The "Value-Added" Forensic Autopsy: Public Health, Other Uses, and Relevance to Forensic Pathology's Future

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ABSTRACT

This article centers on the "value-added" forensic autopsy, one in which the autopsy goes beyond the basic tasks of determining cause, manner, and basic circumstances of death. It is important to recall that the word "forensic" is derived from the Latin "*forensis*" which means "forum," or "public," not "crime" or "science." Thus, the value-added forensic autopsy can be seen as one that is done with the public in mind, as opposed to being focused only on needs of the criminal justice system. The value-added autopsy might be one in which a decision is made to perform an autopsy in case that might otherwise not have been autopsied, or to do a more extensive or "complete" autopsy than might otherwise have been performed, or, perhaps, do additional ancillary laboratory testing. The "value-added" concept is not offered in the financial context, but rather, the societal context. This article discusses perceived reasons why value-added autopsies might not be performed and reasons and examples of how they can be beneficial. More study is needed, however, to determine their place in the medicolegal death investigation setting.

The forensic pathology profession might be wise to consider whether it wants to remain considered as mainly a criminal justice player or in addition, take further advantage of its potential in public health, public safety, research, civil law proceedings, and other activities and disciplines that can benefit from forensic pathology information. Such contemplation and action could seal, or even secure the fate and future of forensic pathology practice. *Acad Forensic Pathol*. 2015 5(2): 177-185

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INTRODUCTION

It is probably safe to say that forensic pathology in the United States is not what it could be. A more pointed question is whether forensic pathology is what it *should* be.

This article centers on what might be termed the "value-added" forensic autopsy: one in which the autopsy goes beyond the basic tasks of determining (or even just documenting the obvious) cause, manner, and basic circumstances of death. It is important to recall that the word "forensic" is derived from the Latin "*forensis*" which means "forum," or "public," not "crime" or "science." Thus, the value-added forensic autopsy can be seen as one that is done with the public in mind, not focused only on needs of the criminal justice system.

Depending on the situation, and for the purpose of this article, a value-added autopsy might be one in which a decision is made to perform an autopsy in case that might otherwise not have been autopsied, or, to do a more extensive or "complete" autopsy than might otherwise have been performed, or, perhaps do additional ancillary laboratory testing. "Value-added" is not offered in the financial context of "more bang for the buck" (because additional procedures might incur additional expenses) but rather, in the societal context of potential public benefit with an element of altruism.

DISCUSSION

Background

Media entertainment has portrayed the forensic pathologist as a crime solver, which is not really the case in most instances (1). Forensic pathologists are fact finders and fact providers who with their interpretations and opinions can, indeed, assist in the solving of crime. But the bulk of the forensic pathologist's work does not involve criminal cases (homicides). In fact, even in metropolitan medical examiner offices with high homicide rates, homicides account for perhaps 10% of all deaths certified by the medicolegal office (2). The majority of the remaining cases are natural deaths, followed by accidents, suicides, and a small portion of cases with undetermined manner. The basic question is how far we should go in performing autopsies or more "complete" autopsies in the nonhomicide cases, and what value might be added if autopsies were done in such cases.

This report is not a scientific study, but if it were, the hypothesis would be that performing value-added autopsies on more cases to be certified by the medical examiner or coroner would add value by providing information for families, the civil justice community, the public health and safety communities, the medical care community, and for research purposes, including data which would not be available in the lack of autopsy.

The Scientific Working Group on Medicolegal Death Investigation (SWGMDI) discussed a concept analogous to the value-added autopsy (cases in which the value of autopsy is "contentious") (3). The difficulties in objectively showing whether they are cost-effective and/or otherwise valuable is a significant issue and a proposed study protocol was offered (3). The real and potential value of the autopsy from a variety of viewpoints has been the subject of a number of conferences and publications over the years (4-13). Few would argue with the real or conceptual values. The question remains whether value-added autopsies are appropriate in the forensic medicolegal setting.

The "pie in the sky" concept of performing value-added forensic autopsies would certainly meet with resistance by some, if not many forensic pathologists, for reasons on multiple levels. Below are some of the author's perceived conceptual reasons, along with questions that illustrate how a value-added forensic autopsy might be beneficial. It is difficult to support the reasons with scientific or other data, and they are offered more as food for thought.

Potential Reasons for not Performing Value-Added Autopsies

There are a number of conceivable reasons why value-added autopsies are not performed. These are outlined below.

First is the issue of **forensic pathology manpower**. In many offices, the caseload is such that the number of forensic pathologists is not adequate to do routine autopsies, let alone value-added forensic autopsies (14-16). For example, in single gunshot wound to the head suicide cases, the standard procedure may be to document the entry wound and internal head injury, retrieve the bullet, do an external examination, and maybe, perform toxicology. This is the "bullet-puller" portrayal of some forensic pathologists recently discussed on the National Association of Medical Examiners Listserv (17). But what if the decedent or family member had cited cancer (perhaps not well-documented as to its existence or nature) as a reason for committing suicide? Is there value in knowing whether cancer did exist, and, if so, what type it was and the extent? What if cancer was present and is a type that has familial tendencies? Documentation of negative findings might also be useful. For example, what if no cancer was found in this case. Would that information be helpful to the family and perhaps allay concerns of cancer in the family?

What if large quantities of pills were found in the stomach of someone who shot himself? Would that not help support a determination of suicide? Yes, these things may be rare, but in a single case, are we not obligated to do a complete investigation? How can one rule out subtle neck compression in a suspected suicide (possible homicide) without doing an internal examination of the neck? What if previously unknown hemochromatosis was found incidentally? Would that information not be meaningful to the family since it can be heritable? Such potential uses abound.

Using a "we are too busy" rationale for not performing autopsies in such cases is certainly understandable, but perhaps not really defensible in the scientific context of looking beyond the obvious, doing the best we can to better confirm suicidal intent or other manner of death, and knowing that medically and scientifically that the autopsy *can* provide value-added information. These same principles apply to motor vehicle fatalities, drug-caused and other accidental deaths, and natural deaths. Studies have shown that the cause of death determined at autopsy in natural deaths is different from that which would have been written on the death certificate if an autopsy had not been performed, with major differences in more than 25% of cases (18). That has direct impact on vital statistics mortality data, which are used for research and funding prioritization of various government and other programs (13).

A second issue is **forensic pathologist attitude**. There are some forensic pathologists who may have diminished interest in nonhomicide cases. They still see the medical examiner/coroner as part of the criminal justice system and are not particularly interested in the value-added concept. Their attitude might be, "this man obviously died of injuries from a car wreck. What else matters?" But those who work in busy offices have probably seen cases of motor vehicle injury that overshadowed an inconspicuous gunshot wound, which was overlooked. Think about how many small circular or angulated wounds there can be on an apparent traffic fatality victim!

A third issue is the **parent organization**. There are medical examiners housed within law enforcement agencies, and in some states, the coroner is the sheriff. In at least two states, the county medical examiner or coroner may be the prosecuting attorney (19). It is hard to deny that this law enforcement or prosecutorial oversight does not guide policy, procedure, or attitude toward the types of cases in which autopsies are performed or their completeness, perhaps related to law enforcement funding priorities. When there is no indication of crime, law enforcement entities may lose interest. Perhaps this attitude could "rub off," or even be pushed upon forensic pathologists working in such systems.

A fourth issue is **work environment and payment basis**. Some forensic pathologists serve multiple jurisdictions and travel from place to place to do autopsies. In short, the quicker they get done in one place the quicker they can get to the next. It is also probable that the pay arrangement plays a role, and whether a forensic pathologist gets paid by the case or on a salary. Lower per case payment for external examinations versus higher pay for complete autopsy would

intrinsically seem to favor the performance of autopsy, while situations of fixed salary might trend things in the other direction.

Another issue is **training**. Especially for forensic pathologists who remain working where they trained, they tend to do things the way they were trained. If they were trained to lean toward external examinations only or limited autopsies, that is probably what they will do in practice. For example, a NAME survey responder indicated that he did not do "partial autopsies" because that's the way he was taught, and another was taught that incomplete autopsies give incomplete results (20). The author of this article was trained to do complete autopsies in cases where people died on scene or on arrival to the hospital when death appeared to result from injury or poisoning, and maintains that practice in his office today. Training certainly influences practice.

A sixth issue is **system type**. In systems having to pay for body transport (or pay per case for autopsy) and having to transport bodies long distances for autopsy, the coroner or other local official may make case decisions on the basis of finances instead of the value of routine or value-added autopsy's usefulness (21). This may preclude a forensic pathologist from even being involved in case management or autopsy decisions. In other places, bodies are sent in from rural areas with little or no history, perhaps "found dead at home, not suspicious." The pathologist basically goes about the case somewhat blindly, assumes natural death, and does an external examination, only to find additional information later, when it is too late, that a complete autopsy may have been more appropriate.

A seventh issue is the question of **what constitutes a complete or value-added autopsy**. The SWGMDI stressed the importance of defining a "complete autopsy" (3). Does it include routine vitreous electrolyte testing, toxicology, microscopy on all tissue sections, and even genetic testing? Which organs and tissues should be examined and to what extent? The cost of the autopsy dissection is relatively fixed, but adding the services above may impose additional costs. But for the added value, samples collected now may be used in the future for more specific study or genetic testing, or even research if law permits. In some instances, autopsy is necessary to collect such samples or to correlate autopsy findings with eventual lab results.

An eighth issue is the **definition of circumstances of death**. "Circumstances of death" may have different meaning to various forensic pathologists. To some, it may only go as far as what is needed for the death certificate such as "shot by other," or "Fell off 20-story building." To others, the definition may be more comprehensive and consider things such as potential reasons for the fall from a building, or medical conditions that may have led to a person committing suicide, among other examples. If the forensic pathologist takes the death certificate approach, he or she may have less interest in trying to more fully detail the "circumstances" surrounding death. And, in some settings, the forensic pathologist may not have access to information needed to more fully characterize the circumstances, especially in places where the death investigator or coroner is physically remote from the place of autopsy.

Finally, differing **philosophies about the use of tax dollars** may come into play. Some forensic pathologists or office funding administrators/controllers may not view it as appropriate to spend tax dollars (money that supports the medical examiner/coroner office) on matters that might be construed as research, idle or peripheral interest, or civil in nature. They do not view such things as being within the basic mandate or scope of the office. Instead, they prefer that special projects be done with special funds and staff support with special arrangements and necessary consent. Others might disagree with that approach.

It is difficult to document or prove that any or all of the above perceptions are true. Many of them are not even specific for forensic pathologists and could apply to people in other professions or vocations. But it seems that they could be true in regard to forensic pathologists, and that each if the above issues can be a reason why value-added forensic autopsies are not, or cannot be performed.

In general, uniform performance of value-added autopsies can only be done if there are enough forensic pathologists to do them, and there is adequate funding to support them. Both of these requirements involve support from outside of the forensic pathology discipline—mainly the entities which fund death investigation systems. Forensic pathologists can do their part by training new forensic pathologists, but there must be an increase in the number of forensic pathologists being trained and working in the field. This will require funding from entities that forensic pathologists, for the most part, do not control.

Imagine a world in which a forensic pathologist could do 200-250 value-added autopsies per year, have an income competitive with other physicians, and not work in a setting in which higher numbers of autopsies are performed along with many other external examinations and limited autopsies, for the same income. Which is preferable to the forensic pathologist? The former work setting cannot be accomplished by forensic pathologists alone. Systemic support is needed to attain such a goal.

The forensic pathologist must always have discretion as to whether an autopsy is performed in specific cases, such as those involving religious objections and in other circumstances as well. But it can be within the discretion of a forensic pathologist or the administrative head of a death investigation office that value-added forensic autopsies are the procedure of choice assuming adequate support is in place to do them. Instead of taking pride in saying "I think an external examination will do in this case," pride might be better placed in the statement, "I did a complete autopsy and the most thorough job I could professionally accomplish in this case, and I used my extensive training and professional skills to do it."

Previous reports have documented the value of medicolegal death investigation and autopsy for the purposes of public health, epidemiological research and surveillance, and public safety (22-23). Forensic pathologist Charles Hirsch focused on such uses in his "Forensic Pathology and Public Health" Maude Abbott Lecture of 1997 (24). Most recently, awareness of the public health importance of forensic pathology and death investigation work has been manifest in the National Association of Medical Examiners' establishment of the "Susan P. Baker Public Health Impact Award" for a relevant presentation at NAME's annual meeting (25).

Some agencies and programs that regularly derive information from forensic pathologists and death investigation systems are listed, described, and referenced in **Table 1**. For the most part, it is the cause, manner, and circumstances of death that are most important to the respective agency, and actual autopsy findings are of little or no concern with some exceptions. Over the years, the value of forensic pathology information has been increasingly recognized and requests for forensic pathology involvement in reporting system are continually increasing. The new Sudden Death in the Young (SUDY) Registry includes an 18-page form to document the autopsy and its findings, and some items might be considered as going beyond the "routine autopsy" (26).

For completeness, some examples regarding the use of cause, manner, and circumstances of death data follow. The Federal Railroad Administration investigates railroad trespass deaths and has prepared reports on improving safety at railroad crossings (27). Recently, the National Association of Medical Examiners Pediatric Toxicology Registry has been used to review data regarding methadone detected in infant fatality cases, to assist the forensic pathologist in better assessing possible cause and manner of death (28). NAME PedTox data have also been used as a basis for published reports (29). Medical examiner data have recently been used to better characterize arrest (police)-related deaths and medical examiners were specifically acknowledged for providing information used in the report (30). High Intensity Drug Trafficking Area (HIDTA) teams use timely local medical examiner data to assess drug abuse fatality patterns, such as the recent emergence of fentanyl in heroin death cases, leading to further investigation as to the source of fentanyl (or its derivatives/analogues) (31). Minnesota, Louisiana, and Wisconsin have used medical examiner/coroner-based child fatality review data to improve safe sleep practices and develop pro-

grams to prevent infant deaths (32). Medical examiner/coroner data reported to the Consumer Product Safety Commission (CPSC) Medical Examiners and Coroners Alert Project (MECAP) have directly led to recall of cushions posing risk of infant death, recall of unsafe portable cribs, placement of safety warnings on 5-gallons buckets posing risks to toddlers, and improvements in chain saw design to name just a few (33). Further, MECAP states that medical examiner/coroner information is its most valuable source of information because it is timely and provides more complete information than death certificates (33). The Centers for Disease Control and Prevention's (CDC) Medical Examiner/Coroner Information Sharing Program (MECISP) collected a variety of information for medical examiners and coroners to develop guidelines, model databases, and to publish studies based on medical examiner/coroner data (34). Although the MEICSP program ended in the early 21st century, it is now being rebuilt within CDC's National Center for

Table 1: Entities to Which Forensic Pathologists and Death Investigation Systems Have Reported Specific Case Information, and Entities Which Rely Upon Forensic Pathology or Medical Examiner/Coroner Data for Various Programs

Entity	Type of Information
Consumer Product Safety Commission (CPSC) Medical Examiner/Coroner Alert Project (MECAP)	Deaths involving consumer products other than cosmetics, pharmaceuticals, motor vehicles. http://www.cpsc.gov/
Food and Drug Administration (FDA) FDA MedWatch	Adverse events involving prescription drugs, medical devices, cosmetics, nutritional products, foods and beverages. https://www.accessdata.fda.gov/scripts/medwatch/
Local or State Health Departments	Notifiable diseases such as TB, Neisseria, etc.
US DOT Federal Railroad Administration (FRA)	Collects data on railway trespass fatlaities http://www.fra.dot.gov/Page/P0001
Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI)	Uses death certificates and other death investigation data on fatal occupational injuries. See http://www.fra.dot.gov/Page/P0001
National Institute of Occupational Safety and Health (NIOSH;CDC) National Traumatic Occupational Fatality (NTOF) Surveillance System	Uses death certificate data to tabulate occupational fatalities due to injury. http://www.cdc.gov/niosh/injury/data.html
National Center for Health Statistics (NCHS;CDC)	Collects coded data from all death certificates, including those completed by forensic pathologists. http://www.cdc.gov/nchs/fastats/deaths.htm
National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS)	Uses death certificates and other death investigation data on motor vehicle fatalities. http://www.nhtsa.gov/FARS
National Association of Medical Examiners (NAME) Pediatric Toxicology (PedTox) Registry	Collects case information from pediatric fatality cases in which drugs were detected. https://pedtox.orainc.com/login.php
National Association of Medical Examiners (NAME) Death Registry	Reports of selected deaths such as those involving police action, previously undiagnosed neoplasms etc. https://ndr.orainc.com/
Office of National Drug Control Policy High Intensity Drug Trafficking Area (HIDTA) Program.	Some forensic pathologists report drug caused deaths to the local HIDTA agency to assist in monitoring drug use patterns and fatalities
CDC National Violent Death Reporting System (NVDRS)	About 32 states have programs to collect comprehensive information on violent deaths, mainly suicides and firearm related fatalities. http://www.cdc.gov/ViolencePrevention/NVDRS/index.html
Electronic Death Registration (EDR) System	Many states have such programs so that death certificate information can be entered electronically. http://www.naphsis.org/systems
Child Fatality Review Teams	The local or state teams due comprehensive reviews of childhood deaths
CDC Sudden Unexplained Infant Death (SUID) Registry	Collects information about sudden unexplained infant deaths http://www.cdc.gov/sids/CaseRegistry.htm
CDC and NIH Registry of Sudden Death in the Young (SUDY)	Expands the SUID Registry to include older children and also possibly provide genetic laboratory testing. http://www.nih.gov/news/health/oct2013/nhlbi-24.htm
Elder Abuse and Exploitation Review Programs (EDRT)	These are emerging and vary by state (35)

Health Statistics. And it is obvious that data provided for death certificates and the National Violent Death Reporting System by forensic pathologists is crucial to national mortality statistics analysis and violent death analysis and prevention programs (36).

We also need to recall that it was, at least in part, forensic pathologists who helped identify conditions in the United States such as Legionnaire's Disease, West Nile Virus, Hantavirus Pulmonary Syndrome, cyanide-laced acetaminophen, the effects of inhaling hydrocarbons (huffing, sniffing), foods that pose aspiration risks in children, and other conditions (23). For some of these (infections in particular), the "chalking off" of deaths as being due to natural causes without autopsy might have delayed discovery of the various conditions or hampered the elucidation of the pathology in such cases. Especially in the infectious conditions listed above, one might say that value-added autopsies were performed. A more recent example is the "extra mile" forensic pathologists have taken to further characterize concussive and repetitive brain injury and the nature of traumatic brain injury in athletes and in infants. The taking of additional samples at autopsy in possible infectious disease cases and having them analyzed by the CDC's infectious disease laboratory is a great example of the value-added autopsy. The testing, at least for now, is without charge and, it provides the opportunity to make etiologic specific diagnoses and determine causes of death that would otherwise have been unknown (37).

In the author's medical examiner office, what might be called value-added autopsies have led to useful information in a variety of cases. Histology in a gunshot homicide case led to the differentiation of unclear entry and exit wounds by finding renal tissue in one wound (the bullet passed through the kidney on its way to the exit wound). Whether shot from the front or back could have great weight in a criminal trial. Taking of additional tissue samples at autopsy and analysis at CDC has led to etiologic specific diagnoses of influenza, myocarditis, and pneumonia. Epidemiology is served in such cases. Full autopsy in traffic fatality cases has shown a natural underlying cause for the collision (such as evolving myocardial infarction) with subsequent contributing fatal injuries. Such a finding could have weight in a civil law proceeding. As just one other example, full autopsy in an unexpected suicidal hanging showed an early pregnancy, which subsequently was thought to be the reason for suicide. These are just a few examples among many other such cases.

With the marked decline in the number and rate of autopsies performed in hospitals (many do not even do them), the great majority of autopsies in the United States are done in the medicolegal setting. We can probably accept the fact that with modern diagnostics, the cause of death of many hospitalized patients is reasonably known. The question is mainly whether the death certificate reflects the real cause of and is properly completed, but that is another issue entirely. We can probably also assume that when a physician is willing to sign a death certificate on a nonhospitalized patient, that the likely cause of death is reasonably known, but the same issue arises about the quality of death certification. That being said, it is the forensic autopsy setting that really has the best opportunity to gage the health of the population which has no known medical history or who die of external causes (injury or poisoning).

For example, the added value forensic autopsy could help determine the frequency and type of previously undiagnosed malignancies, the existence of comorbidities, and the frequency and nature of infectious diseases associated with or causing sudden death. Detailing the extent of specific injuries might be useful in clarifying the types of forces causing certain injuries or in evaluating injuries caused by automotive safety devices. Detailing injury in a gunshot wound might help determine the nature and extent of injury caused by a new type of ammunition. There are myriad examples of how the value-added autopsy might be helpful to someone or for some purpose. The question is whether we want to, or if we can, "go there." This is something the forensic pathology profession needs to consider in the context of how the autopsy can benefit society and go beyond determining the cause and manner of death, and it is something that society needs to consider in its expectations and support of the death investigation system and forensic autopsy.

The value-added autopsy might be considered as one that is done for reasons such as those listed in **Table 2**. It is not good enough to just do the value-added autopsy, however. Something must be done with the information to make it useful, such as share it with relevant entities and interested parties. In essence, the public health principles of *surveillance* and *epidemiologic research* must be employed (23).

CONCLUSIONS

Unless some applicable standard, statute, office policy, or funding constraint dictates otherwise, the forensic pathologist can decide whether to do a value-added forensic autopsy. On the surface, it seems that the less extensive an autopsy, the less information there may be to address direct needs in the case or for other secondary purposes. One probably won't find what he or she does not look for, and without a full venture, the potential gain of the venture may be lessened. The forensic pathologist can weigh these considerations and decide for him/herself how to conduct the autopsy. The author of this report is admittedly uncertain about the best way to incorporate the value-added autopsy concept into practice. Further study is needed to more formally document the cost-effectiveness and overall return of the value-added autopsy.

The forensic pathology profession might be wise to consider whether it wants to remain considered as mainly a criminal justice player or in addition, take further advantage of its potential in public health, public safety, research, civil law proceedings, and other activities and disciplines that can benefit from forensic pathology information. Such contemplation and action could seal (remain criminal justice oriented), or even secure the fate (expand scope and opportunity) of forensic pathology practice.

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Table 2: Examples of What Might be Considered as a "Value-Added" Forensic Autopsy, in Addition to Those Mentioned in the Text of the Article

Reason	Users/Beneficiary
Determine the incidence of undiagnosed TB, HIV, and viral hepatitis in the homeless or substance abuse using population	Public Health Programs and Services for the homeless and substance abusing population
Determine the incidence and nature of previously undiagnosed neoplasms	Cancer Registries
Completely document the nature of injuries in motor vehicle fatalities	Users of the Abbreviated Injury Scale and/or Haddon Matrix for trauma audits and injury prevention strategies; Civil or criminal attorneys involved in motor vehicle collision cases
More completely document autopsy findings and health conditions related to suicide	Families, civil cases
More completely document autopsy findings to reduce speculation and provide more facts in autopsy cases likely to become civil law suits	Civil plaintiff and defense attorneys
Collect specimens to better identify infectious causes of death and emerging infectious diseases	Public Health Departments and CDC
Autopsy selected deaths occurring in nursing and personal care homes, especially in the elderly	Assess possible abuse, neglect, exploitation; state licensing boards; state protective service agencies
Autopsy trauma cases with hospital care prior to death	Surgical trauma audits and morbidity/mortality conferences
Apparent illicit drug overdoses	Assess comorbidities or conditions brought about by the intoxication
Collection of samples for possible future DNA or protein analysis	Family if genetic conditions are found; research to identify new defects

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