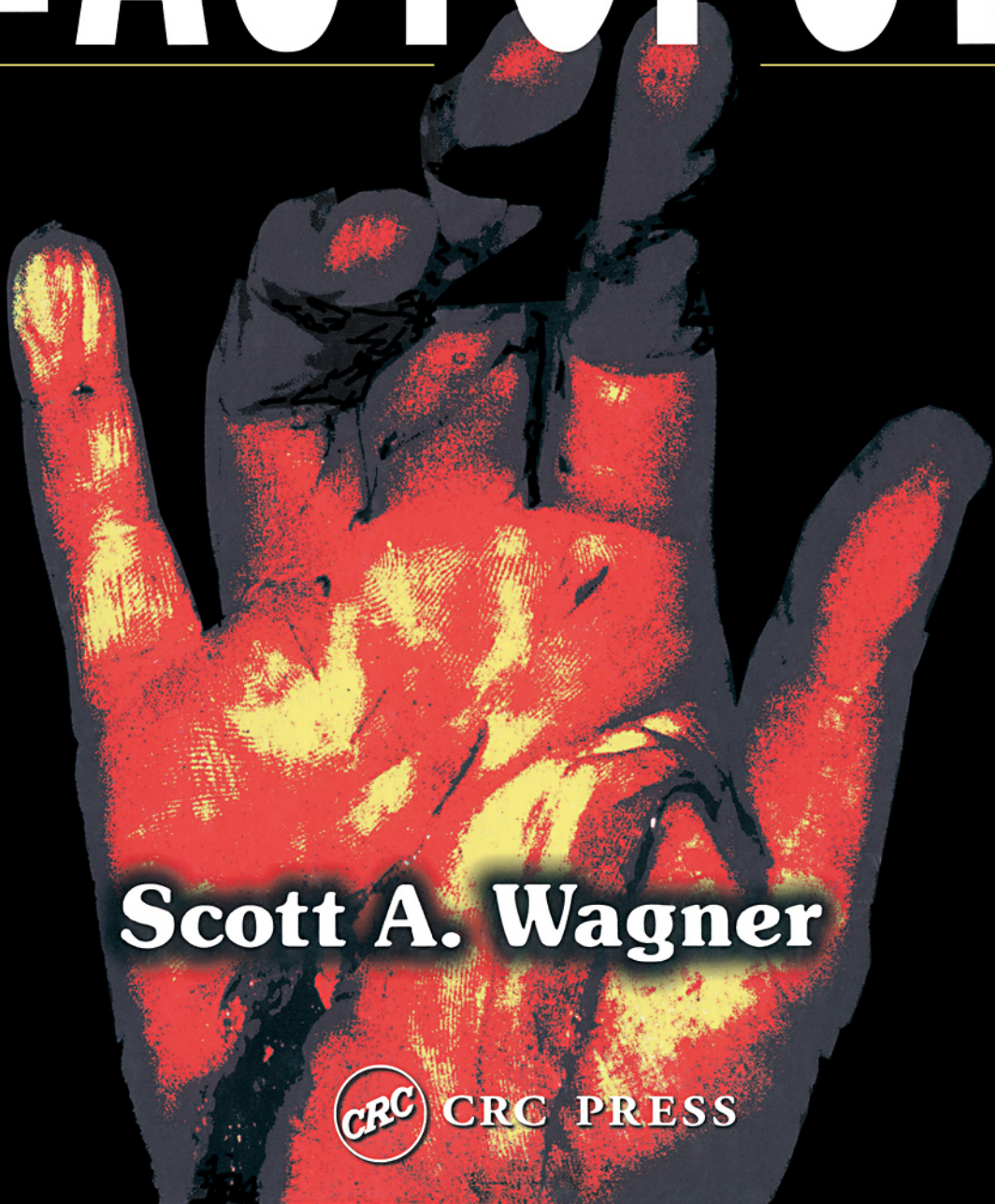


**COLOR ATLAS OF**

# **THE AUTOPSY**



**Scott A. Wagner**



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# Preface

Finally, there is a book that takes the reader through the autopsy procedure in a stepwise fashion, just as though the reader were at the autopsy. The chapters and the information in this book are revealed in layers, just like opening the body at autopsy. The aim is not only to show *what* is done in an autopsy, but *why* and *how* it is done. Many similar books have been written for pathologists or other physicians, but not for those who must work with pathologists. Death investigators, law enforcement officials, and other professionals need to know about the “strange” things pathologists do as well as how and why they do them. This book is dedicated to and written for those patient souls who must interact with pathologists before, during, and after the autopsy.

The primary purpose of this book is to introduce the process and principles of the autopsy procedure to the new and uninitiated. Because the autopsy is primarily a visual study of the diseases and injuries of the human body, images are essential to explain the process. Images are used in the book to tell the story of how the forensic pathologist develops opinions of the cause and manner of death.

This book is written as a natural extension of 15 years of teaching and demonstrating the autopsy to medical students, paramedics, flight nurses, nursing students, death investigators, law enforcement officials, firefighters, conservation officers, and other similar professionals and students of these professions. Many such professionals are involved with the practice of medicine and are eager to see the autopsy. For some, viewing an autopsy is an educational requirement. I have found it difficult to demonstrate an autopsy for all those professionals who need to see the procedure because the demand to see an autopsy exceeds the number of autopsies being performed. Also, the time for teaching during the 1½-hour standard autopsy is limited. For me, it was difficult to orient the visitor to what I was doing. I finally realized that the professionals and students who came to my autopsy suite left with more questions than they had when they arrived.

I began looking for videos and other teaching aids to orient those uninitiated to the autopsy. I found that little or nothing was available, especially in the video medium. To fill this void, I produced the video, *The*

*Autopsy, Chapter One: Unraveling Life’s Mysteries*, in the year 2000. This video serves to teach and demonstrate visually the basic principles and practices of the autopsy. It allows the viewer to see three autopsies, with narrative explanations. Response to the video has been fantastic. Since its release, we have had numerous requests for written material to support and supplement the video medium. This book is largely a response to those requests. With narrative and over 500 still pictures, this book expands greatly on each aspect of the autopsy.

The reader should keep in mind that this is a basic book on the autopsy. The intent is not to teach one how to do an autopsy, but to show the process and principles used in the basic forensic autopsy. Those who are interested in learning more details about anatomy, physiology, pathology, forensic pathology, and other disciplines touched upon here should consult the suggested reading list at the back of the book. The methods demonstrated in this book are not meant to advocate only one way to perform the procedures. They simply indicate one way to do each procedure. The aim is to present a practical approach to the autopsy, with interesting findings presented along the way. One should think of this book as spending a few days at the author’s autopsy table.

It is my intention that the information and images in this book be used only by professionals and students in fields related to law enforcement, death investigation, medicine, and law, or by funeral directors. Improper use of these images can be a violation of the law, and using these photographs in a salacious manner violates the basic ethics the author and his colleagues uphold. The first lesson to learn about the autopsy is reverence for the deceased and their families. It is in keeping with this reverence that I honor the deceased and use these images only to educate future and seasoned death investigators, detectives, nurses, paramedics, and other professionals. This is done to better our understanding of diseases and injuries, with the aim of benefiting the whole of humankind.

**Scott A. Wagner**



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## About the Author



**Scott A. Wagner, M.D.**, is the director of the Phillip E. O'Shaughnessy Northeast Indiana Forensic Center in Fort Wayne, IN, and an assistant clinical professor of pathology at Indiana University School of Medicine. Dr. Wagner loves to share his fascination with pathology and forensic pathology with colleagues, students, coroners, nurses, law enforcement, first responders, and others. He has developed a video series, *The Autopsy, Chapter One: Unraveling Life's Mysteries*, and is currently producing the second video in this series.



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# Introduction

The study of the autopsy begins with two basic assumptions: 1) the life of the individual is of the highest value, and 2) the deceased is to be treated with reverence. Our society holds the life of an individual above all else. If our culture had no reverence for life, we certainly would not care about death. Autopsies obviously do not benefit the dead; they benefit the living, and that is the focus of our study.

This book was written to fill a gap in information about the autopsy. Books on the autopsy are normally written for physicians or experts in the fields of pathology and forensic pathology. While these books are essential for physicians and other experts in the field, no accessible books are available that show the process of the autopsy to those who interface with pathologists. It is often difficult for paramedics, crime scene investigators, firefighters, law enforcement officials, nurses, and students of these fields to observe an autopsy. Even when an autopsy can be

viewed, the pathologist has limited time to explain the theories behind, and the purposes of, the autopsy procedure. Some professionals never see or experience an autopsy until they are on the job. Pathologists benefit when they interact with professionals who understand something about the autopsy, i.e., what an autopsy can and cannot do.

This book is not a comprehensive study of the autopsy procedure. Anatomy, physiology, and histology are touched upon, but they are not the focus of the book. Forensic medicine and principles are introduced. However, the reader is advised to consult the bibliography for encyclopedic information on diseases and injuries. We depict routine autopsy procedures done in a convenient, practical way. There are many ways to approach and perform an autopsy, and we certainly do not mean to imply that our methods are the only ones, or even the best. Our aim is to expose the reader to the principles, common findings, and practices of the adult autopsy.



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# 1 Approach to the Autopsy: Purpose and Philosophy

*“To the living we owe respect, but to the dead we owe only the truth.”*

**Voltaire**

## WHAT IS AN AUTOPSY?

The autopsy answers the final question: Why did life pass from a specific human body? It is a question we have all asked when a loved one, friend, coworker, or even a public figure dies. The more untimely the death, the more tragic it seems, so many more questions arise. A wife asks why her healthy husband suddenly collapses and is unresponsive. Coworkers are puzzled as they watch a young bricklayer cry out in pain and fall to his death from a great height. An entire country wants to know how its president was assassinated. The autopsy serves to answer these and many other questions.

The autopsy is a complete evaluation of an individual’s death and the circumstances surrounding that death. It includes a full examination of the body, and the autopsy has been called “the ultimate physical examination.” This examination includes:

- A complete evaluation of the medical history and the events leading to death
- The collection and documentation of trace evidence on and around the body
- The photographing and cataloging of injuries
- A detailed external examination from head to toe
- An internal examination, including the dissection of organs and tissues
- A microscopic examination of organs and tissues
- Laboratory and toxicologic examinations of body tissues and fluids
- A written report detailing the pertinent findings, negative findings, and conclusions, including the cause and manner of death

A common misconception is to think of the autopsy as simply a dissection of organs. Yes, the autopsy involves dissecting organs, but it is a much more comprehensive study of a person’s death. The dissection portion of the autopsy is only a part of the complete examination a pathologist performs. More than a simple medical procedure, the autopsy is a comprehensive consultation with

the pathologist and part of a complete death investigation. Your family doctor takes the same approach. For example, you may go to your doctor because you are tired all the time and want to find out why. You know your doctor will listen to your heart and lungs, but you want him to do more because your sluggishness might not be caused by a heart or lung problem. You want the doctor to use any means available to find out why you are so tired. He might have to perform blood tests or x-rays or take a detailed history from you. The pathologist approaches the autopsy in the same fashion, finding all the medical facts, whether they lie in the medical history, dissection, or toxicology results. The facts obtained in the study of the problem are used to form opinions. The key opinions are usually the cause and manner of death.

The body of the deceased is treated with the same respect the pathologist would show his or her own loved ones. Except in unusual circumstances, the autopsy does not alter any viewable portions of the body. Only rarely are visitors to the funeral service able to recognize that an autopsy has been performed. One misconception is that the body is mutilated during an autopsy. This book will show that the autopsy is a precisely performed examination and dissection.

## TYPES OF AUTOPSIES: HOSPITAL AND MEDICAL–LEGAL

There are two types of autopsies: hospital and medical–legal. Hospital autopsies are performed on inpatients of hospitals, upon the requests of families. Physicians cannot order these autopsies without permits signed by the next of kin. Autopsy permits often grant physicians permission to study only those body parts that might help answer a specific medical question or determine the mechanism of death. Most hospital autopsies are done in teaching hospitals, where the examinations are often quite detailed and are performed for institutional research and the education of medical residents.

Hospital autopsies are less common today than in the past for a number of reasons. The approximate \$1500 to \$2000 cost is not covered by Medicare or private insurers, so the expense is borne by the hospital or family. Hospital regulatory agencies no longer require autopsy quotas for accreditation, and more hospital deaths have come under the purview of the coroner and medical examiner systems.

Previously, physicians eagerly sought autopsies to gauge the quality of medical care and to gain medical knowledge. In today's legal climate, some physicians fear an autopsy might elicit facts that could be used in lawsuits against them. In the author's experience, the reverse is true — an autopsy generally demonstrates that the patient died of causes unrelated to the standard of care. Not performing an autopsy in this situation can lead to the worst assumptions, i.e., that poor medical care caused the death and that this substandard care is being covered up.

Medical–legal autopsies are performed at the behest of the medical examiner or coroner, who is required to investigate all suspicious and unnatural deaths (see the section “Unnatural Deaths”). In most states a board-certified pathologist must perform these autopsies. The aim of medical–legal autopsies is to obtain the cause and manner of death (see the following bulleted lists). Because medical–legal autopsies are comprehensive examinations that include a study of the central nervous system, they exceed hospital autopsies in scope. As medical science is increasingly able to prolong the lives of victims of severe trauma, more and more hospital deaths are coming under the jurisdiction of the coroner or medical examiner. Victims who, in past times, would have died at the scene or in the emergency room now either recover or die after a long hospital course. Since such traumatic deaths are considered unnatural, these cases fall under medical–legal jurisdiction.

The different aims of hospital and medical–legal autopsies are illustrated in the following example. A 92-year-old woman with significant cardiac disease falls down her steps and suffers a hip fracture. While convalescing in the hospital, she dies suddenly, 3 days after her accident and admission.

A hospital autopsy would focus on answering these medical questions:

- Did she suffer a myocardial infarction or a pulmonary embolus (mechanism of death)?
- If her hospital care had been different (e.g., if anticoagulants had been given more aggressively), could her death have been prevented?
- If she was given a new anticoagulant under a research protocol, was this new drug effective? (This involves evaluating new drug protocols.)

The medical–legal investigation and autopsy would focus on:

- The injury (cause of death).
- The hip fracture.
- How the injury occurred (manner of death): Did she trip (accident), or did she have a myocardial infarction before falling down the steps (natural)? If she were pushed down the steps, the manner of death would be homicide.

If it was shown that this woman slipped and fell down the steps, sustained a hip fracture, and developed blood clots that embolized to the lung after 3 days of hospitalization, the death certificate would read as follows — Cause of Death: pulmonary embolus due to fracture of the hip; Manner of Death: accident.

When pathologists are asked to do an autopsy, they use any means available or known to them to answer the questions posed by the death investigation. A major part of this examination is the autopsy procedure itself. This book will show that the autopsy is a complex and comprehensive investigation into the causes and circumstances of death. The investigation of death and the autopsy can take the pathologist into virtually any field of medicine, engineering, science, law, law enforcement, and many other disciplines.

## WHAT IS THE PURPOSE OF THE AUTOPSY?

The fundamental function of the jurisdictional authority investigating the death, i.e., the medical examiner or the coroner, is also the basic purpose of the autopsy: to establish the cause and manner of death. An autopsy is done mainly to complete a death certificate and to register the vital statistics. The cause of death is the disease or injury that sets into motion the chain of events leading to the death. The manner of death is a classification system for deaths (natural, homicide, suicide, accident, and undetermined). A treating physician, coroner, medical examiner, or health officer can certify death without an autopsy. Autopsies are expensive, so the jurisdictional authority in charge of the investigation must be selective about choosing cases for autopsy. A coroner, medical examiner, judge, and in many areas the public health officer can order an autopsy without the consent of next of kin.

Autopsies are usually not required when the patient has been under the regular treatment of a physician for a potentially terminal illness, and in such cases the treating physician can certify the death. However, when a person dies suddenly, unexpectedly, or under suspicious circumstances, even while under documented treatment of a physician, an autopsy is usually required. Listed below are cases that nearly always require an autopsy. As one can see, virtually any death can come under medical–legal jurisdiction.

## CASES THAT USUALLY REQUIRE AN AUTOPSY

These include the following:

- Homicides
- Suicides
- Accidents that occur on the job

- Drivers in single-car accidents (could be a suicide)
- Sudden, unexpected deaths of children
- Deaths of pilots in aircraft crashes
- Natural diseases that might impact the community (e.g., meningitis)
- Fire deaths
- Accidents caused by the negligence or reckless behavior of others
- Deaths of persons in custody of the State or other agency
- Accidents that occur without a witness
- Accidents in which natural disease is a factor
- Sudden, unexpected deaths of apparently healthy persons (usually younger than 75 years)
- Deaths in which the manner of death is not readily apparent
- Deaths in which litigation is reasonably expected
- Hospital deaths in which the quality of care is an issue
- All suspicious deaths

## NATURAL DEATHS

When a disease, a syndrome, or a combination of diseases is the primary cause of death, the manner of death is categorized as natural. Investigating natural deaths is significant to the coroner and medical examiner for at least two reasons. First, infectious diseases such as meningitis, human immunodeficiency virus (HIV), or hepatitis can be discovered and those who had contact with the deceased can be evaluated and treated. Second, inherited diseases can be diagnosed, so living and future descendants of the deceased may be helped if they have correctable medical conditions.

Natural is the most common manner of death. Apparent accidental deaths are often natural deaths, such as in cases when the driver of a vehicle suddenly swerves off the road and is found dead after only a minor crash. Myocardial infarction is a common cause of death in this situation. Finding a natural disease by autopsy in this situation is important for a number of reasons. First, the cause of the automobile crash is needed for accident reconstruction purposes. Second, life insurance policies often pay double indemnity if the manner of death is an accident. Third, alcohol and substance abuse are ruled out as causes of the crash. In the investigation of sudden, unexpected death, most individuals also are found to have died of natural causes, usually cardiac in nature.

Some deaths, such as from cirrhosis of the liver, are classified as natural, even if the cause is chronic alcoholism and even though the person willingly drinks alcohol and knows cirrhosis can result. This classification is done

both by convention and presumably because the alcohol-induced cirrhosis develops over 10, 20, or more years. If a smoker with severe emphysema continues to smoke and dies from respiratory failure, this death would also be classified as natural. But if a person takes arsenic chronically, that death would be classified as a suicide.

Victims of homicides also have natural diseases. These diseases can accelerate death in some cases. In fact, an elderly man with severe heart disease might not survive the same gunshot wound that a young, healthy person would. Blood loss from a leg wound would be easily tolerated by a healthy 20-year-old, but an elderly man with cardiac disease might not survive the stress on his cardiovascular system and could develop a myocardial infarction. Since pathologists make no assumptions, we treat the cases of the elderly man and the younger man equally, and the manner of death is homicide in both. We do not blame or hold the victim accountable for his existing cardiovascular disease. The gunshot wound set into motion a chain of events that resulted in death. Even though the cardiac disease contributed to the death, the cause of death is the gunshot wound.

## UNNATURAL DEATHS

Autopsies are necessary in most unnatural deaths including homicides, suicides, accidents, and those deaths in which the manner of death cannot be classified with the available information (often termed undetermined, unclassified, or could not be determined). Unnatural death is not a manner of death, per se. In an unnatural death, even though the cause and manner of death might appear obvious at the scene, an autopsy is usually performed. In an accident, finding the cause of the accident is essential, and an autopsy is often a large part of that investigation. In an apparent suicide, *intent* to kill oneself must be demonstrated. In a homicide, evidence must be collected and injuries must be documented. Autopsies are always performed in homicides or apparent homicides.

### Homicides

A homicide is the killing of another human being, either by commission or omission. Murder, manslaughter, and reckless homicide are legal terms referring to the degree of action in the homicide. Certifying a case's manner of death as homicide does not mean the perpetrator committed murder or will even face legal charges. Shootings and stabbings are the obvious homicides, but a policeman shooting a school sniper is an example of "justifiable" or "police action" homicide. A common question is, "Why, in the case of a witnessed homicide involving a single gunshot wound to the head, is an autopsy necessary?" Here are but a few reasons for an autopsy in such a case: