property;

(b) Prevent or overcome resistance to the taking; or

(c) Facilitate escape.

The degree of force used is immaterial if it is used to compel acquiescence to the taking of or escaping with the property. A taking constitutes robbery whenever it appears that, although the taking was fully completed without the knowledge of the person from whom taken, such knowledge was prevented by the use of force or fear.

INSTRUCTION NO. 12

You are instructed that if you find a defendant guilty of Robbery you must also determine whether or not a deadly weapon was used in the commission of this crime.

INSTRUCTION NO. 13

A deadly weapon is any weapon, device, instrument, material or substance which, under the circumstances in which it is used, attempted to be used or threatened to be used, is readily capable of causing substantial bodily harm or death.

INSTRUCTION NO. 14

If you find beyond a reasonable doubt that a defendant committed Robbery with the Use of a Deadly Weapon, then you are instructed that the verdict of Robbery with the Use of a Deadly Weapon is the appropriate verdict.

If, however, you find that a deadly weapon was not used in the commission of the Robbery, but you do find that a Robbery was committed, then you are instructed that the verdict of Robbery without the Use of a Deadly Weapon is the appropriate verdict.

You are instructed that you cannot return a verdict of both Robbery with the Use of a Deadly Weapon and Robbery without the Use of a Deadly Weapon.

INSTRUCTION NO. 15

Every person who willfully seizes, confines, inveigles, entices, decoys, abducts, conceals, kidnaps or carries away a person by any means whatsoever with the intent to hold or detain, or who holds or detains a person for the purpose of committing robbery and/or killing a person, and/or inflicting substantial bodily harm upon a person, shall be deemed guilty of kidnapping in the first degree.

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INSTRUCTION NO. 16

When associated with a charge of robbery or murder, kidnapping does not occur if the movement is incidental to the robbery and does not increase the risk of harm over and above that necessarily present in the commission of such offense.

INSTRUCTION NO. 17

If you find the defendant guilty of Kidnapping, you must also determine whether or not a deadly weapon was used in the commission of this crime.

INSTRUCTION NO. 18

If you find beyond a reasonable doubt that a defendant committed Kidnapping of the First Degree with the Use of a Deadly Weapon, then you are instructed that the verdict of Kidnapping of the First Degree with the Use of a Deadly Weapon is the appropriate verdict.

If, however, you find that a deadly weapon was not used in the commission of the Kidnapping, but you do find that a Kidnapping was committed, then you are instructed that the verdict of Kidnapping of the First Degree without the Use of a Deadly Weapon is the appropriate verdict.

You are instructed that you cannot return a verdict of both Kidnapping of the First Degree with the Use of a Deadly Weapon and Kidnapping of the First Degree without the Use of a Deadly Weapon.

INSTRUCTION NO. 19

Murder is the unlawful killing of a human being, with malice aforethought, whether express or implied. The unlawful killing may be effected by any of the various means by which death may be occasioned.

INSTRUCTION NO. 20

Malice aforethought means the intentional doing of a wrongful act without legal cause or excuse or what the law considers adequate provocation. The condition of mind described as malice aforethought may arise, not alone from anger, hatred, revenge or from particular ill will, spite or grudge toward the person killed, but may result from any unjustifiable or unlawful motive or purpose to injure another, which proceeds from a heart fatally bent on mischief or with reckless disregard of consequences and social duty. Malice aforethought does not imply deliberation or the lapse of any considerable time between the malicious intention to injure another and the actual execution of the intent but denotes rather an unlawful purpose and design in contradistinction to accident and mischance.

INSTRUCTION NO. 21

Express malice is that deliberate intention unlawfully to take away the life of a fellow creature, which is manifested by external circumstances capable of proof.

Malice may be implied when no considerable provocation appears, or when all the circumstances of the killing show an abandoned and malignant heart.

INSTRUCTION NO. 22

The intention to kill may be ascertained or deduced from the facts and circumstances of the killing, such as the use of a weapon calculated to produce death, the manner of its use, and the attendant circumstances characterizing the act.

INSTRUCTION NO. 23

Murder of the First Degree is murder which is (a) perpetrated by any kind of willful, deliberate and premeditated killing, or (b) committed in the perpetration of Burglary, or (c) committed in the perpetration of Robbery, or (d) committed in the perpetration of Kidnapping.

INSTRUCTION NO. 24

Premeditation is a design, a determination to kill, distinctly formed in the mind at any moment before or at the time of the killing.

Premeditation need not be for a day, an hour or even a minute. It may be as instantaneous as successive thoughts of the mind. For if the jury believes from the evidence that the act constituting the killing has been preceded by and has been the result of premeditation, no matter how rapidly the premeditation is followed by the act constituting the killing, it is willful, deliberate and premeditated murder.

INSTRUCTION NO. 25

There is a kind of murder which carries with it conclusive evidence of premeditation and malice aforethought. This class of murder is murder committed in the perpetration or attempted perpetration of Burglary, Robbery, and Kidnapping. Therefore, a killing which is committed in the perpetration or attempted perpetration of the felony of Burglary, Robbery, and Kidnapping is deemed to be Murder in the First Degree, whether the killing was intentional, unintentional or accidental. This is called the Felony-Murder rule.

Application of the Felony-Murder rule is not limited to the "victim" of the underlying felony and is applicable to all persons killed whether they themselves were being kidnapped, robbed or the victim of a burglary.

INSTRUCTION NO. 26

Although your verdict must be unanimous as to the charge, you do not have to agree on the theory of guilt. Therefore, even if you cannot agree on whether the facts establish premeditated murder or felony murder, so long as all of you agree that the evidence establishes the Defendant's guilt of murder in the first degree, your verdict shall be Murder of the First Degree.

INSTRUCTION NO. 27

You are instructed that if you find a defendant guilty of murder of the first degree, you must also determine whether or not a deadly weapon was used in the commission of this crime.

INSTRUCTION NO. 28

If you find beyond a reasonable doubt that a defendant committed Murder of the First Degree with the Use of a Deadly Weapon, then you are instructed that the verdict of Murder of the First Degree with the Use of a Deadly Weapon is the appropriate verdict.

If, however, you find that a deadly weapon was not used in the commission of the Murder, but you do find that a Murder was committed, then you are instructed that the verdict of Murder of the First Degree without the Use of a Deadly Weapon is the appropriate verdict.

You are instructed that you cannot return a verdict of both Murder of the First Degree with the Use of a Deadly Weapon and Murder of the First Degree without the Use of a Deadly Weapon.

INSTRUCTION NO. 29

The offense of First Degree Murder necessarily includes the lesser offense of Second Degree Murder.

If you are convinced beyond a reasonable doubt that the crime of murder has been committed by a defendant, but you have a reasonable doubt whether such murder was of the first or of the second degree, you must give the defendant the benefit of that doubt and return a verdict of murder of the second degree.

INSTRUCTION NO. 30

Murder of the Second Degree is murder with malice aforethought, but without the admixture of premeditation.

All murder which is not Murder of the First Degree is Murder of the Second Degree.

INSTRUCTION NO. 31

You are instructed that if you find a defendant guilty of murder of the second degree you must also determine whether or not a deadly weapon was used in the commission of this crime.

INSTRUCTION NO. 32

If you find beyond a reasonable doubt that a defendant committed Murder of the Second Degree with the Use of a Deadly Weapon, then you are instructed that the verdict of Murder of the Second Degree with the Use of a Deadly Weapon is the appropriate verdict.

If, however, you find that a deadly weapon was not used in the commission of the Murder, but you do find that a Murder was committed, then you are instructed that the verdict of Murder of the Second Degree without the Use of a Deadly Weapon is the appropriate verdict.

You are instructed that you cannot return a verdict of both Murder of the Second Degree with the Use of a Deadly Weapon and Murder of the Second Degree without the Use of a Deadly Weapon.

INSTRUCTION NO. 33

Every person concerned in the commission of a crime, whether he directly commits the act constituting the offense, or aids or abets in its commission, and whether present or absent, and every person who, directly or indirectly, counsels, encourages, hires, commands, induces or otherwise procures another to commit a crime is a principal, and shall be proceeded against and punished as such.

INSTRUCTION NO. 34

You are instructed that to aid and abet is defined as follows: the word "aid" means to help, assist, or strengthen; the word "abet" means to encourage, counsel, induce or assist.

INSTRUCTION NO. 35

You are instructed that presence, companionship, and conduct before and after the offense are circumstances from which one's participation in the criminal intent may be inferred. However, mere presence and companionship before and after the offense in and of itself is not sufficient to support a conviction.

INSTRUCTION NO. 36

In arriving at a verdict in this case as to whether the defendant is guilty or not guilty, the subject of penalty or punishment is not to be discussed or considered by you and should in no way influence your verdict.

If the Jury's verdict is Murder in the First Degree, you will, at a later hearing, consider the subject of penalty or punishment.

INSTRUCTION NO. 37

To constitute the crime charged, there must exist a union or joint operation of an act forbidden by law and an intent to do the act.

The intent with which an act is done is shown by the facts and circumstances surrounding the case.

Do not confuse intent with motive. Motive is what prompts a person to act. Intent refers only to the state of mind with which the act is done.

Motive is not an element of the crime charged and the State is not required to prove a motive on the part of the Defendant in order to convict. However, you may consider evidence of motive or lack of motive as a circumstance in the case.

INSTRUCTION NO. 38

The Defendant is presumed innocent until the contrary is proved. This presumption places upon the State the burden of proving beyond a reasonable doubt every material element of the crime charged and that the Defendant is the person who committed the offense.

A reasonable doubt is one based on reason. It is not mere possible doubt but is such a doubt as would govern or control a person in the more weighty affairs of life. If the minds of the jurors, after the entire comparison and consideration of all the evidence, are in such a condition that they can say they feel an abiding conviction of the truth of the charge, there is not a reasonable doubt. Doubt to be reasonable must be actual, not mere possibility or speculation.

If you have a reasonable doubt as to the guilt of the Defendant, he is entitled to a verdict of not guilty.

INSTRUCTION NO. 39

You are here to determine the guilt or innocence of the Defendant from the evidence in the case. You are not called upon to return a verdict as to the guilt or innocence of any other person. So, if the evidence in the case convinces you beyond a reasonable doubt of the guilt of the Defendant, you should so find, even though you may believe one or more persons are also guilty.

INSTRUCTION NO. 40

The evidence which you are to consider in this case consists of the testimony of the witnesses, the exhibits, and any facts admitted or agreed to by counsel.

There are two types of evidence; direct and circumstantial. Direct evidence is the testimony of a person who claims to have personal knowledge of the commission of the crime which has been charged, such as an eyewitness. Circumstantial evidence is the proof of a chain of facts and circumstances which tend to show whether the Defendant is guilty or not guilty. The law makes no distinction between the weight to be given either direct or circumstantial evidence. Therefore, all of the evidence in the case, including the circumstantial evidence, should be considered by you in arriving at your verdict.

Statements, arguments and opinions of counsel are not evidence in the case. However, if the attorneys stipulate to the existence of a fact, you must accept the stipulation as evidence and regard that fact as proved.

You must not speculate to be true any insinuations suggested by a question asked a witness. A question is not evidence and may be considered only as it supplies meaning to the answer.

You must disregard any evidence to which an objection was sustained by the court and any evidence ordered stricken by the court.

Anything you may have seen or heard outside the courtroom is not evidence and must also be disregarded.

INSTRUCTION NO. 41

The credibility or believability of a witness should be determined by his manner upon the stand, his relationship to the parties, his fears, motives, interests or feelings, his opportunity to have observed the matter to which he testified, the reasonableness of his statements and the strength or weakness of his recollections.

If you believe that a witness has lied about any material fact in the case, you may disregard the entire testimony of that witness or any portion of his testimony which is not proved by other evidence.

INSTRUCTION NO. 42

A witness who has special knowledge, skill, experience, training or education in a particular science, profession or occupation is an expert witness. An expert witness may give his opinion as to any matter in which he is skilled.

You should consider such expert opinion and weigh the reasons, if any, given for it. You are not bound, however, by such an opinion. Give it the weight to which you deem it entitled, whether that be great or slight, and you may reject it, if, in your judgment, the reasons given for it are unsound.

INSTRUCTION NO. 43

Although you are to consider only the evidence in the case in reaching a verdict, you must bring to the consideration of the evidence your everyday common sense and judgment as reasonable men and women. Thus, you are not limited solely to what you see and hear as the witnesses testify. You may draw reasonable inferences from the evidence which you feel are justified in the light of common experience, keeping in mind that such inferences should not be based on speculation or guess.

A verdict may never be influenced by sympathy, prejudice or public opinion. Your decision should be the product of sincere judgment and sound discretion in accordance with these rules of law.

INSTRUCTION NO. 44

When you retire to consider your verdict, you must select one of your number to act as foreperson who will preside over your deliberation and will be your spokesman here in court.

During your deliberation, you will have all the exhibits which were admitted into evidence, these written instructions and forms of verdict which have been prepared for your convenience.

Your verdict must be unanimous. As soon as you have agreed upon a verdict, have it signed and dated by your foreperson and then return with it to this room.

INSTRUCTION NO. 45

Now you will listen to the arguments of counsel who will endeavor to aid you to reach a proper verdict by refreshing in your minds the evidence and by showing the application thereof to the law; but, whatever counsel may say, you will bear in mind that it is your duty to be governed in your deliberation by the evidence as you understand it and remember it to be and by the law as given to you in these instructions, with the sole, fixed and steadfast purpose of doing equal and exact justice between the Defendant and the State of Nevada.

GIVEN: J Braverman
DISTRICT JUDGE

# EXHIBIT 72

# EXHIBIT 72

310

INST

FILED IN OPEN COURT
NOV - 2 2005 20
SHIRLEY B. PARRAGUIRRE, CLERK
BY Theresa Lee DEPUTY
THERESA LEE

DISTRICT COURT
CLARK COUNTY, NEVADA

THE STATE OF NEVADA,

Plaintiff,

-vs-

MARLO THOMAS,

Defendant.

Case No. C136862

Dept No. XV

INSTRUCTIONS TO THE JURY

(INSTRUCTION NO. 1)

MEMBERS OF THE JURY:

It is now my duty as judge to instruct you in the law that applies to this penalty hearing. It is your duty as jurors to follow these instructions and to apply the rules of law to the facts as you find them from the evidence.

You must not be concerned with the wisdom of any rule of law stated in these instructions. Regardless of any opinion you may have as to what the law ought to be, it would be a violation of your oath to base a verdict upon any other view of the law than that given in the instructions of the Court.

S14

INSTRUCTION NO. 2

If, in these instructions, any rule, direction or idea is repeated or stated in different ways, no emphasis thereon is intended by me and none may be inferred by you. For that reason, you are not to single out any certain sentence or any individual point or instruction and ignore the others, but you are to consider all the instructions as a whole and regard each in the light of all the others.

INSTRUCTION NO. 3

In the penalty hearing, evidence may be presented concerning aggravating and mitigating circumstances relative to the offense.

Hearsay is admissible in a penalty hearing.

MThomas-8JDC06491

INSTRUCTION NO. 4

The jury must find the existence of each aggravating circumstance, if any, unanimously and beyond a reasonable doubt.

The jurors need not find mitigating circumstances unanimously.

INSTRUCTION NO. 5

During the first portion of the penalty hearing, you will consider evidence relevant to the existence of aggravating circumstances and evidence relevant to the existence of mitigating circumstances. You must consider each type of evidence for its appropriate purposes.

In determining unanimously whether any aggravating circumstance has been proven beyond a reasonable doubt, you are to consider only evidence relevant to that aggravating circumstance.

In determining individually whether any mitigating circumstance exists, you are to consider only evidence relevant to that mitigating circumstance.

In determining individually whether any mitigating circumstances outweigh any aggravating circumstances, you are to consider only evidence relevant to any mitigating and aggravating circumstances.

If you find unanimously and beyond a reasonable doubt that at least one aggravating circumstance exists and each of you determines that any mitigating circumstances do not outweigh the aggravating, note this on the special verdict form.

If you do not decide unanimously that at least one aggravating circumstance has been proven beyond a reasonable doubt or if at least one of you determines that the mitigating circumstances outweigh the aggravating, note this on the special verdict form.

MThomas-8JDC06493

INSTRUCTION NO. 6

You are instructed that the following factors are circumstances by which Murder of the First Degree may be aggravated:

The murder was committed by a person who, at anytime before a penalty hearing is conducted, is or has been convicted of a felony involving the use or threat of violence to the person of another.

The murder was committed to avoid or prevent a lawful arrest or to effect an escape from custody.

The defendant has, in the immediate proceeding, been convicted of more than one offense of murder in the first or second degree.

INSTRUCTION NO. 7

Mitigating circumstances are those factors which, while they do not constitute a legal justification or excuse for the commission of the offense in question, may be considered, in the estimation of the jury, in fairness and mercy, as extenuating or reducing the degree of the Defendant's moral culpability.

In balancing aggravating and mitigating circumstances, it is not the mere number of aggravating circumstances or mitigating circumstances that controls.

INSTRUCTION NO. 8

Murder of the First Degree may be mitigated by any of the following circumstances, even though the mitigating circumstance is not sufficient to constitute a defense or reduce the degree of the crime:

1. The murder was committed while Marlo Thomas was under the influence of extreme mental or emotional disturbance or influence of drugs.

2. Marlo Thomas accepted responsibility for the crime.

3. Marlo Thomas was cooperative with the authorities and voluntarily gave a statement to the detective.

4. Marlo Thomas expressed or demonstrated remorse for the incident.

5. Marlo Thomas was raised without the benefit of a father figure.

7. Marlo Thomas has counseled others against criminal acts.

8. The Defendant suffered as a child and young adult with learning disabilities.

9. The Defendant suffered as a child and young adult with emotional disabilities.

10. Any other mitigating circumstances.

INSTRUCTION NO. 9

In determining whether mitigating circumstances exist, jurors have an obligation to make an independent and objective analysis of all the relevant evidence. Arguments of counsel or a party do not relieve jurors of this responsibility. Jurors must consider the totality of the circumstances of the crime and the defendant, as established by the evidence presented in the guilt and penalty phases of the trial. Neither the prosecution's nor the defendant's insistence on the existence or nonexistence of mitigating circumstances is binding upon the jurors.

INSTRUCTION NO. 10

A reasonable doubt is one based on reason. It is not mere possible doubt, but is such a doubt as would govern or control a person in the more weighty affairs of life. If the minds of the jurors, after the entire comparison and consideration of all the evidence, are in such a condition that they can say they feel an abiding conviction of the truth of the charge, there is not a reasonable doubt. Doubt to be reasonable must be actual, not mere possibility or speculation.

INSTRUCTION NO. 11

The jury is instructed that in determining the existence of aggravating circumstances as well as mitigating circumstances that it may consider all evidence introduced at both the penalty hearing phase of these proceedings and at the trial of this matter.

MThomas-8JDC06499

INSTRUCTION NO. 12

In your deliberation you may not discuss or consider the subject of guilt or innocence of a Defendant, as that issue has already been decided.

INSTRUCTION NO. 13

The credibility or believability of a witness should be determined by his manner upon the stand, his relationship to the parties, his fears, motives, interests or feelings, his opportunity to have observed the matter to which he testified, the reasonableness of his statements and the strength or weakness of his recollections.

If you believe that a witness has lied about any material fact in the case, you may disregard the entire testimony of that witness or any portion of his testimony which is not proved by other evidence.

INSTRUCTION NO. 14

Although you are to consider only the evidence in the case in reaching a verdict, you must bring to the consideration of the evidence your everyday common sense and judgment as reasonable men and women. Thus, you are not limited solely to what you see and hear as the witnesses testify. You may draw reasonable inferences from the evidence which you feel are justified in the light of common experience, keeping in mind that such inferences should not be based on speculation or guess.

A verdict may never be influenced by prejudice or public opinion. Your decision should be the product of sincere judgment and sound discretion in accordance with these rules of law.

INSTRUCTION NO. 15

During your deliberation, you will have all the exhibits which were admitted into evidence, these written instructions and forms of verdict which have been prepared for your convenience.

INSTRUCTION NO. 16

The Court has submitted three sets of verdicts to you. One set is for a determination of the existence of an aggravating circumstance. The second set is for a determination of the existence of mitigating circumstances. The third set is for a determination of weight to be given the aggravating and/or mitigating circumstances.

INSTRUCTION NO. 17

Now you will listen to the arguments of counsel who will endeavor to aid you to reach a proper verdict by refreshing in your minds the evidence and by showing the application thereof to the law; but, whatever counsel may say, you will bear in mind that it is your duty to be governed in your deliberation by the evidence as you understand it and remember it to be and by the law as given to you in these instructions, with the sole, fixed and steadfast purpose of doing equal and exact justice between the Defendant and the State of Nevada.

GIVEN: Nov 3, 2005 Sally Loehrer
DISTRICT JUDGE

# EXHIBIT 73

# EXHIBIT 73

STATE OF NEVADA
OFFICE OF THE ATTORNEY GENERAL
TRANSPORTATION DIVISION
1263 South Stewart Street
Carson City, Nevada 89712

CATHERINE CORTEZ MASTO
*Attorney General*

KEITH MUNRO
*First Assistant Attorney General*

DANIEL WONG
*Chief Deputy Attorney General*

June 13, 2008

Gary Taylor
Assistant Federal Public Defender
411 East Bonneville Avenue, Suite 250
Las Vegas, Nevada 89101

Re: Confidential Execution Manual

Dear Gary:

I apologize for the delay in getting this to you.

Accompanying this cover letter, please find a redacted copy of the Nevada Department of Correction's current Confidential Execution Manual. The redacted portions cannot be released due to security concerns and issues. My records show I previously provided to you a copy of the revised Section IV Execution Procedure – Revised October 2007 on or about October 2, 2007.

Sincerely,

CATHERINE CORTEZ MASTO
Nevada Attorney General

By _____
Daniel Wong
Chief Deputy Attorney General / Chief Counsel
Transportation Division
(775) 888-7423

cc: Rex Reed, Nevada Department of Corrections
DW/CJS
Enc.

L:\004LegalManager\Carol\Wong\Correspondence\Taylor ltr re Execution Manual.doc

# CONFIDENTIAL

# EXECUTION

# MANUAL

**PROCEDURES FOR EXECUTING THE DEATH PENALTY**

**NEVADA STATE PRISON**

# CONFIDENTIAL

REVISED: February 2004

Section I.

AUTHORITY – NEVADA REVISED STATUTES

**NRS 176.345 Proceedings when conviction carries death penalty.**

1. When a judgement of death has been pronounced, a certified copy of the judgment of conviction must be forthwith executed and attested in triplicate by the clerk under the seal of the court. There must be attached to the triplicate copies a warrant signed by the judge, attested by the clerk, under the seal of the court, which:
   a. Recites the fact of the conviction and judgment;
   b. Appoints a week, the first day being Monday and the last day being Sunday, within which the judgment is to be executed, which must not be less than 60 days nor more than 90 days from the time of judgment; and
   c. Directs the sheriff to deliver the prisoner to such authorized person as the director of the department of prisons designates to receive the prisoner, for execution. The prison must be designated in the warrant.
2. The original of the triplicate copies of the judgment of conviction and warrant must be filed in the office of the county clerk, and two of the triplicate copies must be immediately delivered by the clerk to the sheriff of the county. One of the triplicate copies must be delivered by the sheriff, with the prisoner, to such authorized person as the director of the department of prisons designates, and is the warrant and authority of the director for the imprisonment and execution of the prisoner, as therein provided and commended. The director shall return his certified copy of the judgment of conviction to the county clerk of the county in which it was issued. The other triplicate copy id the warrant and authority of the sheriff to deliver the prisoner to the authorized person designated by the director. The final triplicate copy must be returned to the county clerk by the sheriff with his proceedings endorsed thereon.

**NRS 176.355 Execution of death penalty: Method; time and place; witnesses.**

1. The judgment of death must be inflected by an injection of lethal drug.
2. The director of the department of prisons shall:
   a. Execute a sentence of death within the week, the first day being Monday and the last day being Sunday, that the judgement is to be executed, as designated by the district court. The director may execute the judgment at any time during that week if a stay of execution is not entered by a court of appropriate jurisdiction.
   b. Select the drug or combination of drugs to be used for the execution after consulting with the state health officer.
   c. Be present at the execution.
   d. Notify those members of the immediate family of the victim who have, pursuant to NRS 176.357, requested to be informed of the time, date and place scheduled for the execution.
   e. Invite a competent physician, the county coroner, a psychiatrist and not less than six reputable citizens over the age of 21 years to be present at the execution. The director

shall give preference to those eligible members or representatives of the immediate family of the victim who requested, pursuant to NRS 176.357, to attend the execution.

3. The execution must take place at the state prison.
4. A person who has not been invited by the director may not witness the execution.

**NRS 176.357 Request for notification of execution of death penalty; request to attend.**

1. If after a conviction for murder a judgment of death has been pronounced, each member of the immediate family of the victim who is 21 years of age or older may submit a written request to the director to be informed of the time, date and place scheduled for the execution of the sentence of death. The request for notification may be accompanied by a written request to attend or nominate a representative to attend the execution.
2. As used in this section, "immediate family" means persons who are related by blood, adoption or marriage, within the second degree of consanguinity or affinity.

**NRS 176.365 Director of department of corrections to make return on death warrant.**
After the execution, the director of the department of prisons must make a return upon the death warrant to the court by which the judgment was rendered, showing the time, place, mode and manner in which it was executed.

**NRS 176.495 New warrant generally.**

1. If for any reason a judgement of death has not been executed, and it remains in force, the court in which the conviction was had must, upon the application of the attorney general or the district attorney of the county in which the conviction was had, cause another warrant to be drawn, signed by the judge and attested by the clerk under the seal of the court, and delivered to the director of the department of prisons.
2. The warrant must state the conviction and judgment and appoint a week, the first day being Monday and the last day being Sunday, within which the judgement is to be executed. The first day of that week must be not less than 15 days nor more than 30 days after the date of the warrant. The director shall execute a sentence of death within the week the judgment is to be executed, as designated by the district court. The director may execute the judgment at any time during that week if a stay of execution is not entered by a court of appropriate jurisdiction.
3. Where sentence was imposed by a district court composed of three judges, the district judge before whom the confession or plea was made, or his successor in office, shall designate the week of execution, the first day being Monday and the last day being Sunday, and sign the warrant.

**NRS 454.213 Authority to possess and administer dangerous drug.**

9. Any person designated by the head of a correctional institution.

**NRS 454.221 Furnishing dangerous drug without prescription prohibited; penalty; exceptions.**

1. A person who furnishes any dangerous drug except upon the prescription of a practitioner is guilty of a category D felony and shall be punished as provided in NRS 193.130, unless the dangerous drug was obtained originally by a legal prescription.
2. The provisions of this section do not apply to the furnishing of any dangerous drug by:

f. A pharmacy in a correctional institution to a person designated by the director of the department of prisons to administer a lethal injection to a person who has been sentenced to death.

Exception

In the case of a female person, upon whom has been imposed the judgment of death, such person shall be delivered to the Warden of the Southern Nevada Women's Correctional Facility and there to be held pending decision upon appeal. Upon exhausting the appeal process, the female person sentenced to death shall be delivered to the Warden of the Nevada State Prison at [redacted] In the event of an eleventh hour commutation of sentence, said female prisoner shall be returned to the Southern Nevada Women's Correctional Facility, there to be confined pursuant to such commutation.

Section II.

OVERVIEW OF THE DAY OF EXECUTION

At approximately 10:30 a.m. (all times are approximate and may be adjusted on an "as needed" basis) on the day of the execution, the assigned sergeant and [redacted] observation officers will report to the condemned man's living unit. They will take with them two complete sets of new state-issue clothing, which have been searched by the sergeant. They will enter the unit and proceed to the cell of the condemned inmate. The condemned inmate will not be allowed to bring with him any personal items. All of the inmate's personal property will be thoroughly searched by the sergeant, who will also fill out an inventory sheet, which will be counter signed by the condemned inmate. His personal property will be disposed of in accordance with departmental procedures. He will then be allowed to eat lunch at approximately [redacted] After being positively identified, the condemned inmate will then be taken to the unit office where he will be stripped and body searched. He will then put on one set of new clothing, consisting of a pair of jeans, shirt, socks, underwear and tennis shoes. The inmate will be placed in leg and wrist restraints, and escorted to the last night cell area by the [redacted] observation officers. Direct sight coverage will be maintained by the officers of the condemned inmate when he is moved into the last night cell. The second set of clothing will be stored in the last night cell area.

Should the inmate have a radio and/or TV set, they will not be allowed to be placed in the cell but will be in the outer corridor of the cell. He will then be introduced to the [redacted] observation officers (one of the officers is relief). Following the inmate being placed in the last night cell area he will again be positively identified by a staff identification officer and the Associate Warden of Operations.

The inmate will be informed that his dinner will be served at approximately [redacted] He will also be asked who his spiritual advisor is and if he desires a visit from him or the Institutional Chaplain. The Institutional Chaplain will be assigned to the Nevada State Prison the day before the execution and the day of the execution.

At approximately 4:00 – 4:30 p.m., his dinner will be brought from the Culinary of the Nevada State Prison by a sergeant and [redacted] The dinner will be personally prepared by [redacted] and such preparation shall be witnessed by the Culinary officer. Coffee will be available throughout the night.

[redacted]

Note: In the event that more than one inmate is scheduled for execution on the same day, [redacted] observation officers will be utilized.

Following the completion of dinner, until two hours prior to the time set for execution, the inmate may receive visits from his spiritual advisor, the Director, and the Warden. The observation officers will remain in the institution from the start of the observation ~~officers~~ until

the execution is completed. Any other visitors, except as mentioned above, must be approved by the Director.

The inmate will be allowed to send out last letters to the news media and his family. Requests other then those above must be processed through the Nevada State Prison Warden for his approval.

At no time will the condemned inmate be out of visual observation of the observation officers.

Section III.

LIST OF NEEDED EQUIPMENT AND MATERIALS (MAY VARY)

1. Portable stretcher, equipped with restraining straps, one blanket and one pillow.
2. Cardiac monitor. **
3. One stop watch, one stethoscope, one pair surgical shears, and one pocket flashlight.
4. Two medium straight hemostats.
5. Two tourniquets, adhesive tape, both narrow and wide, one roll of gauze, several gauze pads, alcohol, sponges, and tongue depressor.
6. Two intravenous flasks (500 ml each) containing normal saline.
7. Three 10 ml syringes containing the necessary amount of Pavulon, clearly marked.
8. Three 140 ml syringes containing the necessary amount of Sodium Thiopental, clearly marked.
9. Three 140 ml syringes containing the necessary amount of Potassium Chloride, clearly marked.
10. Six 30 cc vials of Sodium Chloride for Diluent, (for mixing drugs).
11. Two 18-gauge intercath needles, 1 ¾" long.
12. Two standard fluid administration tubing sets with "Y" injection site.
13. Two extension sets.
14. Two 60 cc syringes (for mixing drugs).
15. Two 3 cc syringes with 21 gauge, 1 ½" needles attached.
16. Two injection needles, 20 gauge 2".
17. One 18 gauge 1 ½" needles (mixing medication).
18. Sterile cut-down tray if necessary.
19. Four syringes containing 10 mg. of Valium each.
20. Blood spill kit.

Note: In the event of two or more inmates being scheduled for execution on the same day, the above listed items will be provided for each inmate, with the exception of those indicated by ** which will require only one.

Drugs of Choice

The lethal substances and amounts to be used in the execution are:

1. Sodium Thiopental 5 grams.
2. Pavulon 20 milligrams.
3. Potassium Chloride 160 milliequivalents.

Personal differences exist. At times dosages have to be increased for certain individuals, although the above doses are lethal for most individuals. It will be the responsibility of the physician, working in conjunction with the staff pharmacist, to ensure that the above is sufficient to cause death.

NOTE: In the event of two or more inmates being scheduled for execution on the same day, the above listed items will be provided for each inmate.

Section IV.

EXECUTION PROCEDURE

The condemned inmate shall be pre-medicated with a sedative approximately four hours and one hour before the Execution is scheduled to occur. This sedative pre-medication is mandatory.

Medical services personnel will administer the sedative pre-medication orally. This sedative pre-medication is intended to provide a calming affect and shall not cause any lack of cognitive ability, incoherency or incompetence. A physician will determine the appropriate sedative and dosage.

A five-member security team will relieve the observation commander and the three observation officers approximately one hour prior to the time of Execution.

The window shades of the Execution Chamber shall be raised prior to the condemned inmate entering the Execution Chamber. Prior to the time of Execution, the condemned inmate will be escorted into the Execution Chamber by one supervisor and three officers. The condemned inmate will be placed on the table and the restraints will be secured. The window shades inside the Execution Chamber will remain raised during the Execution procedure.

Appropriate medical services personnel will perform the actual venipuncture. Venipuncture will occur into the veins of both arms. Once the venipunctures are completed, the needles will be taped securely into place and will be checked for patency. If the venipuncturist is unable to find an adequate vein in an arm, the venipuncture will occur into the vein of a leg. Once the venipunctures are completed, a stethoscope (if necessary) and cardiac monitor will be attached by the security team commander and checked to ensure they are functioning correctly. The medical services personnel will then leave the Execution Chamber.

A normal saline solution will then be infused at a slow rate in order to keep the system clear.

Three syringes - one each containing the appropriate doses of Sodium Thiopental, Pavulon and Potassium Chloride – constituting one set will be available. Three sets will be available.

The lethal injections shall be administered individually by syringe into a "Y" injection site of the intravenous tubing. The order of injection shall be first – Sodium Thiopental, second – Pavulon, and third – Potassium Chloride. At the order of the Director to proceed, the lethal injections will be administered at a rapid rate. Once started, the lethal injections will continue until all three syringes of two sets are administered and emptied. The first syringe of the first set and the first syringe of the second set will be administered simultaneously. The second syringe of both sets will be administered simultaneously. The third syringe of both sets will be administered simultaneously.

Once the lethal injections have been administered, the attending physician or designee and coroner shall then determine whether it was sufficient to cause death. If the previous lethal injections are determined to be insufficient to cause death, the third set of lethal injections shall be administered.

Once the death pronouncement has been made, all witnesses, observers and media personnel will be escorted from the Execution Chamber viewing area. All unused lethal injection solutions shall be handled in a most careful manner and returned to the Pharmacy to be inventoried and disposed of appropriately. The disposition of all solutions will be recorded including how much was used and how much was discarded.

NOTE: A physician may examine the condemned inmate prior to the scheduled Execution to determine if it might be necessary to utilize a vein in the leg for the venipuncture, or if there is an indication that a cut-down may be necessary.

Revised October 2007.

Section V.

WITNESS PROCEDURE

Nevada law requires there be at least six, but no more than nine, witnesses to attend an execution. The Director must approve all witnesses and/or other persons to be present.

NOTE: Instead of being on-call, a deputy from the Attorney General's office will be present at Nevada State Prison from 8:00 p.m. until the execution is over.

The witnesses will arrive at the institution approximately one hour prior to the execution and be escorted to the Visiting Room. Each witness will be given an I.D. card.

Approximately 25 minutes before the scheduled execution time the Associate Warden of Programs will escort the witnesses to the execution chamber via the Unit 3 (Cellhouse) entrance. When the escort reaches the bottom of the stairs, the witness group will proceed into Unit 3 and up the stairs and into the witness room. The witnesses will not be allowed to take any cameras, recording devices, or any personal items into the witness area.

None of the personnel involved in the execution will be in sight, and all blinds to the chamber will be closed. When all witnesses are in the witness area, the AWO will notify the PIO in the Courthouse. The PIO will then escort the media witnesses to the witness area utilizing the same route used by the AWP. The 217 door leading to the witness room will be closed but it is not necessary to lock it. The shades will then be raised and the inmate will be escorted into the chamber and secured on the table. ~~The shades will then be drawn.~~

~~Once the venipuncture and attachment of the stethoscope and cardiac monitor has been completed, the security team commander will raise the shades so the witnesses may view the execution.~~ The spiritual advisor will be allowed to witness the execution from the west execution chamber window. When the physician and coroner have declared the inmate dead, the shades will be drawn.

The media witnesses will then be escorted out of the chamber area and out of the institution. The official witnesses will then complete the affidavits provided by the AWP. Following completion of these affidavits, the AWP will escort the witnesses out of the institution.

NOTE: In the event two or more inmates are scheduled for execution on the same day, the witnesses will be escorted to the Visiting Room between executions and will be executed back to the execution chamber prior to the second execution following the same procedure listed above. Members of the media will be allowed to exit NSP to the area outside the fence between executions if they wish to do so. They will then be escorted back to the execution chamber area by the PIO as outlined above.

The Associate Warden of Operations will be provided with a body receipt in triplicate that will be completed when the mortician accepts delivery of the body.

The death certificate will be completed by the attending physician and the coroner will also complete his/her section of the death certificate. It shall be the Associate Warden of Operations' responsibility to ensure these documents are completed and accurate.

Following the completion of all required forms, the body will be released to the mortician. After the body has been loaded into the call car, the call car will exit through the maintenance gate. After a security inspection is completed the vehicle will exit NSP property.

Section VI.

EXTRA DUTY STATIONS AND SECURITY PLAN FOR THE EXECUTION OF THE DEATH PENALTY

The following plan of action has been designated to provide for complete security coverage of the Nevada State Prison during an execution of the death penalty.

[redacted]

Section VII.

INTERNAL CONTROL PLAN

[redacted]

Section VIII.

POST-EXECUTION PROCEDURE

[redacted]

Immediately following the execution of the death penalty, the body shall be removed and turned over to the attending mortician, following the procedures for the death of an inmate.

NOTE: In the event two or more executions are scheduled for the same day, a separate vehicle as outlined above will be required for each inmate.

All disposable equipment, including needles, tubing, etc., will be turned over to the prison pharmacist for proper disposal within one working day. If unavailable, then they will be secured in the NSP pharmacy until the next business day.

Unopened solutions or drugs will be turned over to the prison pharmacist for proper handling within one working day. If unavailable, then they will be secured in the NSP pharmacy until the next business day.

The disposition of all solutions is to be recorded, as to the amount used and the amount discarded. The number of solutions that were utilized will be recorded by volume, and those that were turned over to the pharmacist, will also be recorded by number and volume.

The security team will have the responsibility of cleaning the execution chamber.

All staff directly involved in the execution will meet in the Courthouse with the designated clergy members, at which time, a debriefing will be conducted as well as psych counseling will be provided.

It shall be the responsibility of the Associate Warden of Operations to release all of the officers on overtime status and the decision will be based on the situation, as he/she perceives it.

Section IX.

COMMUTATION OR STAY OF EXECUTION

It must be understood that once infusion of the lethal injection has begun that the execution cannot be stopped.

In the event of an eleventh hour stay of execution, all preparations will cease and the Director will be immediately notified by the Warden.

If the condemned inmate has already been taken to the execution chamber, he/she shall be returned to the last night cell and all personnel shall remain on duty until released by the Associate Warden of Operations.

The on-call Deputy Attorney General, if not present at the institution, shall be notified of the situation as soon as possible. The availability of the on-call Deputy Attorney General shall be coordinated by the AWP at NSP and the Chief Deputy of the Criminal Division of the Attorney General's office.

Section X.

SAMPLE OF FORMS USED DURING THE EXECUTION PROCESS

A. Execution Checklist

B. Execution Position Assignments

C. Affidavit

D. I.D. Department Identification Form

E. Letters of Agreement – Medical Services

F. Telephone Logs

G. Radio communications Assignment Memo [redacted]

H. Report and Schedule of Execution, Exhibit "A" (Time Keeper Checklist)

I. Maps - Nevada State Prison
- Execution Chamber
- NSP Parking Lot

# EXHIBIT 74

# EXHIBIT 74

**Declaration of Mark J. S. Heath, M.D.**

I, Mark J.S. Heath, M.D., hereby declare as follows:

1. I am an Assistant Professor of Clinical Anesthesiology at Columbia University in New York City. I received my Medical Doctorate degree from the University of North Carolina at Chapel Hill in 1986 and completed residency and fellowship training in Anesthesiology in 1992 at Columbia University Medical Center. I am Board Certified in Anesthesiology, and am licensed to practice Medicine in New York State. My work consists of approximately equal parts of performing clinical anesthesiology, teaching residents, fellows, and medical students, and managing a neuroscience laboratory. As a result of my training and research I am familiar and proficient with the use and pharmacology of the chemicals used to perform lethal injection. I am qualified to do animal research at Columbia University and am familiar with the American Veterinary Medical Association's guidelines.

2. Over the past several years, as a result of concerns about the mechanics of lethal injection as practiced in the United States, I have performed many hundreds of hours of research into the techniques that are used during this procedure. I have testified as an expert medical witness in courts in Maryland, Georgia, Tennessee, Kentucky, Virginia, and Louisiana in the following actions: *Baker v. Saar*, No. WDQ-05-3207 (D. Md.); *Evans v. Saar*, No. 1:06-CV-00149-BEL, (D. Md.);
*Reid v. Johnson*, No. 3:03cv1039 (E.D. Va.); *Abdur'Rahman v. Bredesen*, No. 02-2236-III (Davidson County Chancery Ct., Tenn.); *State v. Michael Wayne Nance*, 95-B-2461-4 (Ga. Superior Ct.); *Ralph Baze & Thomas Bowling v. Rees*, 04-CI-01094 (Franklin County Circuit Ct., Ky.); *Taylor v. Cawford*, 05-4173-CV-C-FJG (W.D. Mo.); and *State v. Nathanial Code*, No.138860, (1st Judicial D. Ct. of LA for Caddo Parish 2003). I have filed affidavits that have

been reviewed by courts in the above states and also in California, Pennsylvania, New York, Alabama, North Carolina, South Carolina, Ohio, Oklahoma, Texas, Missouri, and by the United States Supreme Court.

3. During court proceedings, I have heard testimony from prison wardens who are responsible for conducting executions by lethal injection. I have testified before the Nebraska Senate Judiciary Committee regarding proposed legislation to adopt lethal injection. I have testified before the Pennsylvania Senate Judiciary Committee regarding proposed legislation to prohibit the use of pancuronium and the other neuromuscular blockers in Pennsylvania's lethal injection protocol. My research regarding lethal injection has involved both extensive conversations with recognized experts in the field of lethal injection, toxicology, and forensic pathology and the exchange of personal correspondence with the individuals responsible for introducing lethal injection as a method of execution in Oklahoma (the first state to formulate the procedure) and in the United States.

4. My qualifications are further detailed in my curriculum vitae, a copy of which is attached hereto as Exhibit A and incorporated by reference as if fully rewritten herein.

5. I have been asked by counsel for Edward Lee Beets to review the procedures concerning lethal injection currently in place in Nevada to assess whether there is a risk of the inmate experiencing pain and suffering while the lethal injection is administered. I hold all opinions expressed in this Declaration to a reasonable degree of medical certainty, except as specifically noted at the end of paragraph 35, where I make a speculative comment.

6. I have reviewed the Nevada Department of Corrections' "Confidential Execution Manual."

7. In addition, I have reviewed numerous documents, including execution logs, for California's executions. Comparable information about executions by lethal injection in Nevada is unavailable. However, Nevada's lethal injection protocol is similar to that used in California prior to the proceedings in *Morales v. Hickman.*

8 I have also reviewed Nev. Rev. Stat. § 638.005 and N.A.C. §§ 638.450 et. seq. which pertain to the training for those performing euthanasia on animals, as well as statutes pertaining to euthanasia of animals from the states of: California, Florida, Georgia, Maine, Maryland, Massachusetts, New Jersey, New York, Oklahoma, Tennessee, Texas, Connecticut, Delaware, Illinois, Kansas, Kentucky, Louisiana, Missouri, Rhode Island and South Carolina. I have also reviewed the 2000 Report of the Panel on Euthanasia of the American Veterinary Medical Association, attached hereto as Exhibit B, the American Society of Anesthesiologist's Practice Advisory for Intraoperative Awareness and Brain Function Monitoring, attached hereto as Exhibit C, and the American Society of Anesthesiologist's Standards for Basic Anesthetic Monitoring, attached hereto as Exhibit D.

9. Based upon my review of this material and my knowledge of and experience in the field of anesthesiology, I have formed several conclusions with respect to the protocol of the Nevada Department of Corrections ("NDOC") for carrying out lethal injections. These conclusions arise both from the details disclosed in the materials I have reviewed and from medically relevant, logical inferences drawn from the omission of details in those materials (e.g., details regarding the training of the personnel involved; details of all of the medical equipment used; and details of the precise methods by which the personnel involved use the equipment to carry out an execution by lethal injection).

**A. NDOC's Lethal Injection Protocol**

10. NDOC's lethal injection protocol calls for the administration of 5 grams of sodium thiopental, 20 milligrams of pancuronium bromide (Pavulon), and 160 milliequivalents of potassium chloride. Broadly speaking, the sodium thiopental is intended to serve as an anesthetic, rendering the inmate unconscious for the duration of the execution. Five grams of sodium thiopental is a massive, and potentially lethal, dose. The pancuronium bromide paralyzes the inmate's voluntary muscles, including those of his chest and diaphragm. Pancuronium is not an anesthetic or sedative drug, and it does not affect consciousness. Potassium chloride is a salt solution that, when rapidly administered in high concentrations, induces cardiac arrest.

11. Although the successful delivery into the circulation of 5 grams of sodium thiopental and 20 milligrams of pancuronium would be lethal, it is important to understand that the lethality of sodium thiopental and pancuronium is due to respiratory arrest, which takes several minutes to ensue and does not typically occur prior to the administration of potassium. In the execution sequence, before death is caused by respiratory arrest from sodium thiopental and pancuronium, death is caused by cardiac arrest caused by potassium. I base this opinion, that the potassium and not the pancuronium or sodium thiopental is responsible for the death of prisoners during lethal injection, on the following:

A) Review of records from EKGs from lethal injection procedures conducted in other states. During lethal injection, cardiac activity consistent with generating perfusion persists through the administration of sodium thiopental and pancuronium and only stops after potassium has been administered. The relatively sudden cessation of organized EKG activity is not consistent with a cessation of circulation due to administration of sodium thiopental and/or pancuronium and is consistent with cessation of

circulation after the administration of a large dose of potassium chloride.

B) Properties of Sodium Thiopental and Pancuronium. Sodium thiopental and pancuronium exert their effects by interacting with molecular targets in the nervous system and on muscle cells in a manner that induces unconsciousness and stops breathing. Sodium thiopental and pancuronium, unlike other chemicals such as cyanide, do not kill cells or tissues, and are useful to clinicians precisely because they do not kill or harm cells or tissues. The reason that sodium thiopental and pancuronium can cause death is that they cause the prisoner to stop breathing. Failure to breathe will result in brain damage, brain death, and cardiac arrest as the level of oxygen in the blood declines over time. These processes take a varying amount of time, depending on many factors. Physicians generally use four minutes of not breathing as the approximate benchmark time after which irreversible brain damage from lack of oxygen occurs, and death typically occurs some number of minutes after the onset of brain damage. It is worth noting, however, that this general figure of four minutes is often used in the context of cardiac arrest, in which there is no circulation of blood through the brain. If some level of blood circulation persists, it is very likely that brain damage and brain death would take longer than four minutes.

In the context of lethal injection, sodium thiopental and pancuronium, if successfully delivered into the circulation in large doses, would indeed each be lethal, because they would stop the inmate's breathing. However, as described above, in execution by lethal injection as

practiced by Nevada and other states the administration of potassium and death precede any cardiac arrest that would be caused by sodium thiopental and pancuronium.

12. Intravenous injection of concentrated potassium chloride solution causes excruciating pain. The vessel walls of veins are richly supplied with sensory nerve fibers that are highly sensitive to potassium ions. The intravenous administration of concentrated potassium in doses intended to cause death therefore would be extraordinarily painful. NDOC's selection of potassium chloride to cause cardiac arrest needlessly increases the risk that a prisoner will experience excruciating pain prior to execution. There exist, however, alternative chemicals that do not activate the nerves in the vessel walls of the veins in the way that potassium chloride does. Despite the fact that the statute authorizing lethal injection in Nevada does not specify or require the use of potassium, NDOC has failed to choose a chemical that would cause death in a painless manner.

13. Thus, NDOC chose the means of causing death by choosing a medication (potassium chloride) that causes extreme pain upon administration, instead of selecting available, equally effective yet essentially painless medications for stopping the heart. In so doing, NDOC has taken on the responsibility of ensuring, through all reasonable and feasible steps, that the prisoner is sufficiently anesthetized and cannot experience the pain of potassium chloride injection.

14. The provision of anesthesia has become a mandatory standard of care whenever a patient is to be subjected to a painful procedure. Throughout the civilized world, the United States, and Nevada, whenever a patient is required to undergo a painful procedure, it is the standard of care to provide some form of anesthesia. Circumstances arise in which prisoners in Nevada require surgery, and in many instances the surgery requires the provision of general

anesthesia. In these circumstances general anesthesia is provided, and it is provided by an individual with specific training and qualifications in the field of anesthesiology. It is critical to understand that the great majority of physicians and nurses and other health care professionals do not possess the requisite training, skills, experience, and credentials to provide general anesthesia. It would be unconscionable to forcibly subject any person, including a prisoner in Nevada, to a planned and anticipated highly painful procedure without first providing an appropriate anesthetic, and it would be unconscionable to allow personnel who are not properly trained in the field of anesthesiology to attempt to provide or supervise this anesthetic care.

15. As a living person who is about to be subjected to the excruciating pain of potassium injection, it is imperative that all prisoners undergoing lethal injection be provided with adequate anesthesia. This imperative is of the same order as the imperative to provide adequate anesthesia for any Nevada prisoner requiring general anesthesia (or any type of anesthesia) before undergoing painful surgery. Given that the injection of potassium is a scheduled and premeditated event that is known without any doubt to be extraordinarily painful, it would be unconscionable and barbaric for potassium injection to take place without the provision of sufficient general anesthesia to ensure that the prisoner is rendered and maintained unconscious throughout the procedure, and it would be unconscionable to allow personnel who are not properly trained in the field of anesthesiology to attempt to provide or supervise this anesthetic care.

**B. Failure to Adhere to a Medical Standard of Care in Administering Anesthesia**

16. It is my opinion to a reasonable degree of medical certainty that the lethal injection procedures selected for use in Nevada and used elsewhere subject the prisoner to an increased and unnecessary risk of experiencing excruciating pain in the course of execution.

Because of the potential for an excruciating death created by the use of potassium chloride, it is necessary to induce and maintain an appropriate and deep plane of anesthesia. The circumstances and environment under which anesthesia is to be induced and maintained according to NDOC's execution manual create, needlessly, a significant risk that inmates will suffer the pain that accompanies the injection of potassium chloride.

17. Presumably because of the excruciating pain evoked by potassium, lethal injection protocols like Nevada's plan for the provision of general anesthesia by the inclusion of sodium thiopental. When successfully delivered into the circulation in sufficient quantities, sodium thiopental causes sufficient depression of the nervous system to permit excruciatingly painful procedures to be performed without causing discomfort or distress. Failure to successfully deliver into the circulation a sufficient dose of sodium thiopental would result in a failure to achieve adequate anesthetic depth and thus failure to block the excruciating pain of potassium administration.

18. NDOC's procedures do not comply with the medical standard of care for inducing and maintaining anesthesia prior to and during a painful procedure. Likewise, NDOC's procedures are not compliant with the guidelines set forth by the American Veterinary Medical Association for the euthanasia of animals. Further, NDOC has made insufficient preparation for the real possibility, encountered in many other jurisdictions, and planned for in those jurisdictions, that peripheral IV access cannot be successfully established.

**1. The Dangers of Using Sodium Thiopental as an Anesthetic**

19. A major concern I have based on what I know about NDOC's lethal injection protocol relates to the use of sodium thiopental. Sodium thiopental is an ultrashort-acting barbiturate with a relatively short shelf life in liquid form. Sodium thiopental is distributed in

powder form to increase its shelf life; it must be mixed into a liquid solution by trained personnel before it can be injected.

20. When anesthesiologists use sodium thiopental, we do so for the purposes of temporarily anesthetizing patients for sufficient time to intubate the trachea and institute mechanical support of ventilation and respiration. Once this has been achieved, additional drugs are administered to maintain a "surgical depth" or "surgical plane" of anesthesia (i.e., a level of anesthesia deep enough to ensure that a surgical patient feels no pain and is unconscious). The medical utility of sodium thiopental derives from its ultrashort-acting properties: if unanticipated obstacles hinder or prevent successful intubation, patients will likely quickly regain consciousness and resume ventilation and respiration on their own.

21. The benefits of sodium thiopental in the operating room engender serious risks in the execution chamber. Although the full five grams of sodium thiopental, if properly administered into the prisoner's bloodstream, would be more than sufficient to cause unconsciousness and, eventually, death, if no resuscitation efforts were made, my research into executions by lethal injection strongly indicates that executions have occurred where the full dose of sodium thiopental listed in the protocol was not fully and properly administered. If an inmate does not receive the full dose of sodium thiopental because of errors or problems in administering the drug, the inmate might not be rendered unconscious and unable to feel pain, or alternatively might, because of the short-acting nature of sodium thiopental, regain consciousness during the execution.

22. Thus, the concerns raised in this affidavit apply regardless of the size of the dose of sodium thiopental that is prescribed under the protocol. The level of anesthesia, if any, achieved in each individual inmate depends on the amount that is successfully administered, although other factors such as the inmate's weight and sensitivity/resistance to barbiturates are

also relevant. Many foreseeable situations exist in which human or technical errors could result in the failure to successfully administer the intended dose. NDOC's execution manual both fosters these potential problems and fails to provide adequate instruction for preventing or rectifying these situations, and it does these things needlessly and without legitimate reason. Examples of problems that could prevent proper administration of sodium thiopental include, but are not limited to, the following:

a) Errors in Preparation. Sodium thiopental is delivered in powdered form and must be mixed into an aqueous solution prior to administration. This preparation requires the correct application of pharmaceutical knowledge and familiarity with terminology and abbreviations. Calculations are also required, particularly if the protocol requires the use of a concentration of drug that differs from that which is normally used.

b) Error in Labeling of Syringes. NDOC's execution manual states the syringes will be "clearly marked," but does not specify a standard order in which the syringes will be prepared or how they will be labeled. This could cause confusion in creating the syringes, leading to mislabeling, which, depending on the labeling system used, might not be detected and corrected later in the process.

c) Error in Selecting the Correct Syringe during the sequence of administration.

d) Error in Correctly Injecting the Drug into the Intravenous Line. Nevada's execution manual fails to identify the person(s) responsible for injecting the lethal drugs and further fails to identify their qualifications.

e) The IV Tubing May Leak. An "IV setup" consists of multiple components that are assembled by hand prior to use. If, as is the practice in Nevada, the personnel who are

injecting the drugs are not at the bedside but are instead in a different room or part of the room, multiple IV extension sets need to be inserted between the inmate and the administration site. Any of these connections may loosen and leak. In clinical practice, it is important to maintain visual surveillance of the full extent of IV tubing so that such leaks may be detected. Nevada's practice, by which the executioner(s) is in a separate room with no visual surveillance precludes detection of any leak that may occur.

f) Incorrect Insertion of the Catheter. If the catheter is not properly placed in a vein, the sodium thiopental will enter the tissue surrounding the vein but will not be delivered to the central nervous system and will not render the inmate unconscious. This condition, known as infiltration, occurs with regularity in the clinical setting. Recognition of infiltration requires continued surveillance of the IV site during the injection, and that surveillance should be performed by the individual who is performing the injection so as to permit correlation between visual observation and tactile feedback from the plunger of the syringe.

g) Migration of the Catheter. Even if properly inserted, the catheter tip may move or migrate, so that at the time of injection it is not within the vein. This would result in infiltration, and therefore a failure to deliver the drug to the inmate's circulation and failure to render the inmate unconscious.

h) Perforation or Rupture or Leakage of the Vein. During the insertion of the catheter, the wall of the vein can be perforated or weakened, so that during the injection some or all of the drug leaves the vein and enters the surrounding tissue. The likelihood of rupture occurring is increased if too much pressure is applied to the plunger of the syringe during injection, because a high pressure injection results in a high velocity jet of drug in the vein that can penetrate or tear the vessel wall.

i) Excessive Pressure on the Syringe Plunger. Even without damage or perforation of the vein during insertion of the catheter, excessive pressure on the syringe plunger during injection can result in tearing, rupture, and leakage of the vein due to the high velocity jet that exits the tip of the catheter. Should this occur, the drug would not enter the circulation and would therefore fail to render the inmate unconscious.

j) Securing the Catheter. After insertion, catheters must be properly secured by the use of tape, adhesive material, or suture. Movement by the inmate, even if restrained by straps, or traction on the IV tubing may result in the dislodging of the catheter.

k) Failure to Properly Administer Flush Solutions Between Injections of Drugs. Solutions of paralytic agents such as pancuronium cause sodium thiopental to precipitate out of solution on contact, thereby interfering with the delivery of the drug to the inmate and to the central nervous system. NDOC's manual does not specify if, how, or when the lines will be flushed.

l) Failure to Properly Loosen or Remove the Tourniquet from the Arm or Leg after placement of the IV catheter will delay or inhibit the delivery of the drugs by the circulation to the central nervous system. This may cause a failure of the sodium thiopental to render and maintain the inmate in a state of unconsciousness.

m) Impaired Delivery Due to Restraining Straps. Restraining straps may act as tourniquets and thereby impede or inhibit the delivery of drugs by the circulation to the central nervous system. This may cause a failure of the sodium thiopental to render and maintain the inmate in a state of unconsciousness. Even if the IV is checked for "free flow" of the intravenous

fluid prior to commencing injection, a small movement within the restraints on the part of the inmate could compress the vein and result in impaired delivery of the drug.

### 2. The Need for Adequate Training in Administering Anesthesia

23. Because of these foreseeable problems in administering anesthesia, in Nevada and elsewhere in the United States, the provision of anesthetic care is performed only by personnel with advanced training in the medical subspecialty of Anesthesiology. This is because the administration of anesthetic care is complex and risky, and can only be safely performed by individuals who have completed the extensive requisite training to permit them to provide anesthesia services. Failure to properly administer a general anesthetic not only creates a high risk of medical complications including death and brain damage, but also is recognized to engender the risk of inadequate anesthesia, resulting in the awakening of patients during surgery, a dreaded complication known as "intraoperative awareness." The risks of intraoperative awareness are so grave that, in October 2005, the American Society of Anesthesiologists published a new practice advisory on the subject of intraoperative awareness. If the individual providing anesthesia care is inadequately trained or experienced, the risk of these complications is enormously increased. In Nevada and elsewhere in the United States, general anesthesia is administered by physicians who have completed residency training in the specialty of Anesthesiology, and by nurses who have undergone the requisite training to become Certified Registered Nurse Anesthetists (CRNAs). Physicians and nurses who have not completed the requisite training to become anesthesiologists or CRNAs are not permitted to provide general anesthesia.

24. In my opinion, individuals providing general anesthesia in the Nevada State Prison should not be held to a different or lower standard than is set forth for individuals providing general anesthesia in any other setting in Nevada. Specifically, the individuals

providing general anesthesia within Nevada State Prison should possess the experience and proficiency of anesthesiologists and/or CRNAs. Conversely, a physician who is not an anesthesiologist or a nurse who is not a CRNA should not be permitted to provide general anesthesia within Nevada State Prison (or anywhere else in Nevada).

25. NDOC's execution protocol fails to specify whether the person or persons administering the lethal injection have any training in administering anesthesia, or, if personnel are given training, what that training might be. The absence of any details as to the training, certification, or qualifications of injection personnel raises critical questions about the degree to which condemned inmates risk suffering excruciating pain during the lethal injection procedure. The great majority of nurses are not trained in the use of ultrashort-acting barbiturates; indeed, this class of drugs is essentially only used by a very select group of nurses who have obtained significant experience in intensive care units and as nurse anesthetists. Very few paramedics are trained or experienced in the use of ultrashort-acting barbiturates. Based on my medical training and experience, and based upon my research of lethal injection procedures and practices, inadequacies in these areas elevate the risk that the lethal injection procedure will cause the condemned to suffer excruciating pain during the execution process. Failure to require that the person or persons administering the lethal injection have training equivalent to that of an anesthesiologist or a CRNA compounds the risk that inmates will suffer excruciating pain during their executions.

### 3. NDOC's Failure to Account for Foreseeable Problems in Anesthesia Administration

26. In addition to lacking any policy on the training necessary to perform a lethal injection, NDOC's execution manual imposes conditions that exacerbate the foreseeable risks of improper anesthesia administration described above, and fails to provide any procedures for

dealing with these risks. Perhaps most disturbingly, Nevada's lethal injection practice prevents any type of effective monitoring of the inmate's condition or whether he is anesthetized and unconscious. After the IV lines are inserted into the inmate but before the administration of the sodium thiopental, the execution chamber is closed and the prisoner is left alone in the chamber for the duration of the execution. Nevada's practice is that all prison personnel and others involved in the execution will be in a separate room. There is no window through which the executioner(s) can observe the inmate as the series of drugs is injected. This falls below the standard of care. Accepted medical practice dictates that trained personnel monitor the IV lines and the flow of anesthesia into the veins through visual and tactile observation and examination. The lack of any qualified personnel present in the chamber during the execution thwarts the execution personnel from taking the standard and necessary measures to reasonably ensure that the sodium thiopental is properly flowing into the inmate and that he is properly anesthetized prior to the administration of the pancuronium and potassium.

27. In my opinion, having a properly trained and credentialed individual examine the inmate after the administration of the sodium thiopental (but prior to the administration of pancuronium) to verify that the inmate is completely unconscious would substantially mitigate the danger that the inmate will suffer excruciating pain during his execution. As discussed later in this affidavit, this is the standard of care, and in many states the law, that is set forth for dogs and cats and other household pets when they are subjected to euthanasia by potassium injection. Yet NDOC's execution manual does not provide for such verification, and indeed Nevada practice actively prevents the person or persons administering the lethal injection from determining whether or not the inmate remains conscious by requiring that all of the drugs must be administered remotely, from another room without even visual surveillance.

28. By requiring that the drugs be administered remotely, Nevada practice

necessitates the use of multiple connection sites in the IV tubing. This unnecessarily increases the risk of leakage and/or pinching of the tubes, and therefore creates a greater risk that the inmate will not be properly sedated. Any reasonable standard of care would require a system to be in place to ensure that the prisoner is properly anesthetized.

29. Other than stating "the lethal medication will be administered at a rapid rate," NDOC's execution manual provides no specifications regarding the timing of the administration of the drugs, thereby compounding the risks described in this Declaration. This concern is greatly amplified by the use of an ultrashort-acting barbiturate and is borne out by a review of the execution records from California. In each of the executions, the time between administrations of the three drugs varied for no apparent reason. The lack of a defined schedule for the administration of the three drugs increases the risk that the sedative effect of the sodium thiopental will wear off, should the inmate not receive the full dose.

30. Nevada's lethal injection protocol does not account for procedures designed to ensure the proper preparation of the drugs used. I have not seen details regarding the credentials, certification, experience, or proficiency of the personnel who will be responsible for the mixing of the sodium thiopental from powder form, or for the drawing up of the drugs into the syringes. Preparation of drugs, particularly for intravenous use, is a technical task requiring significant training in pharmaceutical concepts and calculations. It is my opinion based on my review of lethal execution procedures in states that have disclosed more detailed information than what I have seen about Nevada's procedures, that there exist many risks associated with drug preparation that, if not properly accounted for, further elevate the risk that the drug will not be properly administered and the inmate will consciously experience excruciating pain during the lethal injection procedures.

31. The altering of established medical procedures without adequate medical review and research, by untrained personnel, causes great concern about the structure of the lethal injection protocol and its medical legitimacy. There is no indication of how Nevada's execution protocol was developed, who was consulted, what procedures were considered and why. The protocol may be something the Warden developed alone, or in consultation with other corrections personnel, some of whom may or may not have any medical training, or any specialized knowledge of anesthetic literature and practice. Appropriate mechanisms for medical review, and standardization of the implementation and amendment process, are critical features in any medical protocol so that the medical professionals and the public can be assured that proper and humane procedures are in place and being followed. Indeed, in other states, physicians and other medical personnel play a role in ensuring that any protocol is consistent with basic medical standards of care and humaneness. Otherwise, the process is subject and prone to ad hoc administration and error, if not gross negligence, or worse, an alteration of the process so as to inflict as much agony as possible. With lethal injection, such concerns are highly elevated.

32. There are no procedures contained within NDOC's execution manual for the resuscitation of the inmate once the sodium thiopental is administered. To the contrary, the manual states that "once infusion of the lethal injection has begun . . . the execution cannot be stopped." This would foreclose the possibility of altering the course of an execution in the event of legal relief. Any time up until the potassium chloride is administered, the prisoner could be readily resuscitated given the appropriately trained personnel and routine resuscitation medication and equipment. If this were to occur after the potassium chloride was administered, resuscitation would be more challenging but still possible. Resuscitation would require equipment close-by, and properly credentialed personnel, neither of which are specified in the execution manual.

33. Based on my medical training and experience, and based on my research into lethal injection procedures and practices, it is my opinion to a reasonable degree of medical certainty that any reliable, humane lethal injection procedure must account for the foreseeable circumstance of a condemned inmate having physical characteristics that prevent intravenous access from being obtained by a needle piercing the skin and entering a superficial vein suitable for the reliable delivery of drugs. There have been multiple lethal injections in which this problem has arisen from a variety of circumstances. Some of these circumstances could be due to conditions including obesity, corticosteroid treatment, history of intravenous drug use, history of undergoing chemotherapy. Additionally, some people happen to have veins that are too small or deep to permit peripheral access. It is often not possible to anticipate difficult intravenous access situations, and there are multiple examples of executions in which the personnel placing the IVs struggled to obtain peripheral IV access and eventually abandoned the effort. NDOC's execution manual is deficient in its failure to plan for the foreseeable possibility that peripheral IV access can not be obtained.

34. In this setting, state lethal injection protocols typically specify the use of a "cut-down" procedure to access a vein adequate for the reliable infusion of the lethal drugs. Aside from specifying in the "List of Needed Equipment and Materials," which "may vary," a "sterile cut-down tray if necessary," Nevada's lethal injection execution protocol contains no reference to plans for dealing with the foreseeable circumstance wherein peripheral intravenous access cannot be obtained in the arm or leg. No information regarding the training, experience, expertise, credentials, certification, or proficiency of the personnel who would perform such a "cut down" procedure is listed in the Nevada lethal injection protocol. In this regard, NDOC's lethal injection protocol is deficient in comparison to those of other states that I have reviewed. This complicated medical procedure requires equipment and skill that are not accounted for in the execution manual. It has a very high probability of not proceeding properly in the absence of

adequately trained and experienced personnel, and without the necessary equipment. If done improperly, the "cut-down" process can result in very serious complications including severe hemorrhage (bleeding), pneumothorax (collapse of a lung which may cause suffocation), and severe pain. It is well documented that lethal injection procedures in other states have at times required the use of a central intravenous line. NDOC has not, to my knowledge, released information about the need for central intravenous access during prior executions, and therefore it is not possible to make any assessment about whether the necessary safeguards have been set in place to ensure that the procedure is reasonably humane.

35. This concern over the challenges of IV placement has been demonstrated in numerous cases. For example, most recently, during the execution of Joseph Clark in Ohio, difficulties in finding a vein delayed the execution by almost 90 minutes. *See* Andrew Welsh-Huggins, *IV Fiasco Led Killer to Ask for Plan B*, AP (May 12, 2006), attached hereto as Exhibit E. The execution team struggled for several minutes to find usable vein. The team placed a "shunt" in Clark's left arm, but the vein "collapsed". Subsequently, the team placed a "shunt" in Clark's right arm, but mistakenly attempted to administer the lethal drugs through the IV in the left arm where the vein had already "collapsed". The difficulties prompted Clark to sit up and tell his executioners "It don't work" and to ask "Can you just give me something by mouth to end this?" Similar problems occurred during the execution of Stanley "Tookie" Williams, the injection team took 12 minutes to insert the IV lines. The first line was placed quickly but spurted blood, and the staff struggled for 11 minutes to insert the second line, having so much difficulty that Williams asked whether they were "doing that right." *See The Execution of Stanley Tookie Williams,* SFGate.com (Dec. 14, 2005), attached hereto as Exhibit F. The difficulty of the challenge presented to the IV team is evidenced by the comment that "By 12:10 a.m., the medical tech's lips were tight and white and sweat was pooling on her forehead as she probed Williams' arm." Similarly, the execution log of Donald Beardslee's execution indicates that the

second IV line was inserted with "difficulty," and the time entries indicate that it took 12 minutes to insert the second line, which is consistent with encountering problems in inserting the IV. When it proceeds smoothly, placement of a peripheral IV should, in my experience, take on the order of two minutes or less. In the execution of William Bonin, it took the staff assigned anywhere between 18 and 27 minutes to fashion the IV lines (the records are unclear as to this point). This is an unusually long period of time for an experienced and properly trained professional. In the execution of Stephen Anderson on January 29, 2002, one of the persons who attempted to secure an IV was unable to do so without causing significant bleeding and the need to remove his gloves. Again, this indicates that the process is a difficult one and that it is necessary that the persons doing it are properly trained and experienced. As is widely recognized in the medical community, administration of intravenous medications and the management of intravenous systems are complex endeavors. While speculative and not evidence-based, it is my opinion that it is likely that IV placement is rendered more difficult in the context of executions because the inmates are often in a very anxious status, which causes the release of epinephrine (adrenalin) and norepinephrine, thereby causing constriction (narrowing) of blood vessels (including veins). When veins are constricted/narrowed it can be difficult or impossible to insert an IV catheter. This is the best explanation I can provide for the otherwise unexplained extremely high incidence of difficult or failed peripheral IV placement, in individuals lacking known risk factors for difficult IV access.

36. It is my further opinion that to ensure a lethal injection without substantial risks of inflicting severe pain and suffering, there must be proper procedures that are clear and consistent: there must be qualified personnel to ensure that anesthesia has been achieved prior to the administration of pancuronium bromide and potassium chloride, there must be qualified personnel to select chemicals and dosages, set up and load the syringes, administer "pre-injections," insert the IV catheter, and perform the other tasks required by such procedures; and

there must be adequate inspection and testing of the equipment and apparatus by qualified personnel. The Nevada Department of Corrections' written procedures for implementing lethal injection, to the extent that they have been made available, provide for none of the above.

### C. The Use of Pancuronium Bromide

37. Nevada's use of the drug pancuronium bromide serves no rational or legitimate purpose and compounds the risk that an inmate may suffer excruciating pain during his execution. Pancuronium paralyzes all voluntary muscles, but does not affect sensation, consciousness, cognition, or the ability to feel pain and suffocation. Because the sodium thiopental and potassium chloride would in themselves be sufficient to cause death, and the potassium is administered well before death would result from the pancuronium alone, it is my opinion held to a reasonable degree of medical certainty that there would be no rational place in the protocol for pancuronium as the lethal amount of potassium chloride is administered.

38. Pancuronium bromide is a neuromuscular blocking agent. Its effect is to render the muscles unable to contract but it does not affect the brain or the nerves. It is used in surgery to ensure that there is no movement and that the patient is securely paralyzed so that surgery can be performed without contraction of the muscles. In surgery, pancuronium bromide is not administered until the patient is adequately anesthetized. The anesthetic drugs must first be administered so that the patient is unconscious and does not feel, see, or perceive the procedure. This can be determined by a trained medical professional, either a physician anesthesiologist or a nurse anesthetist, who provides close and vigilant monitoring of the patient, their vital signs, and various diagnostic indicators of anesthetic depth. NDOC's execution manual, to the extent disclosed, fails to provide an assurance that anesthetic depth will be properly assessed prior to the administration of pancuronium bromide.

39. If sodium thiopental is not properly administered in a dose sufficient to cause the loss of consciousness for the duration of the execution procedure, then it is my opinion held to a reasonable degree of medical certainty that the use of pancuronium places the condemned inmate at risk for consciously experiencing paralysis, suffocation and the excruciating pain of the intravenous injection of high dose potassium chloride.

40. If administered alone, a lethal dose of pancuronium would not immediately cause a condemned inmate to lose consciousness. It would totally immobilize the inmate by paralyzing all voluntary muscles and the diaphragm, causing the inmate to suffocate to death while experiencing an intense, conscious desire to inhale. Ultimately, consciousness would be lost, but it would not be lost as an immediate and direct result of the pancuronium. Rather, the loss of consciousness would be due to suffocation, and would be preceded by the torment and agony caused by suffocation. This period of torturous suffocation would be expected to last at least several minutes and would only be relieved by the onset of suffocation-induced unconsciousness or by death from potassium chloride.

41. Because the administration of a paralyzing dose of pancuronium bromide to a conscious person would necessarily cause excruciating suffering, it would be unconscionable to administer pancuronium without first ensuring that the induction of general anesthesia had successfully achieved the necessary anesthetic depth.

42. Based on the information available to me, it is my opinion held to a reasonable degree of medical certainty that Nevada's lethal injection protocol creates an unacceptable risk that the inmate will not be anesthetized to the point of being unconscious and unaware of pain for the duration of the execution procedure. If the inmate is not first successfully anesthetized, then it is my opinion to a reasonable degree of medical certainty that the pancuronium will

paralyze all voluntary muscles and mask external, physical indications of the excruciating pain being experienced by the inmate during the process of suffocating (caused by the pancuronium) and having a cardiac arrest (caused by the potassium chloride).

43. It is my understanding that NDOC's execution protocol requires the presence of six to nine official witnesses to the execution and permits media witnesses to the execution. It is my opinion based on a reasonable degree of medical certainty that pancuronium, when properly and successfully administered, effectively nullifies the ability of witnesses to discern whether or not the condemned prisoner is experiencing a peaceful or agonizing death. Regardless of the experience of the condemned prisoner, whether he or she is deeply unconscious or experiencing the excruciation of suffocation, paralysis, and potassium injection, he or she will appear to witnesses to be serene and peaceful due to the relaxation and immobilization of the facial and other skeletal muscles. The use of pancuronium, in my opinion, therefore prevents the press from fulfilling its essential function of informing the citizens, officials, and courts of Nevada about whether execution by lethal injection is conducted in Nevada State Prison in a manner that is constitutionally compliant and humane.

44. The doses of sodium thiopental and potassium chloride are lethal doses. Therefore, it is unnecessary to administer pancuronium bromide in the course of an execution when it is quickly followed by a lethal dose of potassium chloride. It serves no legitimate purpose and only places a chemical veil on the process that prevents an adequate assessment of whether or not the condemned is suffering in agony, and greatly increases the risks that such agony will ensue. Removal of pancuronium from the protocol would eliminate the risk of conscious paralysis from occurring. It would also eliminate the risk that an inhumane execution would appear humane to witnesses. Finally, removal of pancuronium would vastly reduce the possibility that the citizens, officials, and courts of Nevada could be inadvertently misled by

media reports describing a peaceful-appearing execution when in fact the prisoner could be experiencing excruciating suffering.

### D. Consequences of Improper Anesthesia Administration

45. Execution records from California indicate that four out of the six inmates executed in California since 2000 continued to display activity and behavior that is inconsistent with the successful administration of 5 grams of thiopental, the amount required under California's lethal injection protocol. Five grams of thiopental, the dose required by the California protocol, is a massive dose that, if successfully administered, far exceeds the amount necessary to completely arrest respiratory activity in any prisoner. I therefore can provide no medical explanation for the inmates' continued breathing other than that the thiopental was not administered in its entirety. If the full dose of thiopental was not administered successfully – as is strongly suggested by the inmates' continued breathing – those inmates faced a significant risk of remaining conscious or regaining consciousness during the lethal injection procedure. Importantly, a person who is breathing while under general anesthesia cannot be deeply anesthetized, and may well be awakened by a painful stimulation such as a surgical incision or the administration of potassium.

46. The handwritten records of Stanley "Tookie" Williams' execution indicate that Mr. Williams did not stop breathing until 12:34, upon the injection of the potassium chloride, 12 minutes after the thiopental was injected. Thus, the thiopental did not have the effect on Mr. Williams' brain and respiratory activity that would be expected with a high degree of certainty from the delivery into the circulation of the full 5-gram dose of thiopental.

47. The execution log of Clarence Ray Allen states that Mr. Allen continued breathing for 9 minutes after the delivery of the thiopental. Again, 5 grams of thiopental, if

successfully delivered into the circulation, simply should not take 9 minutes to ablate cerebral electrical activity and respiratory activity.

48. The January 29, 2002 execution log of Stephen Wayne Anderson, reveals that Mr. Anderson continued breathing until 12:22, 5 minutes after the thiopental was administered. Again, this persistent respiratory activity is not consistent with the expected effect of 5 grams of thiopental, which would be to stop all visible respiratory activity within a minute of its delivery into the circulation.

49. The March 15, 2000 execution log of Darrell Keith Rich, states that Mr. Rich's respirations ceased at 12:08, with the administration of the pancuronium, but that Mr. Rich had "chest movements" lasting from 12:09 to 12:10. These chest movements, beginning after Mr. Rich had ostensibly stopped breathing (and while he was still alive, as shown by his heart rate of 110 beats per minute), and 3 minutes after the administration of the thiopental, are again inconsistent with successful administration of the thiopental. The chest movements are consistent, however, with an attempt to fight against the accruing paralytic effect of the pancuronium. Had the 5-gram dose of thiopental reached Mr. Rich and had the expected effect, he would not have been able to fight against the pancuronium by attempting to breathe, nor would he even have been aware of the effect of the pancuronium. Indeed, because 5 grams of thiopental would have arrested all cerebral activity, including all respiratory drive, there would have been no effort on Mr. Rich's part to attempt to breathe during the onset of the pancuronium.

### E. Nevada's Execution Protocol Falls Below the Minimum Standards Mandated for Veterinary Euthanasia

50. The American Veterinary Medical Association (AVMA) states that when potassium chloride is to be used as a euthanasia agent, the animals must be under a surgical plane

of anesthesia and the personnel performing the euthanasia must be properly trained to assess the depth of anesthesia. The AVMA panel specifically states that the animal must be in a surgical plane of anesthesia characterized not simply by loss of consciousness, but also by "loss of reflex muscle response and loss of response to noxious stimuli." It is difficult to understand why the NDOC would chose, at its discretion, to use potassium to execute prisoners and would then fail to adhere to the basic requirements set forth by the AVMA to ensure that animals do not experience the excruciating pain of potassium injection during euthanasia.

51. In *Beardslee v. Woodford*, the Ninth Circuit recognized that nineteen states have enacted statutes that, like the AVMA Report, mandate the exclusive use of a sedative in the euthanasia of animals. Although Nevada has not yet enacted such a statute, Nevada law expressly contemplates the use of sodium pentobarbital and requires that personnel who perform euthanasia of animals must be properly trained in the procedure. No such requirement exists in NDOC's execution manual.

**Conclusion**

52. Based on my research into methods of lethal injection used by various states and the federal government, and based on my training and experience as a medical doctor specializing in anesthesiology, it is my opinion based on a reasonable degree of medical certainty that, given the apparent absence of a central role for a properly trained medical or veterinary professional in NDOC's execution procedure, the chemicals used, the lack of adequately defined roles and procedures, and the failure to properly account for foreseeable risks, the lethal injection procedure Nevada employs creates medically unacceptable risks of inflicting excruciating pain and suffering on inmates during the lethal injection procedure. All of these problems could easily be addressed, and indeed have been addressed for the euthanasia of dogs and cats. It is difficult to understand why NDOC has failed to address these problems and has failed to meet the

minimum standards set forth for veterinary euthanasia.

53. In addition, in order to more fully and fairly assess the impact of the failings of Nevada's execution protocol, it is necessary to obtain all the records and logs used, and all official witness statements from prior executions, as well as the full rules and regulations devised by NDOC for lethal injection. This would include identifying the qualifications, experience and training of those persons who apply the IVs and who administer and monitor the injection.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and that this declaration was executed on May 16, 2006 in New York City, New York.

Mark J. S. Heath, M.D.

# Attachment A

Curriculum Vitae

1) Date of preparation: December 19, 2004

2) Name: Mark J. S. Heath

Birth date: March 28, 1960
Birthplace: New York, NY
Citizenship: United States, United Kingdom

3) Academic Training:

| | |
|---|---|
| Harvard University | B.A., Biology, 1983 |
| University of North Carolina, Chapel Hill | M.D., 1987 |
| Medical License | New York: 177101-1 |

4) Traineeship:

1987 – 1988 Internship, Internal Medicine, George Washington University Hospital, Washington, DC.

1988 – 1991 Residency, Anesthesiology, Columbia College of Physicians and Surgeons, New York, NY

1991 – 1993 Fellowship, Anesthesiology, Columbia College of Physicians and Surgeons, New York, NY

5) Board Qualification:

Diplomate, American Board of Anesthesiology, October 1991.
Testamur, Examination of Special Competence in Perioperative Transesophageal Echocardiography (PTEeXAM), 2001.

6) Military Service: None

7) Professional Organizations:

American Society of Anesthesiologists
International Anesthesia Research Society
Society of Cardiovascular Anesthesiology

8) Academic Appointments:

| | |
|---|---|
| 1993 – 2002 | Assistant Professor of Anesthesiology, Columbia University, New York, NY |
| 2002 - present | Assistant Professor of Clinical Anesthesiology, Columbia University, New York, NY |

9) Hospital/Clinical Appointments:

1993 – present Assistant Attending Anesthesiologist, Presbyterian Hospital, New York, NY.

10) Honors:

Magna cum laude, Harvard University
Alpha Omega Alpha, University of North Carolina at Chapel Hill
First Prize, New York State Society of Anesthesiologists Resident Presentations, 1991

11) Fellowship and Grant Support:

Foundation for Anesthesia Education and Research, Research Starter Grant Award, Principal Investigator, funding 7/92 - 7/93, $15,000.

Foundation for Anesthesia Education and Research Young Investigator Award, Principal Investigator, funding 7/93 - 7/96, $70,000.

NIH KO8 "Inducible knockout of the NK1 receptor"
Principal Investigator, KO8 funding 12/98 - 11/02,
$431,947 over three years
(no-cost extension to continue through 11/30/2002)

NIH RO1 "Tachykinin regulation of anxiety and stress responses"
Principal Investigator, funding 9/1/2002 – 8/30/2007
$1,287,000 over 5 years

12) Departmental and University Committees:

Research Allocation Panel (1996 – 2001)
Institutional Review Board (Alternate Boards 1-2, full member Board 3) (2003 - present)

13) Teaching:

Lecturer and clinical teacher: Anesthesiology Residency Program, Columbia University and Presbyterian Hospital, New York, NY

Advanced Cardiac Life Support Training

*Anesthetic considerations of LVAD implantation.* Recurrent lecture at Columbia University LVAD implantation course.

Invited Lecturer:

*NK1 receptor functions in pain and neural development*, Cornell University December 1994

*Anxiety, stress, and the NK1 receptor*, University of Chicago, Department of Anesthesia and Critical Care, July 2000

*Anesthetic Considerations of LVAD Implantation*, University of Chicago, Department of Anesthesia and Critical Care, July 2000

*NK1 receptor function in stress and anxiety*, St. John's University Department of Medicinal Chemistry, March 2002

*Making a brave mouse (and making a mouse brave),* Mt.Sinai School of Medicine, May 2002

*Problems with anesthesia during lethal injection procedures*, Geneva, Switzerland. Duke University School of Law Conference, "International Law, Human Rights, and the Death Penalty: Towards an International Understanding of the Fundamental Principles of Just Punishment", July 2002.

*NK1 receptor function in stress and anxiety*, Visiting Professor, NYU School of Medicine, New York, New York. October 2002.

*Anesthetic Depth, Paralysis, and other medical problems with lethal injecton protocols: evidence and concerns*, Federal Capital Habeas Unit Annual Conference, Jacksonville, Florida. May 2004.

*Medical Scrutinyof Lethal Injection Procedures.* National Association for the Advancement of Colored People Capital Defender Conference, Airlie Conference Center, Warrenton, Virginia. July 2004.

*Anesthetic considerations of LVAD implantation.* Recurrent lecture at Columbia University LVAD implantation course.

14) Grant Review Committees: None

15) Publications:

**Original peer reviewed articles**

* Santarelli, L., Gobbi, G., Debs, P.C., Sibille, E. L., Blier, P., Hen, R., **Heath, M.J.S.** (2001). Genetic and pharmacological disruption of neurokinin 1 receptor function decreases anxiety-related behaviors and increases serotonergic function. **Proc. Nat. Acad. Sci**., 98(4), 1912 – 1917.

* King, T.E. $^{\delta}$, **Heath M. J. S$^{\delta}$.**, Debs, P, Davis, MB, Hen, R, Barr, G. (2000). The development of nociceptive responses in neurokinin-1 receptor knockout mice. Neuroreport.;11(3), 587-91 $\delta$ authors contributed equally to this work

* **Heath, M. J. S.**, Lints, T., Lee, C. J., Dodd, J. (1995). Functional expression of the tachykinin $NK_1$ receptor by floor plate cells in the embryonic rat spinal cord and brainstem. **Journal of Physiology** 486.1, 139 -148.

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McGehee, D.S., Aldersberg, M. , Liu, K.-P., Hsuing, S., **Heath, M.J.S.** , Tamir, H. (1997). Mechanism of extracellular $Ca^{2+}$-receptor stimulated hormone release from sheep thyroid parafolicular cells. **Journal of Physiology**: 502,1, 31 - 44.

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Dodd, J., Jahr, C.E., Hamilton, P.N., **Heath, M.J.S.**, Matthew, W.D., Jessell, T.M. (1983). Cytochemical and physiological properties of sensory and dorsal horn neurons that transmit cutaneous sensation. **Cold Spring Harbor Symposia of Quantitative Biology** 48, 685 -695.

Pinsky, D.J., Naka, Y., Liao, H., Oz, M. O., Wagner, D. D., Mayadas, T. N., Johnson, R. C., Hynes, R. O., **Heath, M.J.S.**, Lawson, C.A., Stern, D.M. Hypoxia-induced exocytosis of endothelial cell Weibel-Palade bodies. **Journal of Clinical Investigation** 97(2), 493 - 500.

**Case reports** none

**Review, chapters, editorials**

* **Heath, M. J. S.**, Dickstein, M. L. (2000). Perioperative management of the left ventricular assist device recipient. Prog Cardiovasc Dis.;43(1):47-54.

* Dickstein, M.L., Mets B, **Heath M.J.S.** (2000). Anesthetic considerations during left ventricular assist device implantation. Cardiac Assist Devices pp 63 – 74.

* **Heath, M. J. S.** and Hen, R. (1995). Genetic insights into serotonin function. **Current Biology** 5.9, 997 -999.

* **Heath, M.J.S.**, Mathews D. (1990). Care of the Organ Donor. **Anesthesiology Report** 3, 344-348.

* **Heath, M. J. S.,** Basic physiology and pharmacology of the central synapse. (1998) **Anesthesiology Clinics of North America** 15(3), 473 - 485.

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**Heath, M.J.S.,** Berman M.F. (1991) Isoflurane modulation of calcium channel currents in spinal cord dorsal horn neurons. Anesthesiology 75; 3A; A1037.

Attachment B

# 2000 Report of the AVMA Panel on Euthanasia

# 2000
# Report of the
# AVMA Panel on Euthanasia

## Members of the AVMA Panel

**Bonnie V. Beaver**, DVM, MS, DACVB, (Chair) Department of Small Animal Medicine and Surgery, College of Veterinary Medicine, Texas A&M University, 4474 TAMU, College Station, TX 77843-4474, representing the AVMA Executive Board.

**Willie Reed**, DVM, PhD, DACVP, DACPV, Animal Health Diagnostic Laboratory, College of Veterinary Medicine, Michigan State University, B646 W. Fee Hall-AHDL, East Lansing, MI 48824-1316, representing the AVMA Council on Research.

**Steven Leary**, DVM, DACLAM, Division of Comparative Medicine, Washington University, Box 8061, St Louis, MO 63110, representing the AVMA Animal Welfare Committee.

**Brendan McKiernan**, DVM, DACVIM, Denver Veterinary Specialists, 3695 Kipling St, Wheat Ridge, CO 80033, representing the American Animal Hospital Association.

**Fairfield Bain**, DVM, DACVIM, DACVP, DACVECC, Hagyard-Davidson-McGee Associates PSC, 4250 Iron Works Pike, Lexington, KY 40511-8412, representing the American Association of Equine Practitioners.

**Roy Schultz**, DVM, MS, DABVP, 1114 N Frost Ave, Avoca, IA 51521, representing the American Board of Veterinary Practitioners.

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## PREFACE

At the request of the AVMA Council on Research, the Executive Board of the AVMA convened a Panel on Euthanasia in 1999 to review and make necessary revisions to the fifth Panel Report, published in 1993.[1] In this newest version of the report, the panel has updated information on euthanasia of animals in research and animal care and control facilities; expanded information on ectothermic, aquatic, and fur-bearing animals; added information on horses and wildlife; and deleted methods or agents considered unacceptable. Because the panel's deliberations were based on currently available scientific information, some euthanasia methods and agents are not discussed.

Welfare issues are increasingly being identified in the management of free-ranging wildlife, and the need for humane euthanasia guidelines in this context is great. Collection of animals for scientific investigations, euthanasia of injured or diseased wildlife species, removal of animals causing damage to property or threatening human safety, and euthanasia of animals in excess population are drawing more public attention. These issues are acknowledged in this report and special considerations are described for handling animals under free-ranging conditions, where their needs are far different from those of their domestic counterparts.

This report is intended for use by members of the

veterinary profession who carry out or oversee the euthanasia of animals. Although the report may be interpreted and understood by a broad segment of the general population, a veterinarian should be consulted in the application of these recommendations. The practice of veterinary medicine is complex and involves diverse animal species. Whenever possible, a veterinarian experienced with the species in question should be consulted when selecting the method of euthanasia, particularly when little species-specific euthanasia research has been done. Although interpretation and use of this report cannot be limited, the panel's overriding commitment is to give veterinarians guidance in relieving pain and suffering of animals that are to be euthanatized. The recommendations in this report are intended to serve as guidelines for veterinarians who must then use professional judgment in applying them to the various settings where animals are to be euthanatized.

## INTRODUCTION

The term euthanasia is derived from the Greek terms *eu* meaning good and *thanatos* meaning death.[2] A "good death" would be one that occurs with minimal pain and distress. In the context of this report, euthanasia is the act of inducing humane death in an animal. It is our responsibility as veterinarians and human beings to ensure that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible. Euthanasia techniques should result in rapid loss of consciousness followed by cardiac or respiratory arrest and the ultimate loss of brain function. In addition, the technique should minimize distress and anxiety experienced by the animal prior to loss of consciousness. The panel recognized that the absence of pain and distress cannot always be achieved. This report attempts to balance the ideal of minimal pain and distress with the reality of the many environments in which euthanasia is performed. A veterinarian with appropriate training and expertise for the species involved should be consulted to ensure that proper procedures are used.

Criteria for painless death can be established only after the mechanisms of pain are understood. Pain is that sensation (perception) that results from nerve impulses reaching the cerebral cortex via ascending neural pathways. Under normal circumstances, these pathways are relatively specific, but the nervous system is sufficiently plastic that activation of nociceptive pathways does not always result in pain and stimulation of other (non-nociceptive) peripheral and central neurons can give rise to pain. The term nociceptive is derived from the word *noci* meaning to injure and *ceptive* meaning to receive, and is used to describe neuronal input caused by noxious stimuli, which threaten to, or actually do, destroy tissue. These noxious stimuli initiate nerve impulses by acting at primary nociceptors and other sensory nerve endings that respond to noxious and non-noxious stimuli from mechanical, thermal, or chemical activity. Endogenous chemical substances such as hydrogen ions, potassium ions, ATP, serotonin, histamine, bradykinin, and prostaglandins, as well as electrical currents, are capable of generating nerve impulses in nociceptor nerve fibers. Activity in nociceptive pathways can also be triggered in normally silent receptors that become sensitized by chronic pain conditions.[3,4]

Nerve impulse activity generated by nociceptors is conducted via nociceptor primary afferent fibers to the spinal cord or the brainstem where it is transmitted to two general sets of neural networks. One set is related to nociceptive reflexes (eg, withdrawal and flexion reflexes) that are mediated at the spinal level, and the second set consists of ascending pathways to the reticular formation, hypothalamus, thalamus, and cerebral cortex (somatosensory cortex and limbic system) for sensory processing. It is important to understand that ascending nociceptive pathways are numerous, often redundant, and are capable of considerable plasticity under chronic conditions (pathology or injury). Moreover, even the transmission of nociceptive neural activity in a given pathway is highly variable. Under certain conditions, both the nociceptive reflexes and the ascending pathways may be suppressed, as, for example, in epidural anesthesia. Under another set of conditions, nociceptive reflex actions may occur, but activity in the ascending pathways is suppressed; thus, noxious stimuli are not perceived as pain. It is incorrect to use the term pain for stimuli, receptors, reflexes, or pathways because the term implies perception, whereas all the above may be active without consequential pain perception.[5,6]

Pain is divided into two broad categories: (1) sensory-discriminative, which indicates the site of origin and the stimulus giving rise to the pain; and (2) motivational-affective in which the severity of the stimulus is perceived and the animal's response is determined. Sensory-discriminative processing of nociceptive impulses is most likely to be accomplished by subcortical and cortical mechanisms similar to those used for processing other sensory-discriminative input that provides the individual with information about the intensity, duration, location, and quality of the stimulus. Motivational-affective processing involves the ascending reticular formation for behavioral and cortical arousal. It also involves thalamic input to the forebrain and the limbic system for perceptions such as discomfort, fear, anxiety, and depression. The motivational-affective neural networks also have strong inputs to the limbic system, hypothalamus and the autonomic nervous system for reflex activation of the cardiovascular, pulmonary, and pituitary-adrenal systems. Responses activated by these systems feed back to the forebrain and enhance perceptions derived via motivational-affective inputs. On the basis of neurosurgical experience in humans, it is possible to separate the sensory-discriminative components from the motivational-affective components of pain.[7]

For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is nonfunctional because of hypoxia, depression by drugs, electric shock, or concussion, pain is not experienced. Therefore, the choice of the euthanasia agent or method is less critical if it is to be used on an animal that is anesthetized or unconscious, provided that the animal does not regain consciousness prior to death.

An understanding of the continuum that represents stress and distress is essential for evaluating techniques that minimize any distress experienced by an animal being euthanatized. Stress has been defined as the effect of physical, physiologic, or emotional factors (stressors) that induce an alteration in an animal's homeostasis or adaptive state.[8] The response of an animal to stress represents the adaptive process that is necessary to restore the baseline mental and physiologic state. These responses may involve changes in an animal's neuroendocrinologic system, autonomic nervous system, and mental status that may result in overt behavioral changes. An animal's response varies according to its experience, age, species, breed, and current physiologic and psychologic state.[9]

Stress and the resulting responses have been divided into three phases.[10] Eustress results when harmless stimuli initiate adaptive responses that are beneficial to the animal. Neutral stress results when the animal's response to stimuli causes neither harmful nor beneficial effects to the animal. Distress results when an animal's response to stimuli interferes with its well-being and comfort.[11]

As with many other procedures involving animals, some methods of euthanasia require physical handling of the animal. The amount of control and kind of restraint required will be determined by the animal's species, breed, size, state of domestication, degree of taming, presence of painful injury or disease, degree of excitement, and method of euthanasia. Proper handling is vital to minimize pain and distress in animals, to ensure safety of the person performing euthanasia, and, often, to protect other people and animals.

An in-depth discussion of euthanasia procedures is beyond the scope of this report; however, personnel who perform euthanasia must have appropriate certification and training, experience with the techniques to be used, and experience in the humane restraint of the species of animal to be euthanatized, to ensure that animal pain and distress are minimized during euthanasia. Training and experience should include familiarity with the normal behavior of the species being euthanatized, an appreciation of how handling and restraint affects that behavior, and an understanding of the mechanism by which the selected technique induces loss of consciousness and death. Prior to being assigned full responsibility for performing euthanasia, all personnel must have demonstrated proficiency in the use of the technique in a closely supervised environment. References provided at the end of this document may be useful for training personnel.[12-21]

Selection of the most appropriate method of euthanasia in any given situation depends on the species of animal involved, available means of animal restraint, skill of personnel, number of animals, and other considerations. Available information focuses primarily on domestic animals, but the same general considerations should be applied to all species.

This report includes four appendices that summarize information from the text. Appendix 1 lists acceptable and conditionally acceptable methods of euthanasia, categorized by species. Appendices 2 and 3 provide summaries of characteristics for acceptable and conditionally acceptable methods of euthanasia. Appendix 4 provides a summary of some unacceptable euthanasia agents and methods. Criteria used for acceptable, conditionally acceptable, and unacceptable methods are as follows: acceptable methods are those that consistently produce a humane death when used as the sole means of euthanasia; conditionally acceptable methods are those techniques that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature; and unacceptable techniques are those methods deemed inhumane under any conditions or that the panel found posed a substantial risk to the human applying the technique. The report also includes discussion of several adjunctive methods, which are those methods that cannot be used as the sole method of euthanasia, but that can be used in conjunction with other methods to produce a humane death.

## GENERAL CONSIDERATIONS

In evaluating methods of euthanasia, the panel used the following criteria: (1) ability to induce loss of consciousness and death without causing pain, distress, anxiety, or apprehension; (2) time required to induce loss of consciousness; (3) reliability; (4) safety of personnel; (5) irreversibility; (6) compatibility with requirement and purpose; (7) emotional effect on observers or operators; (8) compatibility with subsequent evaluation, examination, or use of tissue; (9) drug availability and human abuse potential; (10) compatibility with species, age, and health status; (11) ability to maintain equipment in proper working order; and (12) safety for predators/scavengers should the carcass be consumed.

The panel discussed the definition of euthanasia used in this report as it applies to circumstances when the degree of control over the animal makes it difficult to ensure death without pain and distress. Slaughter of animals for food, fur, or fiber may represent such situations. However, the same standards for euthanasia should be applied to the killing of animals for food, fur, or fiber, and wildlife or feral animals. Animals intended for food should be slaughtered humanely, taking into account any special requirements of the US Department of Agriculture.[22] Painless death can be achieved by properly stunning the animal, followed immediately by exsanguination. Handling of animals prior to slaughter should be as stress free as possible. Electric prods or other devices should not be used to encourage movement of animals and are not needed if chutes and ramps are properly designed to enable animals to be moved and restrained without undue stress.[23-27] Animals must not be restrained in a painful position before slaughter.

Ethical considerations that must be addressed when euthanatizing healthy and unwanted animals reflect professional and societal concerns.[28,29] These issues are complex and warrant thorough consideration by the profession and all those concerned with the welfare of animals. Whereas the panel recognizes the need for those responsible for the euthanasia of ani-

mals to be cognizant of these issues, it does not believe that this report is the appropriate forum for an in-depth discussion of this topic.

It is the intent of the panel that euthanasia be performed in accordance with applicable federal, state, and local laws governing drug acquisition and storage, occupational safety, and methods used for euthanasia and disposal of animals. However, space does not permit a review of current federal, state, and local regulations.

The panel is aware that circumstances may arise that are not clearly covered by this report. Whenever such situations arise, a veterinarian experienced with the species should use professional judgment and knowledge of clinically acceptable techniques in selecting an appropriate euthanasia technique. Professional judgment in these circumstances will take into consideration the animal's size and its species-specific physiologic and behavioral characteristics. In all circumstances, the euthanasia method should be selected and used with the highest ethical standards and social conscience.

It is imperative that death be verified after euthanasia and before disposal of the animal. An animal in deep narcosis following administration of an injectable or inhalant agent may appear dead, but might eventually recover. Death must be confirmed by examining the animal for cessation of vital signs, and consideration given to the animal species and method of euthanasia when determining the criteria for confirming death.

## ANIMAL BEHAVIORAL CONSIDERATIONS

The need to minimize animal distress, including fear, anxiety, and apprehension, must be considered in determining the method of euthanasia. Gentle restraint (preferably in a familiar and safe environment), careful handling, and talking during euthanasia often have a calming effect on animals that are used to being handled. Sedation and/or anesthesia may assist in achieving the best conditions for euthanasia. It must be recognized that any sedatives or anesthetics given at this stage that change circulation may delay the onset of the euthanasia agent. Preparation of observers should also be taken into consideration.

Animals that are wild, feral, injured, or already distressed from disease pose another challenge. Methods of pre-euthanasia handling suitable for domestic animals may not be effective for them. Because handling may stress animals unaccustomed to human contact (eg, wildlife, zoo, and feral species), the degree of restraint required to perform any euthanasia procedure should be considered when evaluating various methods. When handling these animals, calming may be accomplished by minimizing visual, auditory, and tactile stimulation. When struggling during capture or restraint may cause pain, injury, or anxiety to the animal or danger to the operator, the use of tranquilizers, analgesics, and/or anesthetics may be necessary. A route of injection should be chosen that causes the least distress in the animal for which euthanasia must be performed. Various techniques for oral delivery of sedatives to dogs and cats have been described that may be useful under these circumstances.[30,31]

Facial expressions and body postures that indicate various emotional states of animals have been described for some species.[32-37] Behavioral and physiologic responses to noxious stimuli include distress vocalization, struggling, attempts to escape, defensive or redirected aggression, salivation, urination, defecation, evacuation of anal sacs, pupillary dilatation, tachycardia, sweating, and reflex skeletal muscle contractions causing shivering, tremors, or other muscular spasms. Unconscious as well as conscious animals are capable of some of these responses. Fear can cause immobility or "playing dead" in certain species, particularly rabbits and chickens. This immobility response should not be interpreted as loss of consciousness when the animal is, in fact, conscious. Distress vocalizations, fearful behavior, and release of certain odors or pheromones by a frightened animal may cause anxiety and apprehension in other animals. Therefore, for sensitive species, it is desirable that other animals not be present when individual animal euthanasia is performed.

## HUMAN BEHAVIORAL CONSIDERATIONS

When animals must be euthanatized, either as individuals or in larger groups, moral and ethical concerns dictate that humane practices be observed. Human psychologic responses to euthanasia of animals need to be considered, with grief at the loss of a life as the most common reaction.[38] There are six circumstances under which we are most aware of the effects of animal euthanasia on people.

The first of these is the veterinary clinical setting where owners have to make decisions about whether and when to euthanatize. Although many owners rely heavily on their veterinarian's judgment, others may have misgivings about making their own decision. This is particularly likely if an owner feels responsible for allowing an animal's medical or behavioral problem to go unattended so that euthanasia becomes necessary. When owners choose to be present during euthanasia, they should be prepared for what will happen. What drugs are being used and how the animal could respond should be discussed. Behaviors such as vocalization, muscle twitches, failure of the eyelids to close, urination, or defecation can be distressing. Counseling services for grieving owners are now available in some communities[39] and telephone counseling is available through some veterinary schools.[40,41] Owners are not the only people affected by euthanasia of animals. Veterinarians and their staffs may also become attached to patients they have known and treated for many years and may continue to struggle with the ethical implications of ending an animal's life.

The second is animal care and control facilities where unwanted, homeless, diseased, and injured animals must be euthanatized in large numbers. Distress may develop among personnel directly involved in performing euthanasia repeatedly. Emotional uneasiness, discomfort, or distress experienced by people involved with euthanasia of animals may be minimized. The person performing euthanasia must be technically proficient, use humane handling methods, understand the reasons for euthanasia, and be familiar with the

method of euthanasia being employed (ie, what is going to happen to the animal). When the person is not knowledgeable about what to expect, he or she may mistakenly interpret any movement of animals as consciousness and a lack of movement as loss of consciousness. Methods that preclude movement of animals are more aesthetically acceptable to most technical staff even though lack of movement is not an adequate criterion for evaluating euthanasia techniques. Constant exposure to, or participation in, euthanasia procedures can cause a psychologic state characterized by a strong sense of work dissatisfaction or alienation, which may be expressed by absenteeism, belligerence, or careless and callous handling of animals.[42] This is one of the principal reasons for turnover of employees directly involved with repeated animal euthanasia. Management should be aware of potential personnel problems related to animal euthanasia and determine whether it is necessary to institute a program to prevent, decrease, or eliminate this problem. Specific coping strategies can make the task more tolerable. Some strategies include adequate training programs so that euthanasia is performed competently, peer support in the workplace, professional support as necessary, focusing on animals that are successfully adopted or returned to owners, devoting some work time to educational activities, and providing time off when workers feel stressed.

The third setting is the laboratory. Researchers, technicians, and students may become attached to animals that must be euthanatized.[43] The same considerations afforded pet owners or shelter employees should be provided to those working in laboratories.

The fourth situation is wildlife control. Wildlife biologists, wildlife managers, and wildlife health professionals are often responsible for euthanatizing animals that are injured, diseased, in excessive number, or that threaten property or human safety. Although relocation of some animals is appropriate and attempted, relocation is often only a temporary solution to a larger problem. People who must deal with these animals, especially under public pressure to save the animals rather than destroy them, can experience extreme distress and anxiety.

The fifth setting is livestock and poultry slaughter facilities. The large number of animals processed daily can take a heavy toll on employees physically and emotionally. Federal and state agricultural employees may also be involved in mass euthanasia of poultry and livestock in the face of disease outbreaks, bioterrorism, and natural disasters.

The last situation is public exposure. Because euthanasia of zoo animals, animals involved in roadside or racetrack accidents, stranded marine animals, nuisance or injured wildlife, and others can draw public attention, human attitudes and responses should be considered whenever animals are euthanatized. Natural disasters and foreign animal disease programs also present public challenges. These considerations, however, should not outweigh the primary responsibility of using the most rapid and painless euthanasia method possible under the circumstances.

## MODES OF ACTION OF EUTHANATIZING AGENTS

Euthanatizing agents cause death by three basic mechanisms: (1) hypoxia, direct or indirect; (2) direct depression of neurons necessary for life function; and (3) physical disruption of brain activity and destruction of neurons necessary for life.

Agents that induce death by direct or indirect hypoxia can act at various sites and can cause loss of consciousness at different rates. For death to be painless and distress-free, loss of consciousness should precede loss of motor activity (muscle movement). Loss of motor activity, however, cannot be equated with loss of consciousness and absence of distress. Thus, agents that induce muscle paralysis without loss of consciousness are not acceptable as sole agents for euthanasia (eg, depolarizing and nondepolarizing muscle relaxants, strychnine, nicotine, and magnesium salts). With other techniques that induce hypoxia, some animals may have motor activity following loss of consciousness, but this is reflex activity and is not perceived by the animal.

A second group of euthanatizing agents depress nerve cells of the brain, inducing loss of consciousness followed by death. Some of these agents release inhibition of motor activity during the first stage of anesthesia, resulting in a so-called excitement or delirium phase, during which there may be vocalization and some muscle contraction. These responses do not appear to be purposeful. Death follows loss of consciousness, and is attributable to cardiac arrest and/or hypoxemia following direct depression of respiratory centers.

Physical disruption of brain activity, caused by concussion, direct destruction of the brain, or electrical depolarization of neurons, induces rapid loss of consciousness. Death occurs because of destruction of midbrain centers controlling cardiac and respiratory activity or as a result of adjunctive methods (eg, exsanguination) used to kill the animal. Exaggerated muscular activity can follow loss of consciousness and, although this may disturb some observers, the animal is not experiencing pain or distress.

## INHALANT AGENTS

Any gas that is inhaled must reach a certain concentration in the alveoli before it can be effective; therefore, euthanasia with any of these agents takes some time. The suitability of a particular agent depends on whether an animal experiences distress between the time it begins to inhale the agent and the time it loses consciousness. Some agents may induce convulsions, but these generally follow loss of consciousness. Agents inducing convulsions prior to loss of consciousness are unacceptable for euthanasia.

Certain considerations are common to all inhalant agents. (1) In most cases, onset of loss of consciousness is more rapid, and euthanasia more humane, if the animal is rapidly exposed to a high concentration of the agent. (2) The equipment used to deliver and maintain this high concentration must be in good working order and in compliance with state and federal regulations. Leaky or faulty equipment may lead to