Forensic Epidemiology and Causation in Forensic Medicine:
Methods for Evidence-Based Practice

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It is a common misperception, both in the forensic medical community and among the lay people who comprise factfinders in the judicial system, that diagnosis based on autopsy findings provides *certain* evidence of the cause of death. Indeed, the term "autopsy," from the Greek "autopsia," meaning to *see for oneself*, suggests that it is the observations from a forensic autopsy that are the source of a determination of both cause and manner of death. The assumption is reasonable when a cause of death is intuitively linked to a pathological finding at autopsy with a high fatality index, such as a gunshot wound to the head. This is because of the general knowledge that such an injury is highly likely to be fatal shortly after occurrence. In cases with multiple competing causes, however, pathological findings have a more tenuous link to cause of death. As an example, for a restrained decedent who became unresponsive while in a weighted prone position, with a recreational level of methamphetamine in his system, neither circumstance or condition is associated with a high risk of sudden death, and thus an intuitive approach will not result in the ability to reliably identify the most probable cause of death. The inherent variability in the certainty of cause of death determinations stems from the unavoidable fact that unlike a diagnosis, a cause is unobservable. Causal determinations are, without exception, based in risk assessment and comparison, and thus are *inferential* rather than *observational* in nature.

Epidemiologic (population-based) study is the data source of all risk estimates, and the methods for applying such information to multifactorial causal analysis in forensic medicine is described in the discipline of forensic epidemiology (FE). In this lecture, the various applications of FE principles to death investigations involving multiple potential causes, including restraint-related death in custody, abusive head trauma/ shaken baby syndrome, neonatal head injury, and suicide (among others), will be presented and discussed. The goal of an FE analysis is to provide an additional evidence basis for FM conclusions of cause and manner of death, and thus improve the reproducibility and reliability of such determinations.