Objectives

• To define the cause of death.
• To distinguish between a cause and a mechanism of death.
• To complete a death certificate in the proper order with the bottom line always indicating the underlying cause of death.
• To properly identify those deaths that must be reported to the Medical Examiner.
CAUSE OF DEATH

- the disease or injury which initiates (sets in motion) the pathophysiologic sequence of events culminating in death
- In the flow chart below: the underlying cause is linked to the death
- Ex. Atherosclerotic coronary artery disease → D
CAUSE OF DEATH

• In the flow chart below: the immediate cause is a complication of the underlying cause but still part of the chain of events ending in death
• Ex. ASCAD → ventricular fibrillation → D
• Immediate cause is usually a mechanism!
What is a proper cause of death?

- A proper or competent underlying cause of death must be **etiologically specific** → means that it can be attributed to a single underlying cause.
- Corollary:
  a proposed cause of death that is not etiologically specific does not qualify as a competent underlying cause of death!
On a death certificate, the lines are arranged as follows...

1A. due to 1B. due to 1C.

(from immediate to underlying cause, or in reverse order)

- Mechanism(s) is (are) on the top line(s) while the underlying cause is on the bottom line
Competent Causes of Death: Examples

coronary artery disease →
coronary arteries in 21-year-old motor vehicle crash victim
Competent Causes of Death: Examples

- *Atherosclerotic* coronary artery disease
Competent Causes of Death: Examples

• *Congenital* coronary artery disease (anomalous origin)
Is this a competent cause of death?

- Intracranial hemorrhage
dura

epidural hematoma
Cause of Death Sequence

- 1A. Epidural hematoma  DUE TO
- 1B. Laceration of middle meningeal artery  D/T
- 1C. Fracture of skull  D/T
- 1D. Blunt impact to head
arachnoid mater

(blood will not wash off)
saccular aneurysm
circle of Willis
anterior cerebral arteries
Cause of Death Sequence

• 1A. Subarachnoid hemorrhage DUE TO
• 1B. Ruptured aneurysm of anterior communicating artery
lateral cerebral ventricles

basal ganglia
Cause of Death Sequence

• 1A. Spontaneous intracerebral hemorrhage DUE TO
• 1B. Hypertensive cardiovascular disease
MECHANISM OF DEATH

• the specific pathophysiologic derangement by which the underlying cause of death exerts its lethal effect

• For practical purposes, you folks (clinicians) almost always treat mechanisms rather than causes → Ex. patient presents to ED with:
  - congestive heart failure
  - NOT with atherosclerotic heart disease
MECHANISM OF DEATH

• However... because mechanisms are not etiologically specific → they do not qualify as competent causes of death!
MECHANISMS OF DEATH

- sepsis
- congestive heart failure
- hemorrhage (exsanguination)
- shock (cardiogenic/septic/hypovolemic/neurogenic)
- Acute respiratory distress syndrome (ARDS)
- respiratory depression
- organ failure → respiratory, hepatic, renal (uremia), multiorgan
- disseminated intravascular coagulation (DIC)
- metabolic acidosis
- cardiac “arrhythmia” → ventricular fibrillation, pulseless electrical activity, asystole
THE ULTIMATE MECHANISM OF DEATH

- Cardiac or cardiopulmonary arrest... 
  *a description of being dead!*
MANNER OF DEATH

• manner of death: a description of the circumstances of death, or *how the cause arose*

• 2 broad categories:
  - natural: *exclusively* (100%) due to *disease*
  - nonnatural (violent): component of *injury*

• categories: homicide, accident, suicide, undetermined, therapeutic complication
MANNER OF DEATH: GUIDELINES

• if a death includes any element other than disease --- in other words, injury --- then the death must be reported to the ME because it is no longer a natural death!

• When attempting to decide whether a case needs to be referred to the ME, you should always ask yourself:
  - What is the underlying cause of death?
  - Is that cause – disease or injury – reportable to the ME?
Is there a time limitation in a cause of death sequence?

- **NO!** --- as long as the sequence connecting the underlying cause of death and the death is continuous and is not broken by an efficient intervening cause --- that sequence remains valid and intact
- May range from seconds to decades!
Case History

• 40-yr-old man with neurogenic bladder, recurrent UTIs, chronic pyelonephritis, quadriplegic, develops urosepsis + renal failure and dies.

• Question. Is this death reportable to the ME?
Case Hx

• WHAT CAUSED THE QUADRIPLEGIA?
Case Hx

- Quadriplegia was caused by a gunshot wound to neck with perforation of C5 vertebral body + cervical spinal cord 15 years earlier

- Answer: YES; case is reportable to the ME because the quadriplegia was caused by an injury
What degree of probability is required legally on a death certificate?

- Not absolute certainty...
- Not beyond a reasonable doubt (standard of proof in a criminal trial)
- Preponderance of the evidence:
  - more likely than not
  - probable
  - 51% or more likely
Deaths Reportable to the Medical Examiner (ME)

1. All deaths due to injury or in which injury makes some contribution to the death.
   - There is no time interval constraint (i.e., no "statute of limitations") for a cause of death sequence as long as it a continuous unbroken physiologic sequence of events
   - interval: may range from seconds to decades!
Deaths Reportable to the ME

• Teaching point: in death following long protracted hospital course, always ask:

*What is the underlying cause of death?*

If underlying cause of death is an *injury* → death must be reported to the ME
Deaths Reportable to the ME

2. Any sudden, unexpected, and/or unexplained death occurring in an adult, child or infant in apparent good health.
Deaths Reportable to the ME

3. Any unexpected and/or unexplained death either during or following a diagnostic or therapeutic procedure.
* the death should be unexpected and/or unexplained to qualify as reportable
Deaths Reportable to the ME

• Case Hx. A 70-yr-old man with a known 8-cm abdominal aortic aneurysm (AAA) suddenly turns pale and goes into shock. He is rushed to the hospital and brought to the OR. Upon entering the abdomen, > 3 liters of clotted and liquid blood are encountered and the patient goes into cardiac arrest and cannot be resuscitated.

• Question. Is this death reportable to the ME?
Deaths Reportable to the ME

• Answer:
  NO because the death is not unexplained (given history of 8-cm AAA) AND the procedure did not in any way contribute to the death!
Deaths Reportable to the ME

• Case Hx. A 35-year-old marathon runner in superior cardiovascular health undergoes an elective inguinal hernia operation; during the operation she experiences torsade de pointes and ventricular fibrillation and cannot be revived.
• Question. Is this death reportable to the ME?
Deaths Reportable to the ME

• Answer: YES because the death is both unexpected and unexplained (in the absence of significant natural disease) and it is uncertain whether the procedure played a role in the death
Deaths Reportable to the ME

4. All deaths of prisoners, including hospitalized prisoners, regardless of their underlying medical conditions.

* Why?

- Because prisoners are deprived of rights that free individuals have and are at greater risk for maltreatment.
Deaths Reportable to the ME

5. Any death occurring under suspicious or otherwise questionable circumstances in a hospitalized patient.

  * patients with significant illnesses are not immune to dying by violent means → “the easiest to kill are those who are expected to die”

  * have a low threshold for illicit drug use and surreptitious administration of insulin
6. Any death in which there is demonstrable or potential evidence (clinical suspicion) of neglect.

- includes infants, children, elderly, mentally impaired, or any otherwise disabled individuals
Deaths Reportable to the ME

• Answer: YES because the death may have been precipitated by failure to provide care when necessary (an act of omission)
Deaths Reportable to the ME

7. Any death resulting from a suspected communicable disease or posing a potential threat to public health.
   * most commonly meningococcemia but can include other infections
Deaths Reportable to the ME

8. Any death occurring in the workplace that may pose a threat to public health or safety.
Deaths Reportable to the ME

9. Any stillbirth precipitated by an injury (i.e., motor vehicle collision or inflicted maternal blunt trauma during 3rd trimester)
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