



## Musculoskeletal Transplant Foundation Position Statement

The MTF Medical Examiner/Coroner Advisory Committee (MECC) believes and supports the position of the National Association of Medical Examiners (NAME) regarding the procurement of tissues and organs for transplantation. "Donation can be accomplished in virtually all cases without detriment to evidence collection, postmortem examination, determination of cause and manner of death, or the conduction of criminal or civil legal proceedings. Although our primary function is to investigate death, enabling transplantation is one of the few opportunities we have to directly save and improve lives." —NAME

## Goal of a Forensic Death Investigation

One of the goals of the office of a medical examiner or coroner is to determine two things: cause and manner of death.

**Cause of Death (COD):** The underlying physiological condition (disease or injury) that culminated in death, which can also be supported by contributing and proximate factors. They may be anatomical/structural (e.g., myocardial infarct, ruptured abdominal aortic aneurysm), chemical (e.g., acute drug overdose), mechanical (e.g., gunshot wound), or environmental (e.g., hyperthermia).

**Manner of Death (MOD):** A classification based on the cause of death and the circumstances surrounding the death. There are five manners per U.S. law: homicide, suicide, accidental, natural, or undetermined. One may see PENDING as a manner; however, it is implicit that the pending will eventually be placed in one of the above categories.

Examples of COD & MOD

A) Basic—Cause of Death: Atherosclerotic Cardiovascular Artery Disease

Manner of Death: Natural

B) Complicated—Cause of Death: Pneumonia complication due to quadriplegia, due to cervical spinal cord injury, due to remote gunshot wound

Manner of Death: Homicide

*Note: Cardiopulmonary arrest (CPA) is not a cause of death, but the end result of an earlier cause to be established; everyone eventually succumbs to CPA.*

## Autopsy

An *autopsy* (also referred to as a *postmortem*, *postmortem dissection*, or simply, *post*) is a formal examination of a deceased person, externally and internally, for evidence of injury and/or illness to explain death and document disease. Definitions may vary from office to office. Some offices define any in-person examination as an autopsy. Some define autopsy as to whether scalpel incision is made. Other offices may require the actual removal of some organ or tissue from the deceased to be considered an autopsy. Do you know your local office's working definition?

- Full—Complete external/internal examination including removal and examination of organs from thorax, neck, abdomen, and head. Incision/exam of non-injured extremities usually inspected visually. Males: May include internal examination of scrotal contents.
- Partial—Complete external/partial internal exam limited by the pathologist to those organs involved in the death. Hospital autopsies may exclude examination of the brain in the absence of neurologic symptoms and still deem the exam to be complete. Often used interchangeably with *limited* or *restricted*.
- External (Visual)—Thorough observation and documentation of unclothed body without removal/inspection of internal organs.
- Limited or Restricted—Partial exam may only focus on particular organ system or body region due to limitations exerted by someone other than the pathologist, as in cases where family may have religious or cultural opposition to autopsy, but COD/MOD must still be determined. Often used interchangeably with *partial*.
- Extended External Examination—External exam with incisions but without removal of any organs (e.g., suspected ruptured abdominal aortic aneurysm in which internal exploration of abdomen confirms retroperitoneal hemorrhage). No further examination is made.

## Specimen Overview



**Toxicology:** Peripheral blood specimen (femoral vein preferred) with collection in grey top tube (contains fluoride as an enzyme inhibitor and preservative to minimize changes in concentration of drugs during storage).



**DNA:** Lavender top tube (EDTA anti-coagulant). Avoid collection from extremities/IV lines in cases of transfusion to avoid DNA typing cells not from the decedent. May also request filter paper blood spot.



**Serology:** Used for infectious disease testing. Blood collection in speckled top (serum separator tube) or red top (serum tube).



**Vitreous humor:** Gelatinous, clear fluid in posterior chamber of eye. Used for testing drugs, electrolytes, ketones, and/or glucose. Placed in small sterile red tube avoiding contamination with blood.



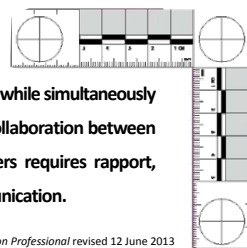
**Thromboembolus:** Clot found in blood vessel, photographed in situ and preserved in formalin. May avoid clot removal if impacted in vessel.



**Urine:** Used for drug testing. In fluid tight container without preservative. Some pathologists prefer to have urine drawn before hemi-pelvis recovery takes place to avoid bladder rupture. Extraction via foley catheter (if already in place) or via suprapubic puncture with long needle.



This concise forensic science reference is intended to assist transplant professionals. The goal is two-fold: to provide transplantable grafts to the medical community while simultaneously supporting medicolegal death investigation. Successful collaboration between transplant professionals and Medical Examiners/Coroners requires rapport, education, and open, clear communication.



*Death Investigation Fact Sheet for the Tissue Donation Professional revised 12 June 2013*

## How does a death become a Coroner's or ME's case?

Examples of statutes that vary state by state. Do you know your state's statutes?

1. Death within 24 hours of coming into a hospital (unresponsive).
2. Death within 24 hours of surgical procedure.
3. Death of an inmate in custody (sometimes mandatory autopsy).
4. Death related to drug use or suspected drug involvement.
5. Accidental deaths, suicides, homicides (often in hospitals if death not immediate).  
*Note: Subdural Hematomas USUALLY qualify unless they are specified non-traumatic.*
6. Death of a fetus due to known/suspected drug use by the mother.
7. Death of a child under the age of 2 years with no known congenital defect/diagnosis (sometimes mandatory autopsy).
8. Deaths during surgery or medical intervention procedure.
9. Home hospice deaths/resident home care deaths can qualify primarily since doctor rarely sees patient within 24-36 hours and/or not available to sign the death certificate.
10. Nursing home deaths, in certain cases, due to possible abuse/neglect.

## Common Needs of ME/C

- Documentation of abnormal findings and pertinent negatives
- Evidence preservation
- Blood and vitreous fluid for toxicologic analysis
- Injury documentation
- Determination of cause and manner of death

## Solutions

- Documentation (written and/or photographic) of abnormal findings and pertinent negatives
- Ongoing communication and collaboration between ME/C and Recovery Agency
- Documentation of transient findings (those findings lost during tissue/organ recovery; e.g., hemopericardium, hemothorax, thromboembolus in the leg)
- Develop clear policies, procedures and protocols addressing forensic needs including:
  - Collection of specimens
  - Photography
  - Chain of custody
  - Documentation of injury
  - Collection and preservation of evidence
  - X-ray prior to recovery



## Photography

Photographs are an excellent way to document findings for the ME/C as long as an arrangement has been made between offices.

Common requirements for photos used by the ME/C

- Always have patient identifier in the image (e.g., investigation case or donor number).
  - Photographs from different distances are important: overall, orienting, and close images.
  - For close images, having a ruler in the image allows for scale.
  - Images from different angles can improve appearance of findings.
- Examples of images: body identification (hospital band, tattoo, scars), personal belongings, face, overall body, medical devices, lesions, suspicious findings, patterned injuries, fractures, masses, procurement artifacts, specimens in container.

## Medical Examiners and Coroners Care

Assistance to Families

- Guidance following the death (e.g., funeral options, time course of events to follow, accurate and timely completion of death certificate).
- Helping families understand what caused a death, or the circumstances of the death.
- Identifying medical conditions in the decedent that are of importance to the health of living family member(s) (e.g., fatal carbon monoxide poisoning due to leak in the home).

Respect for the decedent

- Improving quality of life for people through support of organ and tissue recovery.

Saving lives

- Supporting organ and tissue recovery.
- Promote public health, welfare, and epidemiology (e.g., identification of poisonings, infections, mortality trends) to save and enhance quality of lives.



## Selected Medicolegal Terminology

**Abrasion:** A scrape on the skin, a shallow blunt force injury that does not penetrate the skin.

**Abrasion Ring:** An abrasion produced around an entrance gunshot wound.

**Algor Mortis:** The temperature of the body after death.

**Animal Predation/Scavenging:** Usually postmortem changes by animals on the decedent.

**Antemortem:** Referring to events or specimens taken before death.

**Artifact:** Anything not naturally present, but introduced by some external source.

**Asphyxia:** Lack of oxygen in the blood or lack of cells to utilize oxygen.

**Autopsy:** The external and often internal postmortem examination of a human body.

**Blunt Force Injury:** An impact and resulting injuries against a surface, such as a body hitting the ground, or a baseball bat hitting a body.

**Chemical Asphyxia:** A substance in the blood resulting in the inability of the blood to transport oxygen (such as carbon monoxide).

**Chop Injury:** An injury that has both sharp force and blunt force features.

**Choking:** Asphyxia where the internal airway is obstructed.

**Commotio Cordis:** Death resulting from a witnessed blow to the chest during electric repolarization of the heart; there are no external or internal traumatic findings.

**Contusion:** A bruise; hemorrhage beneath the skin.

**Coroner:** A death investigator, may or may not have medical training, may be appointed or elected.

**Co-sleeping:** Sharing a sleeping surface typically an adult with an infant, which may result in an overlay death.

**Death Investigator:** Someone who has special training to investigate deaths.

**Decomposition:** Changes to the body after death as the natural reaction of the body breaking down.

**Defensive Injuries:** Premortem injuries that indicate the decedent was defending himself/herself from an assailant.

**Dicing:** Typical square or I-shaped small abrasions or small lacerations caused by cuts from tempered glass; most often seen in motor vehicle collisions.

**Embolus:** An object that travels to another location in the vascular system; this can be fat (see *Fat Embolism*), a bullet, catheter tip, injected air, blood clot (see *Thromboembolus*) or other object.

**Epidural Hemorrhage:** Hemorrhage between the skull and dura mater, most often acute arterial hemorrhage.

**Fat Embolism:** Accumulation of fat in the vasculature from traumatically fractured bones and released bone marrow, and often noted in the lungs.

**Forensic Pathologist:** A medical doctor who has special training in death investigation and performs autopsies to determine the cause and manner of death.

**Forensic Pathology:** The study of trauma and the cause and manner of death, especially as it applies to the law.

**Forensic Science:** The practical application of science to matters of the law.

**Hanging:** Asphyxia by neck compression of the airways or vessels of the neck with partial or complete suspension of the body.

**Hematoma:** A space occupying collection of blood. For example, a 'goose-egg' on the head.

**Histology:** Microscopic examination of tissue on glass slides.

**Incised Wound:** A sharp force injury that is longer than it is deep (a slash wound).

**Insect Activity/Infestation:** Usually a postmortem feature indicating insect predation on the deceased body.

**Laceration:** A tear in the skin, a blunt force injury that penetrates the skin.

**Layered Neck Dissection:** A special technique that examines the neck muscles in layers to detect subtle injury, as in cases of neck compression.

**Livor Mortis:** Also called lividity, the pattern of blood passively settling after (and sometimes before) death.

**Marbling:** The staining of the blood vessels walls forming a visible reticular pattern on the skin, usually a feature of decomposition.

**Mechanical Asphyxia:** Asphyxia by an outside force resulting in an inability to expand the respiratory muscles, such as a large weight on the chest.

**Medical Examiner:** Maybe be synonymous with death investigator, may also be a forensic pathologist (depends on jurisdiction).

**Mortem:** Pertaining to death.

**Modified Cardiectomy:** The collaborative procurement of heart valves under the supervision of a pathologist, who may examine the heart under sterile conditions during procurement and prior to shipment for valve preparation.

**Patterned Injury:** A blunt force injury which contains characteristics of whatever caused the injury (e.g., tire tracks on pedestrian involved in motor vehicle death).

**Perimortem:** Pertaining to events or findings around the time of death.

**Pertinent Negative:** A significant absent finding which may rule out certain causes of death (e.g., no lobar infiltrates on chest x-ray in a case of suspected lobar pneumonia).

**Petechiae:** Small hemorrhages (less than 1 millimeter) which may be seen on the mucosa, conjunctiva, or skin in certain types of death where hydrostatic blood pressure may be increased; classically conjunctival petechiae in manual strangulation.

**Positional Asphyxia:** A body position where it is difficult or impossible to breathe.

**Postmortem:** Referring to events/findings/specimens taken after death.

**Postmortem Interval:** The period of time after death.

**Premortem:** Referring to events/findings/specimens taken before death.

**Procurement Artifact:** Changes to decedent as a result of tissue recovery (e.g., sutured incisions, absent bone /connective tissue, needle punctures). AKA Recovery artifact.

**Pulmonary Embolism (PE):** A blockage of the main artery of the lung or one of its branches by a substance that has travelled from elsewhere in the body through the bloodstream. Most commonly from a thrombus in the leg (DVT). See *Saddle Embolus*.

**Recovery:** The surgical removal of tissue for transplant; AKA procurement.

**Rigor Mortis:** Sometimes shortened to rigor, the stiffening and then relaxing of the body after death.

**Saddle Embolus:** A pulmonary thromboembolus which straddles the left and right branches of the pulmonary artery. See *Pulmonary Embolism*.

**Sharp Force Injury:** An injury caused by a sharp object typically a knife.

## Selected Medicolegal Terminology (continued)

**Shored Exit:** A gunshot exit wound that has some features of an entrance wound.

**Smothering:** Asphyxia by something covering the nose and mouth.

**Stab:** A sharp force injury that is deeper than it is longer (a puncture).

**Statute:** An established law or rule.

**Strangulation:** Asphyxia by neck compression of airways or vessels, usually by another person.

**Subarachnoid Hemorrhage:** Hemorrhage between the arachnoid mater and surface of the brain.

**Subdural Hemorrhage:** Hemorrhage between the dura and the arachnoid covering of the brain; may be acute or chronic.

**Tache Noire:** The drying of the corneas after death which causes dark discoloration.

**Tardieu Spots:** Passive postmortem hydrostatic pressure of the blood, in areas of livor mortis, causing red-purple colored spots on the skin in that area, usually bigger than petechiae.

**Thromboembolus:** A premortem blood clot that has traveled from its area of origin and lodged in another area (e.g., pulmonary thromboembolus from a deep venous thrombosis of the leg).

**Thrombus:** A blood clot formed in situ within the vascular system of the body and impeding blood flow; can form premortem or postmortem.

**Trace Evidence:** Small pieces of evidence that point to a cause of death or perpetrator (e.g., glass fragments or paint chips in a motor vehicle versus pedestrian death, tissue under fingernails or foreign hair strands in a homicide).

**Vitreous fluid:** Fluid in the eye that can be very helpful in toxicological or some electrolyte analysis.

**Washer Woman Changes:** Changes on the body, including the finger and toe tips, resulting in vertical ridges/wrinkles indicating that a body has been immersed in a liquid (usually water); can be postmortem.

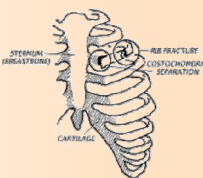
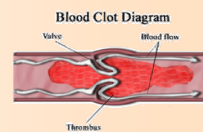
## Select Abbreviations Related to Medicolegal Investigation

- ASCVD—Arteriosclerotic Cardiovascular Disease
- CAD—Coronary Artery Disease
- CAP—College of American Pathologists
- COD—Cause of Death
- CPA—Cardiopulmonary Arrest
- DVT—Deep Vein Thrombosis
- IACME—International Association of Coroners and Medical Examiners
- ME/C—Medical Examiner/Coroner
- MOD—Manner of Death
- NAME—National Association of Medical Examiners
- PE—Pulmonary Embolus or Pulmonary Thromboembolus
- PMI—Postmortem Interval
- SCD—Sudden Cardiac Death
- SIDS—Sudden Infant Death Syndrome
- SBS/SBSI—Shaken Baby Syndrome/Shaken Baby Syndrome with Impact
- SUDI or SUID—Sudden Unexplained Death in Infancy
- SUDEP—Sudden Unexpected Death in Epilepsy
- TAT—Turn Around Time (time from autopsy to release of autopsy report)

For more comprehensive reference, we recommend: *Medical Abbreviations*, by Neil M. Davis, most recent edition. An online resource is [www.acronymfinder.com](http://www.acronymfinder.com).

## Actual case examples of disease and evidence uncovered during tissue procurement that have assisted with death investigation:

- Hemopericardium found during heart-for-valve recovery.
- Thrombus (premortem blood clot) in deep blood vessels of legs (in case of suspected PE).
- Thromboembolus found in pulmonary artery (PE).
- Unexpected rib fractures in an elderly patient that has died of suspected natural causes and/or has not had CPR.
- Bullets or bullet fragments that have been found during tissue recovery, or after tissue recovery, via X-ray exam. Donation made possible and homicide evidence successfully gathered.
- After inconclusive autopsy where infection suspected as cause of death, pathologist able to use copy of routine bone and connective tissue cultures to ascertain COD.
- Archived tissue bank serum supplied to coroner after toxicology sample was mistakenly compromised.



## References, Resources, and Websites

- National Association of Medical Examiners Position Paper on the Medical Examiner Release of Organs and Tissues for Transplantation. *Am J Forensic Med Pathol.* 2007 Sep;28(3):202-7
- Position Statement on Organ and Tissue Donation. Accessed 1 March 2013. (Electronic version: [Click here for web page.](#)) Or search for *College of American Pathologists' position on recovery.*

[www.mtf.org/mecc](http://www.mtf.org/mecc)

[www.cap.org](http://www.cap.org)

[www.restoresight.org](http://www.restoresight.org)

[www.theiacme.com](http://www.theiacme.com)

[www.thename.org](http://www.thename.org)

[www.aafs.org](http://www.aafs.org)

[www.aopo.org](http://www.aopo.org)

[www.aatb.org](http://www.aatb.org)



Scan code to download copy