Confirmational Bias and Investigation of Arrest-Related Deaths

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Dr. William Griggs

Dr. William Griggs

Reverend Samuel Parris

1692: The Salem Witchcraft Trails

- January 20, 1692:
  - Eleven-year old Abigail Williams and nine-year-old Elizabeth Parris begin behaving very strangely
  - much as the Goodwin children acted four years earlier.
  - Soon Ann Putnam Jr. and other Salem girls begin acting similarly.
- Mid-February, 1692: Doctor Griggs,
  - who attends to the "afflicted" girls,
  - suggests that witchcraft may be the cause of their strange behavior,
  - as he could find no natural cause

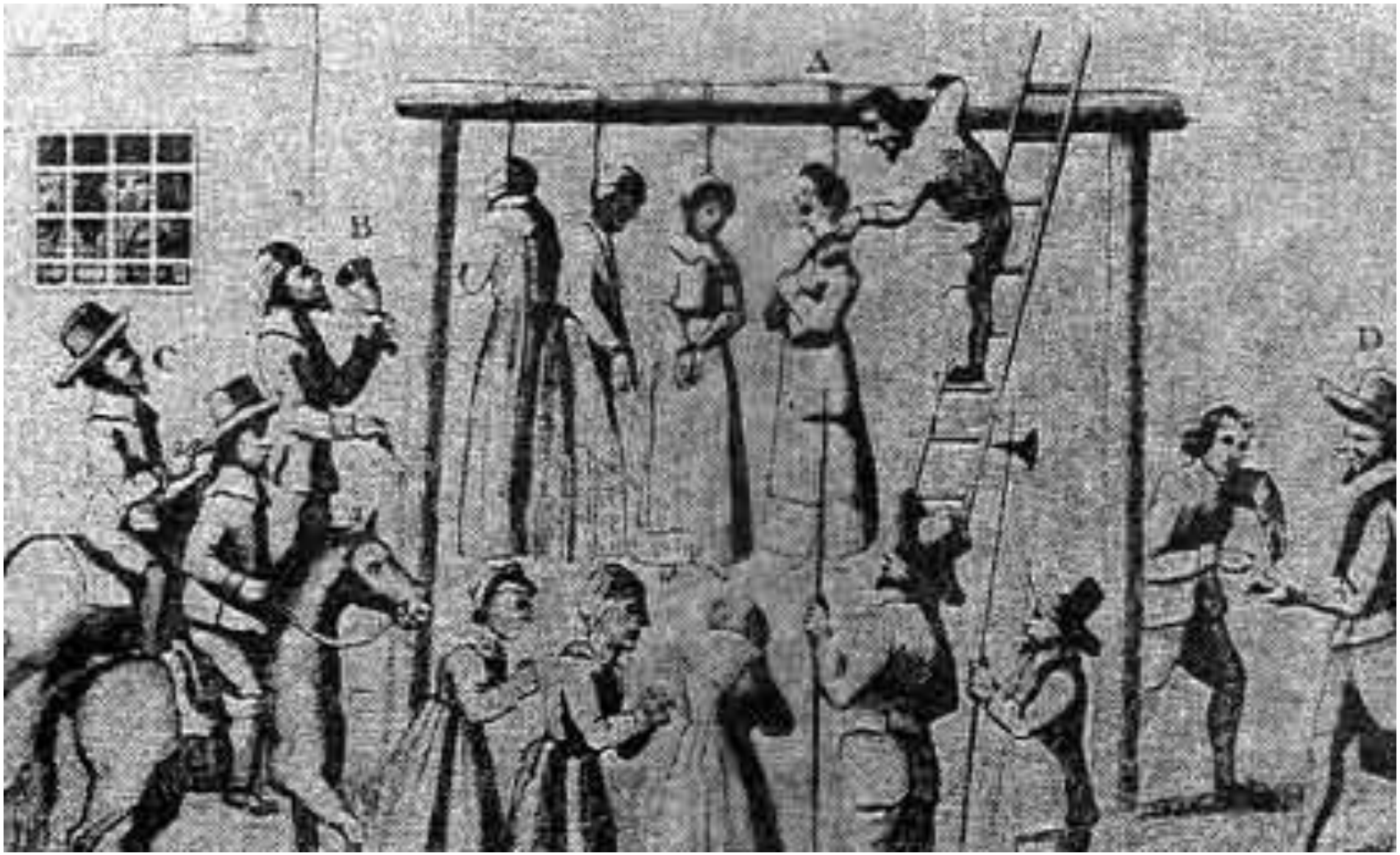
The Trial

Prisoner Being Read Rights

The Death Toll

- By the time the Salem witchcraft trials concluded,
  - Dr. Griggs' misdiagnosis had led directly to the death by hanging of 19 men and women,
  - plus the deaths of seven innocents who expired in prison,
  - plus one poor soul named Giles Corey who refused to participate in the trial. He was crushed to death (''Peine forte et dure") as punishment.
- Melendez – Diaz had not been passed so Dr. Griggs was of the few in Salem not to testify.

Salem, 1692



Confirmational vs Informational Bias

- **Confirmational Bias:** the tendency to search for, interpret, or recall information in a way that confirms one's beliefs or hypotheses.
- **Foundational Bias:** refers to bias arising from measurement error. Many factors can bias the results of a study such that they cancel each other out, or reduce or amplify a real effect the authors are trying to describe.
  - The worst bias is ignorance (lack of knowledge).

Biases in Salem

- Parris' daughter and her friend Abigail Williams began acting strangely and prayer did not improve the situation. Dr. Griggs was consulted. Dx "witchcraft."(**Confirmational Bias)**
- Many of the accused were Parris' enemies and his accusations against them led to their deaths (**Confirmational Bias)**
- Hysteria was not recognized as a disease (**Foundational Bias**)

< 1 Per Career
Law Enforcement Contact Temporal Deaths

Law Enforcement Contact Temporal Deaths Realities

- Occur (on average) < 1 per career for all involved
- Frequency (rough numbers): (per law enforcement activity)

Law Enforcement Activity	Approximate Frequency "1" death per
Contacts	100,000
Arrests	13,000
Uses of Force	600 - 1000
Jail Detentions	700

Introductory Questions

(< 1 per Career)

[on average]

Introductory Questions

< 1 Per career (on average) :

- If something, or an event, occurs < 1 per career (on average), then, how much time, resources, will a person put into learning and becoming competent in the event issues either before or after the event?
- Medical Examiner (ME) [<1 per career (on average)]
  - How much will be spent on purchasing papers?
  - How many hours of time will be invested in self education on the concepts, issues, literature?
  - Could the ME pass a comprehensive test on the issues? Could any of the decision makers?

Introductory Questions

< 1 Per career (on average): Compare:

- **Officer**
  - 600 hours of initial training
  - Field Training Officer training
  - Annual updates/refreshers (24 hours/year)?
- **Emergency Room (ER) Physicians/Doctors:**
  - 4 year degree plus 4 years of medical school
  - Internship and Residency
  - Continuing medical education requirements
  - Comprehensive testing/examinations
  - Support (personnel/equipment) in ER

Introductory Questions

Your Experience Operating Vehicles:

- Do you operate a vehicle?
- How long have been operating a vehicle?
- How many times have you operated a vehicle?

Your Experience Providing Medical Care:

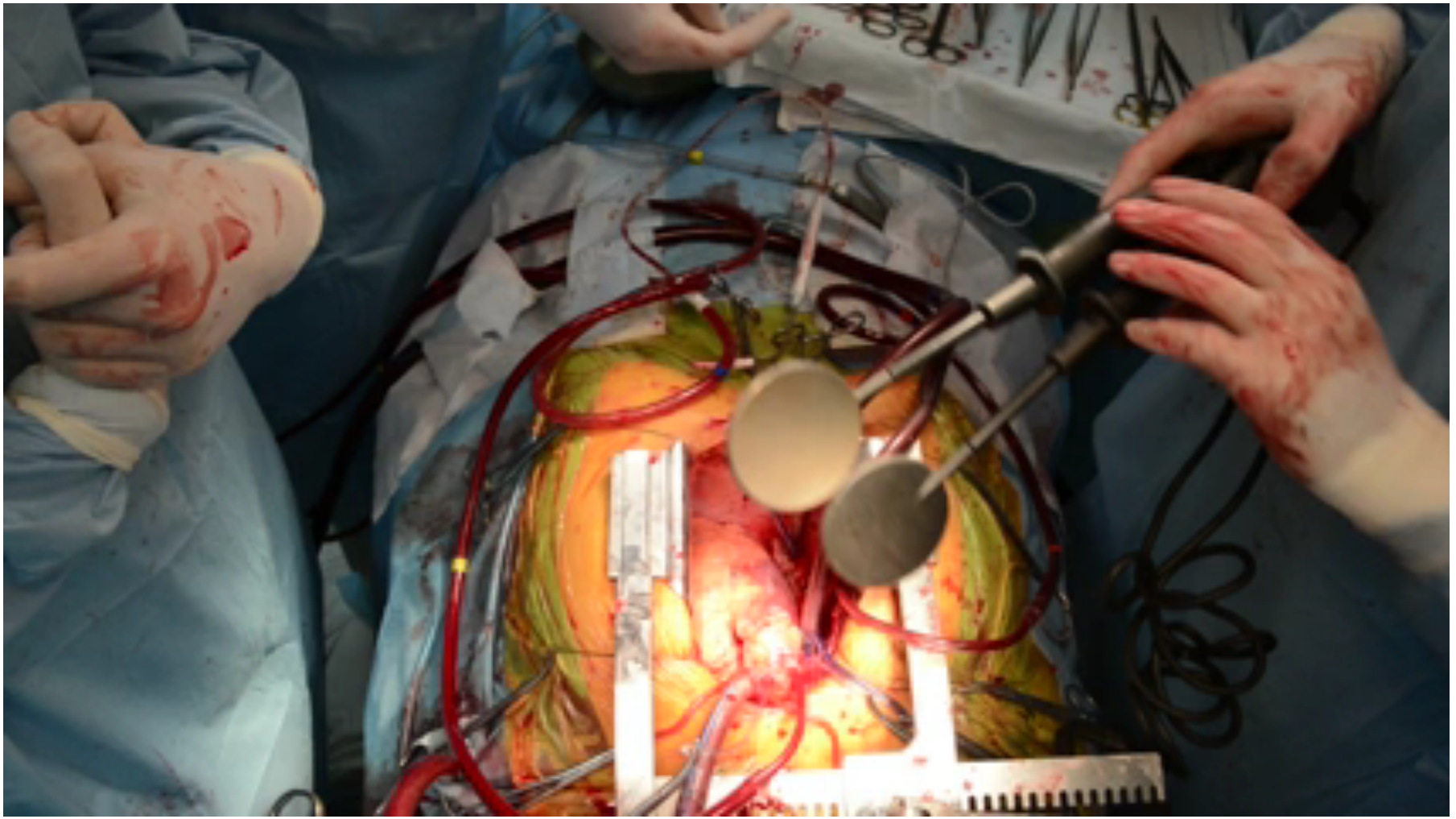
- Have you had some medical training?
- How much medical training have you had?
- How many times have you attended to someone's medical needs?

Here is What “You” Will Operate at 2:00

Do Not Do Mess It Up!!!

Here is What “You” Will do Today at 4:00

Heart Transplant – Do Not Mess It Up!!!



Keep in mind:

Those involved with law enforcement related sudden unexpected death are on average involved in < 1 incident/case per career:

- Officers
- Supervisors and trainers
- Investigators
- Medical examiners and pathologists
- Prosecutors
- Law enforcement executives
- Other decision makers

< 1 Per Career Example Alleged Incidents


Start Spin
STOP SPIN
Drug Death
Restraint Related Death
Arrest Related Death
ExDS
SUDEP
Sickle Cell Exertion Death
Force Temporal Death
Compression Asphyxia
CEW Temporal
OC Temporal
Positioning
Neck Restraint

< 1 Per Career Example Alleged Incidents

- Arrest-Related Death
- Excited Delirium Syndrome (ExDS) Death
- Sudden Unexpected Death in Epilepsy (SUDEP)
- Sickle Cell Exertion Death
- Force Option Temporal Death:
  - Chemical Irritant (OC, CN, CS, Combination)
  - CEW
  - Neck Restraint
- Restraint/Positioning/Weight Force Temporal Death
- Drug/Alcohol Use Temporal Death
- Catecholaminergic/Stress/Exertion Death
- Cardiac, Genetic, Physiologic Underlying Causes

Mortality Enhancers:

- Long term and/or acute poor health
- Long term and/or acute drug/alcohol abuse
- Mental Illness
- Psychiatric medications (past or present)
  - See Black Box warnings on medications
- Subtherapeutic psychiatric meds
  - (often) Off medications for 4-5 days
- Cardiac adnormalities
- Race: "**cardiovascular deaths were 5-fold more common in African-American athletes than whites** (3.8 vs. 0.7/100,000; $p < 0.01$), but did not differ from the general population of the same age and race ($p = 0.6$)."
- Other

Medical Examiners' Biases

- MEs investigating ARDs frequently add modifiers to death certificates, such as:
  - "while prone,"
  - "during police restraint," or
  - "following TASER® [CEW]" application.
- MEs sometimes include:
  - "kitchen sink" inclusions.
  - for "counting" purposes.
  - "possibilities."
- MEs seldom include:
  - exact mechanism of cause or contribution to death,
  - explanation of general and specific causation of mechanism,
  - evidence that supports this speculation, or
  - methodologically reliable supporting literature citations.
- Well designed, peer reviewed, controlled studies have discredited these diagnoses, yet they still appear on death certificates and in autopsy reports.

Medical Examiners' Biases

MEs often attempt to use conclusion based on "balance of probabilities," "differential diagnosis," or exclusion, yet, do not include:

- all possible causes/contributors,
- a clear statement of limitations, including:
  - tests not done.
  - factors not considered.
- statement of degree of medical/scientific certainty being used, and
- clear statement of general, incident general, and specific causation.

Popular Myths About ARDs

- **Prone positioning**
  - Hall examined 4828 (analyzed 3.2 million police encounters) use of force records from 7 police jurisdictions. >2000 remained prone, rest supine. Only one case of SCD and it was in supine position. (Hall, et al, JFLM, ;31:29-35 2015).
- **"Hog Tying" and "weigh force"**
  - Multiple studies of human volunteers with up to 225 pounds on their backs, had no clinically significant effect of pulmonary effects or cardiac output (Savasser, et al, J Forensic Leg Med. JFLM 2013 Nov;20(8):991-5).
- **Pepper Spray applied**
  - Anecdotal reports exist of deaths when OC is used, but very rare and only when OC is applied directly into lungs, i.e. misused. One series 4500 applications no deaths (but police at greater risk) (Kearny, et al, Prehosp Emerg Care. 2014 Jul-Sep;18(3):381-6).

Popular Myths About ARDs

- **TASER CEW Application**
  - The dart-to-heart distance (DTH) must be less than 4 mm for direct electrical induction of VF. Bracketing of the heart is not a necessary criteria. (Kroll, et. al, *Circulation*. 2014;129:93-100, supplement).
  - The theorized cardiac capture leading to VF has been discredited. (Kroll, et. al, *Circulation*. 2014;129:93-100).
  - CEW induces less physiologic/metabolic effects than other force options. (Ho et al, *Am J Emerg Med*. 2009;27(4):413-418).
  - CEW does not worsen metabolic effect already present from exertion or more than brief continued exertion. (Ho, et al, *Acad Emerg Med*. 2010;17(7):e60-68; Vilke, et al, *Acad Emerg Med*. 2009;16(8):704-710..

Other Popular Medical Myths

- Petechiae are considered by many as proof of asphyxia and strangulation, but petechiae are artifacts of increased intra-thoracic pressure.
- Intubation may cause injuries falsely attributed to strangulation (Raven, et. al., Am J Forensic Med Pathol, 20(1)31-36).
- Because the act occurs before the findings there is false attribution of cause and effect relationship.

Law Enforcement and SCD

- Less than 10% of sudden cardiac deaths (SCD) in men under 40 occurs in law enforcement Arrest-Related Deaths (ARDs)
- At the same time law enforcement officers SCD risk is:
  - 34-69 times higher during restraints/altercations and
  - 32-51 times higher during pursuits.*

Varvarigou et al., BMJ, 349:6534, 2014

Stress, Restraint, and ARD

Krexi et al performed postmortem study of 110 cases of SCD occurring after some types of highly stressful situations:

- Altercation = 45%
- Physical restraint = 31%
- Death in Custody = 10%
- School exams, job stress = 7.2%
- Bad news = 4%
- Car Accident, but no injury = 2.73

Krexi et al., Med Sci. Law, epub 4/15/2015

Krexi Details

- Decedents:
  - mostly male
    - half under age 35
  - 25% were obese
- 90% had negative toxicology;
  - of the 10 positives none deemed significant.
    - Of the 10, 8 had normal hearts, one cardiomyopathy and one “floppy mitral valve.”

Single most common finding (60%) was a normal heart

53% died with a negative autopsy and a morphologically normal heart

SCD During Arrest is Rare

- AHA estimates that SCD from Coronary Artery Disease (CAD) accounts for between 250,000-450,000 per year in US
- In those under 25 CDC estimates 2000 cases of SCD unrelated to CAD yearly in US
- SCD in the young is incredibly rare, and ARDs in the young rarer still.
- Rarity of the condition explains temptation to equate temporality with causation (foundational and confirmational biases).

What We Know

- 1/3 of SCD victims have genetic substrate*
  - 1/10 of sudden infant death syndrome (SIDS) also have genetic substrate (most often LQTS)
- Responsible genes are variably penetrant, and abnormal genes may interact with visible preexisting myocardial disease to cause SCD
- **The common denominator in SCDs and SIDS is a negative autopsy.**

Tester & Ackerman, JACC, 49(2) 240-6, 2007

Medical Examiner Sudden Cardiac Death (SCD) Undetermined

Date	% of Deaths Undetermined or Sudden Unexplained Death ("SUD")	Paper
Jan. 2015	53 % undetermined	Krexi, Sudden cardiac death with stress and restraint (n=110)
Apr. 2014	31 % undetermined	Risgaard, Sudden cardiac death in persons aged 1-49 years
Apr. 2014	28 % undetermined	Winkel, Sudden cardiac death in children (1-18 years)
Mar. 2014	20 % undetermined	Harmon, Etiologies of SCD in NCAA Athletes
Feb. 2014	9 % unresolved	Maron, U.S. college athletes
Sep. 2011	20.7 % unexplained	Eckart, young athletes
Dec. 2004	35 % undetermined	Eckart, military 25 year study
1995	5 % undetermined	Van Camp, Nontraumatic sports death high school/college athletes

The Real Meaning of Foundational and Confirmational Causation

Confirmational Bias:

- a politically acceptable way of saying that death investigators are intentionally or unintentionally interpreting and manipulating data in such a way that it confirms their own preconceptions, resulting from their own lack of knowledge
- It also allows them to avoid misplaced public and media pressure to name a culprit, even a speculative one.

Conclusions

- ARDs occur (on average) < 1 per career for all invovled.
- Just because an ME has not “seen” a particular cause/ contributor to death does not mean that it does not exist or is not supported by the literature.
- MEs need to be knowledgeable and current on the literature in all specific areas related to the subject/ autopsy.
- Countless diseases are recognizable only at the molecular level, and methods of testing for them are available.
- If medical examiners were not constrained by their biases they would endeavor to identify these alternative causes.
- If resources for such a search were lacking, the appropriate action would be to classify the cause of death as undetermined, without the speculative hyperbole.

Solutions

- **Eliminate Confirmational Bias:** There should be no pressure to produce a desired diagnosis
- **Eliminate Foundational Bias:** ME must fill the knowledge void – cannot consider a channelopathy as COD if the ME doesn't know what LQTS is
- Consider Federal Intervention – 3 or 4 Federal laboratories could process all non coronary artery disease (CAD) SCD that occur yearly in US

Common Causes of Medical Examiner Errors Include:

Common Causes of Medical Examiner Errors Include:

- Society expects MEs and coroners to always reach a cause and contribution to death conclusion. This is impossible since numerous studies find that 25-53% of children, military recruits, non-athletic, and athletic, sudden deaths cannot be explained.
- Confirmational bias (leaping to a conclusion and moving towards confirming it).
- Failing to ensure identification, collection, analysis, documentation, and maintenance of all evidence.

Common Causes of Medical Examiner Errors Include:

- Failing to investigate or consider other cause-of-death possibilities, such as exertional stress and genetic cardiac abnormalities.
- Failing to test for, or inability to test for, newer designer drugs such as “bath salts.”
- Relying on scientifically unreliable media and consumer interest or public interest reports that are generally hearsay and should not be considered.

Common Causes of Medical Examiner Errors Include:

- Relying on published anecdotes, such as those linking prone restraint or CEWs, to an ARD. Case reports have very important weaknesses and generally provide poor evidence of causality. Generalizing from case reports is such an unreliable practice that, for most purposes, courts do not accept them as evidence.
- Failing to utilize experts where appropriate (e.g. cardiac pathologists, forensic toxicologists, bioelectrical scientists)

Common Causes of Medical Examiner Errors Include:

- Failing to consider the toxidrome (signs and symptoms of poisoning) of substances in relation to mortality.
- Failing to explain and support the precise alleged mechanism of cause-of-death.
- Confusing temporality with causation.
- Decisions made on other logical fallacies, not on methodologically-reliable literature supported analysis.

Common Causes of Medical Examiner Errors Include:

- Decisions made to a degree of certainty of "possibility" and not to an appropriate degree of professional certainty.
- "Kitchen sink" approach to contributors to death – naming or listing a wide range of probably irrelevant incident events, regardless of contribution to death.

ARD Investigation, ME, and Decision Quality-Control Checklist

Item	Check	
1		Temporality, reliance of case reports and series, incomplete differential diagnoses, and confirmational biases avoided
2		Complete investigation: evidence identified, captured, collected, analyzed, organized, maintained, and documented. Within an appropriate time frame. Which means, practically, autopsy within 12 hours and tissues frozen for special studies.
3		Subject's medical, mental, and drug histories thoroughly researched, documented, and considered
4		Any evidence not captured, collected, analyzed, maintained, documented, or considered is documented
5		Additional tests performed as appropriate, e.g. toxicology, cardiac genetics, and force option analysis (testing the option, e.g. CEW, pepper spray, etc.)
6		Adequate biological samples maintained through ~5-year potential life of prosecution and litigation
7		Accurate annotated incident timeline created, including approximation ranges where applicable
8		Any possible cause-of death (CoD) identified, thoroughly researched, analyzed, considered, and individually ruled on
9		Other competent and knowledgeable experts sought, identified, consulted, and utilized when appropriate to specific issues. E.g. cardiac pathologists, geneticists, forensic toxicologists, bioelectrical scientist (for CEW cases).
10		Any proposed CoD or contributor specifically includes thorough analysis of alleged mechanism
11		General causation established under the facts of this case, followed by specific causation
12		Sudden cardiac death due to exertion or other such factors carefully considered and scientifically ruled out. The negative-autopsy literature considered, analyzed, and ruled on
13		Mortality risk enhancers scientifically analyzed, considered, and individually ruled on
14		Logical fallacies are identified, considered, and avoided
15		All relevant underlying concepts fully researched and understood before ruling
16		Any conclusion as to CoD or contribution to death is made to a "reasonable" degree of certainty
17		All limitations to statements and opinions independently listed in report, e.g. no experience with this cause, mechanism, research, etc.