The Real CSI: Forensic Pathology & Death Investigation

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Overview

- Medical Examiner v. Coroner
- Death Certification
- Forensic Autopsy
- Traumatic Injuries:
  - Blunt trauma
  - Sharp trauma
  - Gunshot wounds
- Forensic Pathologist as Expert Witness

Coroner vs. Medical Examiner

- Citizen
- No specified training
- Administrator or Law enforcement
- Elected or appointed

- Physician
- Usually forensic board certified
- Public health
- Usually appointed

Death Investigation System Type

Some countries have a Medical Examiner and some have a Coroner
District Medical Examiner
State Medical Examiner
Coroner in each county
Coroner in each city
Coroner in each county
Coroner in each city
Coroner in each county
Coroner in each city
CALIFORNIA: 58 Counties
- 47 Sheriff-Coroner
- 7 Coroner
- 1 ME-Coroner (Los Angeles)
- 3 ME (San Diego, San Francisco, Ventura)

Board Certified Forensic Pathologists
Certified by American Board of Pathology
- After:
  - 4 years medical school
  - 3-4 years residency
  - 1 year fellowship
- Must pass Anatomic Pathology exam before eligible to take Forensic Pathology exam
- 350-450 board certified practicing in US

Sham Qualifications
ACFEI: www.acfei.com

- Offers Certification In:
  - Forensic Accounting
  - Forensic Consulting
  - Forensic Nursing
  - Medical Investigation
  - Homeland Security
- $145/ year membership dues:
  - Provide a copy of highest diploma, resume, licenses & 3 references (names and phone numbers)
  - Attend a 2 day conference and take a test ($445)
  - OR Have test proctored at a local library ($350)

REPORTABLE DEATHS
Defined by CA H&S Code 10250 and Gov Code 27491

- Violent, sudden, or unusual.
- Unattended by physician in last 20 days.
- Related to accident or injury, either old or recent.
- Homicide, suicide, or accidental.
- Due to criminal acts.

DEATH CERTIFICATION
Reporting Requirements

- The ME/C must be notified for those types of death specified in CA Gov Code 27491.
- The only requirement is for the ME/C to investigate.
- The ME/Coroner has a right to the medical record, and can have it subpoenaed (HIPAA exempt).
- Permission of next of kin NOT required for ME/C autopsy.
- The physician must be able to certify natural cause before allowing a hospital autopsy.

California Gov. Code 27491

- Known or suspected homicide
- Known or suspected suicide
- Accident: Whether the primary cause or only contributory; whether the accident occurred immediately or at some remote time
- Injury: Whether the primary cause or only contributory; whether the injury occurred immediately or at some remote time
California Gov. Code 27491

- Grounds to suspect that the death occurred in any degree from a criminal act.
- No physician in attendance (no medical history).
- Wherein the deceased has not been attended by a physician in the 20 days prior to death.
- Wherein the physician is unable to state the cause of death (must be genuinely unable and not merely unwilling).

California Gov. Code 27491

- Poisoning (food, chemical, drug, therapeutic agents).
- All deaths due to occupational disease or injury.
- All deaths in operating rooms or following surgery or a major medical procedure.
- All deaths where a patient has not fully recovered from an anesthetic, whether in surgery, recovery room or elsewhere.

California Gov. Code 27491

- All solitary deaths. (Unattended by a physician, family member or any other responsible person in the period preceding death.)
- All deaths in which the patient is comatose throughout the period of physician’s attendance, whether in home or hospital.
- All deaths of unidentified persons.
- All deaths where the suspected cause of death is Sudden Infant Death Syndrome (SIDS).

California Gov. Code 27491

- All deaths in prisons, jails, or of persons under the control of a law enforcement agency.
- All deaths of patients in state mental hospitals.
- All deaths where there is no known next-of-kin.
- All deaths caused by a known or suspected contagious disease constituting a public health hazard, to include AIDS.
- All deaths due to acute alcohol or drug intoxication.
Typical CA Death Certificate

Death reported to ME: YES/NO

- 107A Cause of death
- 107B DUE TO Cause of death
- 107C DUE TO Cause of death
- 107D DUE TO Underlying Cause of death
- 112 Other significant conditions contributing to death but not causing 107A (above)
- 113 Medical / Surgical Procedures (Dates)

Cause of Death

The etiologically specific disease or injury which starts the lethal sequence of events without sufficient intervening causes.

Manner of Death

- Natural: Due predominantly to disease or aging
- Accident: Unforeseeable acts or hostile environment
- Homicide: Death at the hand of another
- Suicide: From self-destructive act - need a preponderance of the evidence
- Pending
- Cannot be Determined

Good Natural Causes of Death

- Atherosclerotic cardiovascular disease.
- Myocardial infarct due to atherosclerotic coronary artery disease.
- Hypertensive stroke.
- Ruptured cerebral aneurysm.
- Chronic alcoholism.
- Complications of diabetes mellitus.
- Infectious complications of chronic substance abuse.
NOT GOOD AT ALL!
- Cardiorespiratory arrest
- Cardiac arrhythmia
- Respiratory failure
- End stage liver/kidney disease
- Pneumonia
- Multi-organ system failure
- Sepsis
- Cerebrovascular Accident

BETTER!
- Cardiac arrhythmia DUE TO Rheumatic valve disease
- Respiratory failure DUE TO asthma/COPD
- End-Stage Liver Disease DUE TO Chronic alcoholism
- End-Stage Renal Disease DUE TO Diabetes/HCVD
- Pneumonia - Why?
- Sepsis - Due to what?
- Cerebrovascular Accident - stroke is better, but still DUE TO what?

Debilitated
- Dementia:
  - Alzheimer's
  - Parkinson's
  - Multi-infarct
- Stroke:
  - Ischemic: ASCVD
  - Hemorrhagic: Hypertension, drugs (coke, meth)
- Trauma
- Chronic disease: Diabetes, Alcoholism, COPD...

Sepsis
- Definition: overwhelming infection
  - Hypotension (low blood pressure)
  - Elevated white cell count
  - Organisms in the blood when cultured
- More common in debilitated patients.
- Must be DUE TO something:
  - The name of the bacterial organism isn't enough
  - Source of the infection: respiratory (pneumonia), urinary tract (UTI), intestinal (gastroenteritis), wound...
The Autopsy Examinations: Basics
- External Examination
- Internal Examination of Organs
- Specimens taken for additional testing
- Disease & Injury
- Documentation
  - Diagrams
  - Photographs
  - Autopsy Report

How Does a Medical Examiner Decide on the Cause of Death?
- The majority of cases are easy.
- Most cases are easy:
  - Multiple gunshot wounds (Homicide)
- A few can be very hard!
  - Compelling story but no sufficient trauma on the body to account for death.
  - Lots of trauma on the body and a story that doesn’t explain it all.

A Good Medical Examiner
- Will review all the data available before coming to a final determination.
- Will try to meet with different groups associated with the case to get more information when the story “doesn’t make sense.”
- Will keep an open mind and remain objective before deciding on the cause of death.

But How Does the Medical Examiner Sort Through Findings?
- Class I: Overwhelming pathologic findings.
- Class II: Presence of disease with lethal potential.
- Class III: Marginal pathology combined with a compelling history and the exclusion of other causes.
- Class IV: Lethal pathology is not structurally demonstrable.
- Class V: Undetermined.
Blunt Trauma: Terminology

- Abrasion: “scrape” or “scratch” from rubbing or shearing forces.
- Contusion: “bruise” caused by tearing and crushing of small blood vessels.
- Laceration: a tear of the skin, soft tissues or internal organs.
  - Tissue bridging
  - Undermining
  - Irregular edges

Contusion

- Size (inches)
- Color
- Location
- Does the story fit the observed injury?

Planar Injury

Planar Injury: Fall Pattern
Not a Fall Pattern: Assault

Lacerations

Sharp Trauma: Terminology
- Incised Wound: wider than deep
  - Bloody but not as lethal
- Stab Wound: deeper than wide
  - Lethal but not as bloody
- Chop: Sharp edges with underlying bony injury
  - Unwieldy weapons
  - Usually homicide
Incised Wounds

Stab Wound

Incised Wounds

Defensive Injuries
Types of Firearms

- Handguns: concealable, self-protection
  - Revolver
    - Have single barrel and a rotating cylinder.
    - One pull of the trigger fires the chamber aligned with the barrel and rotates the next chamber into alignment.
  - Pistol
    - Are self-loading semiautomatic firearms. One pull of the trigger fires one cartridge. They have a single chamber and cartridges take turns in using it to be fired. Cartridges are carried in a magazine in the grip of the pistol.
- Rifles: Rifled barrels, fire at highest velocity
- Shotguns: Smooth barrels, fire “shot” or “slug”

Gunshot Wounds

The following can be derived from external examination:

- Range of fire
  - Four things come out of gun besides the bullet:
    - Gas
    - Complete combustion of gunpowder: fouling
    - Incomplete combustion of gunpowder: stippling
    - Flame
  - Direction of fire
What comes out of a fired handgun?

- Gunpowder particles (Stippling)
- Smoke (Soot)
- Flame & Gas (Searing)

Bullet

<table>
<thead>
<tr>
<th>Distance</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6&quot;</td>
<td>Muzzle Stamp, Blow-back Lacs, Soot on Skin, Searing</td>
</tr>
<tr>
<td>6-30&quot;</td>
<td>Soot &amp; Stippling</td>
</tr>
<tr>
<td>&gt;30&quot;</td>
<td>Neither</td>
</tr>
</tbody>
</table>

Gunshot Wounds

- Direction of Fire
  - Derived from relationship of Entrance to Exit
- Entrance:
  - Small "punched-out" central defect missing skin
  - Circumferential ring of abrasion
  - Soot/stippling
  - Atypical: over bone, folds of skin, ricochet, re-entrance
- Exit:
  - Lacerated
  - Approximation of edges maintains skin integrity
  - Atypical (shored): may have abrasion or contusion
Ballistics Lab: Comparison Microscopy

Ballistics Lab: Test-Firing

Ballistics Lab: Trigger Pull
- Typical Handgun: 10-12 lbs/in² pressure
- "Hair Trigger": < 6 lbs/in² pressure

Ballistics Lab: Range of Fire
- Contact
- 2 inches
- 4 inches
- 8 inches
- 18 inches
Defining the Targets

- Instantaneously lethal targets: result in instantaneous incapacitation
  - basal ganglia
  - brainstem
  - medulla oblongata
  - upper cervical cord
  - cerebral hemispheres if extensively involved (large caliber bullet with high stopping power)
- Rapidly lethal targets: 10-15 sec voluntary action (heart, aorta)
- Targets of secondary importance: all others

Wound Ballistic Workshop: Quantico, VA; FBI Academy, Sept. 15-17, 1987

Gunshot Sequence

- Witnesses
- Reconstruction
- Biological Shot Sequence:
  - Suicide: An instantaneously lethal target cannot be first
  - Homicide: Can have many lethal shots
    - Hemorrhage, Range, Other injuries and Witnesses may elucidate sequence
    - Relationship among different fracture lines


Using Biological Shot Sequence

A: Left ear → palate, ejects tooth (Back to Front)
B: Lip → Back of head
C: Nose (slopping) → Left neck
D: Forehead (contact) → Brain (Fatal)
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Attorneys’ Question

- Victim is taller than Defendant by several inches
- Witness: Victim was kneeling and Defendant shot him “execution style” at the side of the head
- Defendant: Victim was “coming at me” and I shot him in self-defense
- Body: Close range gunshot wound enters at the temple and goes from right to left and 30 degrees upwards

Answer: Both Stories Fit!