


**MAYO CLINIC**  


**Forensics, death investigation and autopsy:**  
Explaining the dead to the living.

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**Determining Cause and Manner of Death**

- Must always keep an open mind and attempt to keep biases in check.
- Thorough scene investigation
  - Observations
  - Discussion with “witnesses”
  - Collaboration with law enforcement
- Medical History review
- ESTABLISH POSITIVE IDENTIFICATION

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**Cause of Death**

- The immediate thing that precipitated the death
  - Which came first—The chicken or the egg?
    - Depression
    - Financial Strain
    - Suicide by hanging
  - What is the most logical sequence?—  
Subjective
    - Pneumonia
    - Sepsis
    - Immunocompromised?

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### Manner of Death

Classifies the death into one of a few possibilities:

1. Natural
2. Accident
3. Suicide
4. Homicide
5. Undetermined



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### Death Certificate

- Cause of death and manner of death recorded
- Not the same as legal definitions
- Filed with the state
- Signed off by the doctor who saw the patient
  - If ME case=Medical Examiner signs
  - If Mayo physician, non ME case=primary physician who saw the patient (surgeon, core service line)
  - If hospice=Primary care physician



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### Coroner or Medical Examiner System: Varies by State

#### CORONER

- Elected Official
- Usually a member of the community such as:
  - Funeral director
  - EMT
  - Someone with some science or law enforcement background

#### MEDICAL EXAMINER

- Appointed Official
- Board certified forensic pathologist (definition can vary by state)
- May be employed exclusively by the county or may be completely independent (consult)



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Case 1

Jarrid Smith is a 25 year old male who died unexpectedly in a hotel room. A friend said they were partying and having fun the night before and they all went to sleep around 3:30 AM.

At 9:30 when the friend awoke he was unable to wake Jarrid who was "passed out" on the floor. He called 911.

When EMS arrived, they observed a male with light skin on the bathroom floor of the hotel room. The body was wet and cold to the touch.

What happened? Why did this seemingly healthy man die?



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The Scene Investigation (Situation)

Statement(s)

- Jarrid was found on the bathroom floor.
- They were partying until 3:30 AM.
- No statement was made about who rented the room.
- The friend was seen calling another friend for a ride home.

Observation(s)

- Jarrid's body is wet and cold.
- There are no alcohol bottles, beer cans or other items that indicate a party.
- The room was rented in the name of someone who was not present at the scene
- How did Jarrid and his friend get to the hotel?



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Case 1

- Options to consider:
- Did Jarrid have a health condition that would cause him to possibly drown in a bathtub?
- Did Jarrid take something that caused him to become impaired and then drown in a bathtub?
- Did Jarrid's friends do something to Jarrid to cause his death (e.g. push his head under water? Hit him on the head and place him in the tub?)
- Was Jarrid just found in the bathtub and water had nothing to do with his death?



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### Case 1

- Jarrid's medical record shows he doesn't have any seizure disorders or other health issues that would contribute his death to natural causes.
- Jarrid's hotel room shows no evidence of a party, was rented in someone else's name and the other occupant did not have a car or other means to leave the hotel.
- Jarrid's body was cold—He had been dead for a while before he was "found."



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### Conclusions-External/Scene findings

- Jarrid's body showed signs of remote and recent drug use.
- His friends admitted to cleaning up the hotel room before calling police.
- The friend who rented the room had already had drug-related charges pending and didn't want to get in further trouble.
- The night desk clerk said 4 people checked in. It is fairly safe to assume that a party is usually more than 2 people.



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### Conclusions-Internal/Microscopic Findings

- Jarrid's cause of death is Polysubstance Toxicity (Overdose).

1a. Polysubstance Overdose

- b. -
- c. -
- d. -

2. --



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**Case 2**

- Paul Cassidy, 55 year old man had been on the water boating with his family on a bright, sunny afternoon in June. He had consumed approximately 6 cans of beer over an 8 hour day on the boat.
- Around 6 PM he started feeling tired and felt some pressure in his right arm and neck. The family pulled the boat off the water and Paul went to sit in the truck to cool off.
- Upon arrival at his home, he laid down in bed to rest.

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**Case 2**

- Around 9 PM, his wife went to check on him. He was on his bed and unresponsive. The sheets and bed were in disarray and his hair and sheets were moist (sweaty).
- Of note, he had been seen in the ER a week ago for chest pain
- What could have happened to Paul?
  - Does Paul have any medical conditions?
  - Did anyone enter Paul's room?
  - Did Paul ingest anything that could have led to his death?

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**Case 3**

- Jenna is a 23 year old woman, with a history of depression, anorexia, and an on-again, off-again relationship with her boyfriend. She partied with the cool kids over the holidays, getting highly intoxicated and instigating a fight with her boyfriend. They split up at that time and did not see each other for several months.
- In the spring, she reconnected with him, and was convinced to get some help for her substance abuse. He invited her to move in with him, helping her to eat more regularly and schedule appointments at the clinic.

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### Case 3

- A few days after moving in with her on-again boyfriend, she presented to the ER with generalized weakness and muscle pain. After she was admitted, he confessed to giving her an oxycodone, just one, reasoning that she had been complaining of significant discomfort. Upon speaking with additional family members, it was noted that her purse, left with family at the ER once she was admitted, contained several empty bottles of Tylenol and aspirin.



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### Case 3

- Jenna's hospitalization was short. She was in liver failure and tests showed she had elevated acetaminophen, but treatment was not working. She needed a new liver. She was emergently transferred to a transplant center yet preparations were futile – no donor liver was available and she had developed significant encephalopathy within hours. Her death was pronounced the day after her presentation.



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### Case 3 – what happened?

- Her boyfriend actually gave her the OTC pills along with his extra oxycodone
  - It's a homicide
- She continued to abstain from food, despite her boyfriend making meals for her, ultimately succumbing to her anorexia
  - Natural death
- She consumed several bottles of Tylenol after yet another fight with her boyfriend, resulting in a breakup
  - Suicide
- In an effort to get high like the "good 'ole times," she consumed the Tylenol of her own accord and made plans to meet old friends for a night on the town but just never made it
  - Accidental overdose



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### Case 3

- Acute acetaminophen overdose
  - Acute liver failure with necrosis
  - Wernicke's encephalopathy



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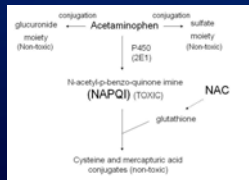
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### Case 3 – treatment

- N-Acetylcysteine = antidote
- 100% hepatoprotective, if administered in time (within about 8 hours)



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### Case 3

- Cause of Death
  - Complications of extensive liver necrosis
  - Chronic alcohol and acetaminophen use
- Manner of Death
  - Accident



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### Case 4 – the story

- Sally, a 92-year-old lady, was carrying in her groceries when she tripped over her cat and fell on her left side. Luckily, she had a LifeAlert and was able to call for help right away. She was brought to the ER where an x-ray showed a left distal femur fracture with additional trauma to her left knee. She had to have surgery and required a knee replacement. A few weeks later, she developed an infection at her new hardware site and needed to have additional surgery.



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### Case 4

- Sally's doctor prescribed her antibiotics but she just didn't feel better. She went back into the hospital after a collapse due to significantly increased weakness and fatigue and was found to have bacteremia. Unfortunately, Sally didn't make it. Her organs went into failure and she died within a few days.



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### Case 4 – what's the cause of death?

- She's just old
  - Natural manner of death from multiple comorbidities
- Doesn't matter how long ago, she broke her leg
  - Accident because she fell



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**Case 4 – final diagnosis**

- 1a. Complications of left knee methicillin-resistant *Staphylococcus aureus* infection with mitral valve endocarditis
- b. Left total knee arthroplasty
- c. Left distal femur and patellar fractures
- d. Fall
- 2. Ischemic cardiomyopathy



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**Case 4 - final**

- Manner of death:
  - Accident



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**Case 5**

- Chris is found on the bathroom floor slumped next to the toilet. His roommates tell police that he was a long-time drug user and had been stumbling around the apartment the night prior.
- His mother, who is out of state, is notified of the death. She reports that he had been feeling under the weather, complaining about being tired during their phone conversation earlier that week. When questioned, she was adamant that he had quit using drugs months ago following a treatment program.



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**Case 5 – final thoughts**

- Is it just another overdose?
- Is it the cold his mother reported?
- What about the heart valve findings?



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**Case 5**

- 1)
  - Toxicology findings – positive for heroin
- 2)
  - Lungs show acute bronchopneumonia
- 3)
  - Endocarditis in a drug user



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**Case 5 – final diagnosis**

- 1a. Acute heroin toxicity
  - b. ---
  - c. ---
  - d. ---
- 2. Mitral and aortic valve endocarditis

- Manner of death: Accident



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Questions & Discussion

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