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THE CONTRIBUTION OF ETHICAL REASONING SKILLS
IN FORENSIC SCIENCE

A Dissertation

Submitted to the McAnulty College and Graduate School of Liberal Arts

Duquesne University

In partial fulfillment of the requirements for
the degree of Doctor of Philosophy

By

Lyndsie N. Ferrara, M.S.

May 2018

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Lyndsie N. Ferrara, M.S.

2018

THE CONTRIBUTION OF ETHICAL REASONING SKILLS
IN FORENSIC SCIENCE

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ABSTRACT

THE CONTRIBUTION OF ETHICAL REASONING SKILLS IN FORENSIC SCIENCE

By

Lyndsie N. Ferrara, M.S.

May 2018

Dissertation supervised by Gerard Magill, PhD

Forensic science applies scientific methods to matters related to the legal system. Members of the forensic field are part of the criminal justice system charged with upholding justice through science. Numerous wrongful convictions and ethical issues involving forensic science indicate a need to dissect the field from a different perspective. Stories in the media regularly identify ethical issues in forensic science ranging from individual misconduct to systemic organizational failures that lead to injustice. Even with these journalistic investigations, a lack of awareness remains regarding the contribution of ethical reasoning skills in forensic science. This dissertation addresses that gap in the forensic field by discussing the potential contribution of ethical reasoning skills to forensic science. Additionally, embedded throughout the dissertation is a discussion

regarding how the principles and reasoning in bioethics contributes to ethical reasoning skills in forensic science.

The dissertation begins by exploring the criminal investigation process along with using a sexual assault investigation to explore paths where bioethics can guide practice. Next, the foundational ethical principles and reasoning in bioethics are presented. Examination of the foundational principles in bioethics and their application in healthcare ethics and research ethics provides the ethical groundwork from which ethical reasoning skills develop. Then a return to forensic science explores the ethical culture in the field. In addition to a bioethics framework, content focused on different reasoning models highlight the contribution of ethical reasoning skills in forensic science. The work of American philosopher Charles Sanders Peirce that focuses on solving problems and analyzing situations using three types of reasoning modes is paramount to understanding and applying reasoning skills. Building on the theoretical foundation from the previous chapters, problem-based learning activities were developed to create educational tools designed to foster ethical reasoning skills in forensic science.

DEDICATION

To my entire family for their endless support, constant encouragement, and awe-inspiring love. As my family has grown, the love and support has also increased exponentially. To my parents who instilled in me the notion that through hard work I can make my dreams a reality. None of this would be possible without your love, guidance, insight, and advice throughout my life. I am truly blessed to have you as my parents and best friends. To my husband who provided a level of love and support beyond expectations. I'm forever grateful that you were by my side during this experience. To my sister for always believing in me and providing support. To my grandparents for their unconditional love and endless enthusiasm surrounding everything I do. And to my extended family especially my in-laws who welcomed me as a member of the family. I love all of you so much and am eternally thankful for each of you.

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LIST OF ABBREVIATIONS

Academic Model Providing Access to Healthcare (AMPATH)
Alcohol, Tobacco, Firearms, and Explosives (ATF)
American Academy of Forensic Sciences (AAFS)
American Bar Association (ABA)
American Society for Bioethics and Humanities (ASBH)
American Society of Crime Laboratory Directors (ASCLD)
American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB)
Association of American Colleges and Universities (AAC&U)
Association of Firearms and Tool Mark Examiners (AFTE)
Bureau of Justice Statistics (BJS)
California Association of Criminalists (CAC)
Centers for Disease Control (CDC)
Combined DNA Index System (CODIS)
Council for International Organizations of Medical Sciences (CIOMS)
Deoxyribonucleic acid (DNA)
Department of Justice (DOJ)
Drug Enforcement Administration (DEA)
Education, Ethics, and Terminology Inter-Agency Working Group (EETIWG)
Ethics and Governance Framework (EGF)
Federal Bureau of Investigation (FBI)
Food and Drug Administration (FDA)
Forensic Science Regulator (FSR)
Forensic Science Standards Board (FSSB)
Healthcare ethics (HCE)
Houston Police Department (HPD)
Indiana University (IU)
Institutional Research Ethics Committee (IREC)
Institutional Review Board (IRB)
International Bioethics Committee (IBC)
International Conference on Harmonisation (ICH)
James Madison University (JMU)
Mitochondrial DNA (mtDNA)
National Academy of Sciences (NAS)
National Bioethics Advisory Commission (NBAC)
National Bioethics Committee (NBC)
National Commission on Forensic Science (NCFS)
National DNA Index System (NDIS)
National Institute of Health (NIH)
National Institute of Justice (NIJ)
National Institute of Standards and Technology (NIST)
Office for Human Research Protections (OHRP)
Open Learning Initiative (OLI)

Organization of Scientific Area Committees (OSAC)
Pentaerythritol tetranitrate (PETN)
Persistent Vegetative State (PVS)
President's Council of Advisors on Science and Technology (PCAST)
Scientific Area Committees (SACs)
Scientific Working Groups (SWGs)
Scientific Working Group for DNA Analysis Methods (SWGDM)
Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST)
Securities and Exchange Commission (SEC)
Sexual Assault Forensic Evidence Reporting (SAFER)
Sexual Assault Forensic examiner (SAFE)
Sexual Assault Kit (SAK)
Sexual Assault Nurse Examiner (SANE)
Sexual Assault Response Team (SART)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
United States (U.S.)
World Health Organization (WHO)

Chapter 1: Introduction

Forensic science is the application of science to matters related to a court of law. Forensic scientists are members of the criminal justice system charged with upholding justice through science. The integrity of forensic science evidence is critical to upholding the criminal justice system. The staggering number of wrongful convictions (354 according to the Innocence Project¹, 2,169 according to the National Registry of Exonerations²) indicate a need to examine forensic science from a different perspective. This dissertation aims to discuss the contribution of ethical reasoning skills in forensic science. The study explains how the principles and reasoning in bioethics can contribute to ethical reasoning skills in forensic science.

Mainstream news outlets regularly identify ethical issues within the forensic science field ranging from misconduct by forensic practitioners to systemic organizational failures that lead to injustice. As recently as April 2017, over 21,000 drug-related convictions were dismissed due to the misconduct of one drug chemistry analyst. Numerous other cases of individual misconduct involve dry-labbing, stealing evidence, manipulation of evidence to support the prosecution, false report conclusions, and overstated testimony.³ This misconduct and misapplication of forensic science has contributed to almost half of the wrongful convictions examined by the Innocence Project. Beyond individual misconduct, the organization model of numerous laboratories housed within police departments has led to examples of an unethical culture.⁴ For years, scandals in the Houston Police Department Laboratory raised serious concerns over the ability of forensic scientists within the system to overcome cultural obstacles, ultimately leading to the identification of serious problems across multiple disciplines. Eventually,

the Houston laboratory was removed from police department jurisdiction and now operates as an independent laboratory.⁵ Since the majority of forensic laboratories across the United States still operate under law enforcement control, other methods must be implemented to improve the ethical culture and conduct.

Beyond mainstream media outlets, federal review and advisor committees have also highlighted the need for reforms in forensic science. In 2009, the National Academy of Sciences (NAS) issued a report titled “Strengthening Forensic Science.” Numerous factors were identified that led to the examination of the validity and reliability of forensic laboratories. Some of the recommendations outlined in the NAS report include expanded research efforts; removing forensic science services from administrative control by law enforcement and prosecutors’ offices; mandatory accreditation and certification; supporting graduate forensic science programs; and creating a national code of ethics.⁶ Additionally, in 2016, the President’s Council of Advisors on Science and Technology (PCAST) published the report, “Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods.” This report specifically identifies the need to clarify scientific standards for the validity and reliability of various forensic methods as well as evaluate specific methods to determine their scientific validity within the legal system.⁷ The forensic science community and federal government entities have responded by creating the Organization of Scientific Area Committees (OSAC) for Forensic Science. The OSACs work to identify and develop high-quality standards for roughly twenty-five specific forensic science disciplines.⁸ While these are important improvements, there remains a lack of awareness of the

contribution of ethical reasoning skills in forensic science. This dissertation addresses this gap in the field.

The analysis in the chapters is organized in the following manner. The Introduction (Chapter 1) provides an overview of the analysis. Chapter 2 presents an overview of the criminal investigation process, to introduce bioethics discourse as the context for the subsequent analysis. Chapter 3 discusses bioethical principles and reasoning as the foundation for ethical reasoning skills in forensic science, especially from the perspective of balancing privacy and the common good. Chapter 4 examines the ethical culture in forensic science to explain the contribution of ethical reasoning skills within organizational structures and in codes of ethics. Chapter 5 explores different reasoning models to highlight the contribution of ethical reasoning skills in forensic science. Chapter 6 applies the insights of the previous chapters to develop educational tools to foster ethical reasoning skills in forensic science.

Chapter 2: Criminal Investigation Process

The first content chapter will explore different facets of the criminal investigation process to introduce bioethics discourse as the context for subsequent analysis. A general overview of a criminal investigation explores the relationship and roles of police officers and forensic analysts.⁹ A detailed analysis of a sexual assault investigation identifies ethical quandaries that the forensic science community needs to recognize. The interaction of the various stakeholders including healthcare personnel, police, and forensic analysts illustrate the ethical questions that arise during a criminal investigation. Potential ethical issues begin with the survivor's initial decision to consent to a sexual assault kit collection following through to reporting as well as tracking the progress of the sexual assault kit from collection to storage and testing.¹⁰ Examining the process from a

healthcare ethics perspective identifies the steps where preserving survivor autonomy and consent is critical in order to uphold justice. Recommendations published in the National Institute of Justice (NIJ) report “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach” are supported by a healthcare ethics analysis. Additionally, applying enhanced communication practices from healthcare ethics to a sexual investigation can inform investigation methods.¹¹ One method for improving communication employs an advocate with ethical training similar to a healthcare ethics consultant.¹²

A. Overview of Process

The criminal investigation process begins with the police investigation then proceeds to the forensic laboratory where various scientific analyses are conducted to determine the relevance of the evidence. Forensic scientists issue scientific reports regarding the findings from the various analyses. If criminal charges are filed against an individual, the investigation transitions to the courtroom. Forensic scientists may be called to testify in court regarding the conclusions of forensic testing.¹³

A.i. Police Investigation

When a crime is committed, police officers are the first responders. The first responding officers are responsible for securing the scene. In many cases, specialized detectives report to the scene to interview witnesses and lead the investigation.¹⁴ In most jurisdictions across the United States, police officers also serve as crime scene investigators. For complex scenes, a team of specially trained forensic scientists may be called to the scene to provide additional support during evidence collection. The crime scene investigators are responsible for documenting the scene through drawings and photographs as well as collecting and preserving evidence. Often the crime scene

investigators perform fingerprint processing, but all other evidence proceeds to a forensic science laboratory for analysis.¹⁵ The majority of forensic science laboratories are embedded within police jurisdiction, which presents ethical issues for forensic scientists.¹⁶ The issues related to this organizational structure will be further explored in chapter four. When submitting evidence, the police request different types of analyses and often include case information such as the nature of the crime and where the items were collected. Additionally, police often have communication with the analysts via phone or email. Detailed case information and interaction with officers can introduce bias, which will also be explored in chapter four.¹⁷ Based on the results of an investigation the district attorney can file criminal charges against a suspect. The forensic testing results can contribute to the case against a suspect and allow the district attorney to move forward with judicial proceedings.¹⁸

A.ii. Forensic Science Analyses

Numerous forensic science disciplines exist and provide important information. Forensic scientists analyze circumstantial evidence. This evidence can be reconstructive or associative in nature. Reconstructive evidence such as bloodstain pattern analysis can aid in determining events surrounding a crime. Associative evidence is the most commonly examined type of evidence. This type of evidence can associate or dissociate a suspect to a crime. Types of associative evidence include hairs, fibers, body fluids, paint, bullets, and fingerprints. This type of evidence can associate a particular individual with the evidence or provide information about the class-characteristics of the evidence.¹⁹

The primary forensic disciplines commonly found within a forensic science laboratory include Serology/DNA, Fingerprints, Firearms and Toolmarks, Toxicology, Drug Chemistry, and Trace Evidence.²⁰ Serology is the identification of body fluids and

DNA analysis is the genetic identification of unknown material (i.e. body fluid, tissue, bone, etc.). The Fingerprint section or Latent Prints section compares unknown fingerprints to known prints for identification purposes. The Firearms/Toolmarks section compares the markings on a fired bullet or cartridge casing or a tool mark impression to determine whether it was fired from a particular firearm or made by a particular tool. This section also performs serial number restoration, tests the functionality of firearms, and reconstructs shooting incidents.²¹ The Toxicology section analyzes poisons to identify the substance and determine the quantity in cases with a legal implication. Drug chemists identify and measure illicit material. While Trace Evidence conducts the most diverse analyses by examining material such as hair, fiber, paint, and gunshot residue. Additional forensic science disciplines include engineering sciences, odontology, entomology, anthropology, digital and multimedia sciences, psychiatry and behavioral sciences, and pathology.²²

The number of forensic disciplines performing analyses on a case is completely dependent on the type of the case and the evidence that is collected. For example, in the majority of forensic science laboratories policies restrict DNA analysis in theft cases due to limited resources. Given the high number of theft cases, the amount of evidence from these cases would cause the DNA backlog to exponentially increase across the country. Case triage is critical within a forensic laboratory to ensure the proper analyses are being conducted on submitted evidence. Since some items may require multiple forensic analyses, it is important to determine the order of such testing. For example, a firearm from homicide case can undergo latent print analysis, DNA testing, and firearms analysis. If the firearm was processed by the firearms section first, any viable fingerprints or DNA

could be obliterated. Therefore, coordination between the forensic sections is critical for successful analysis.

B. Sexual Assault Case Example

A sexual assault investigation provides a general overview of a common criminal investigation. While no two investigations are the same, using a sexual assault investigation as a general example highlights the numerous stakeholders involved in the investigation process. Additionally, sexual assault is a unique case type that incorporates healthcare staff into the collection of vital evidence.²³ This type of investigation provides a nice example to analyze and apply practices from healthcare ethics.

B.i. Overview

It is important to first understand the scope of sexual assault cases and the ethical issues that arise. Someone in the United States is sexually assaulted every 2 minutes. On average, greater than 230,000 sexual assaults occur per year. Of all the assaults that occur, an average of 42% are reported, while 58% remain unreported.²⁴ There are multiple reasons victims cite for not reporting. Some of these reasons include fear of retaliation, believed the police would/could not do anything to help, believed it was not important enough to report, and reported to a different official.²⁵ Even when cases are reported, only 6 perpetrators out of 1,000 cases spend time in jail.²⁶ While increased communication within the hospital will not fix all the issues surrounding sexual assault cases, hospital staff can aid in providing information to the victim so that he/she can make an informed decision about how to proceed.²⁷

During a sexual assault investigation, numerous ethical questions arise typically at various decision points throughout the process. From the outset, sexual assault investigations require a multidisciplinary approach and lack of collaboration among

members of the sexual assault team threaten the success of an investigation and the ability to uphold justice.²⁸ Next, survivors do not understand the entire investigation process, which can lead to a violation of their autonomy.²⁹ Furthermore, issues regarding consent are paramount to the collection and testing of a sexual assault kit (SAK).³⁰ Next, the storage of kits by law enforcement often depends on the reporting status of the case. This leads to abandoned kits unaccounted for on hospital shelves.³¹ Additionally, survivors must agree to speak to police officers and file charges before a forensic analysis may be conducted. Police and laboratory analysts ultimately determine testing status relative to case information and resources, rather than upholding consent and serving the greater good by emphasizing justice through automatic testing.³²

B.ii. Healthcare Ethics Approach

In healthcare ethics, communication is key to successful resolution and prevention of ethical dilemmas. Improved communication through a sexual assault investigation can greatly improve the process while recognizing the importance of upholding survivor autonomy and consent. In addition to a healthcare ethics analysis, it is important to discuss a recent NIJ report, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach”. The 35 recommendations outlined in the report are a culmination of over two years’ worth of work by the Sexual Assault Forensic Evidence Reporting (SAFER) Act Working Group. Henceforth this report will be referred to as the SAFER report. This paper will highlight some of the recommendations related to sexual assault kit collection, storage, reporting, and testing, while providing support through a healthcare ethics (HCE) lens.³³ The importance of preserving survivor autonomy and consent throughout the process will be emphasized. It is important to note this examination only focuses on adult cases. While the importance of improved

communication as well as preserving survivor autonomy and consent can be applied to pediatric cases, it will not be discussed in this article. A healthcare ethics approach focused on upholding ethical principles and utilizing improved communication can positively affect the sexual assault investigation process and contribute to the common good.

The ethical questions raised during a sexual assault investigation are important to analyze and offer solutions. This research will provide the ethical framework necessary for forensic scientists to understand the importance of ethical conduct in the work they perform daily. A healthcare ethics approach utilizing improved communication can positively affect the sexual assault investigation. While a sexual assault investigation illustrates some ethical questions, ethical issues permeate all levels of forensic science. This example demonstrates how healthcare ethics can contribute to current practices in forensic science.

Chapter 3: Ethical Principles and Reasoning

This chapter lays the foundation for further analysis of forensic science according to the prevailing ethical principles and reasoning in bioethics. The chapter begins by outlining the internationally recognized fundamental ethical principles in bioethics.³⁴ The chapter proceeds to define Principlism and explore the importance of autonomy and consent.³⁵ The second half of the chapter explores the need to balance privacy and the common good particularly as it relates to the criminal justice system.³⁶ Traditional bioethics cases highlight the use of bioethical principles and reasoning. This foundation is then applied throughout the dissertation to cases in forensic science. The types of forensic cases that will be discussed are the following: sexual assault investigation (chapter 2, section B), DNA databases and familial DNA searching (chapter 3, section C), forensic

laboratory structure (chapter 4, section A), forensic science codes of ethics (chapter 4, section B), as well as specific homicide and sexual assault case examples (chapter 5, section B).

A. Bioethics Principles

The chapter begins by defining the ethical principles in bioethics. The first section addresses the internationally recognized fundamental principles and explores consent to further enhance understanding of the respect for autonomy principle. Both consent and respect for autonomy were previously discussed in chapter 2. In this section, a healthcare focused context enriches understanding.

A.i. UNESCO Declaration and Principlism

The United Nations Educational, Scientific and Cultural Organization's (UNESCO) "Universal Declaration of Bioethics and Human Rights" outlines the fundamental bioethical principles that respect human dignity and human rights.³⁷ A general overview of the principles addressed in the Declaration is presented at the outset of the chapter, with additional references throughout to expand on real-world applications. Further exploration of the principles respect for autonomy, beneficence, nonmaleficence, and justice utilize Tom Beauchamp and James Childress Principlism.³⁸ The principles evolved from the common morality or norms accepted by all people regardless of societal, religious, or other factors.³⁹ Theologians, philosophers, and policy makers also influenced Principlism. These four principles provide a basic framework for biomedical ethics. Within the framework of Principlism, no principle is ranked above another, but too often in clinical medicine, the principles of beneficence and nonmaleficence prevail. Physicians assess the patient's condition, determine the risk/benefit analysis of the

treatment, and advise patients on the proper course of action. In a clinical setting, it is vital to maintain and respect patient autonomy.⁴⁰

A.ii. The Focus on Consent

The principle respect for autonomy falls under the larger fundamental principle of morality, which is respect for persons. Respect for persons means that each individual has moral value and dignity. Respect for autonomy is one component of this larger principle where every person has the moral right to choose and follow his or her own plan or actions.⁴¹ In America, laws in all the states require informed consent prior to medical treatment, except in some emergencies. In order for a patient to provide informed consent the patient must be competent, receive thorough information, act voluntarily, comprehend this information, and consent to the treatment.⁴² Since competency is a pre-requisite for a person to engage in the informed consent process, it is vital to understand how a person's decision-making capacity is evaluated. Additionally, the requirements of voluntariness and disclosure will be explored to understand the core elements necessary for a patient to provide informed consent.⁴³ The sexual assault example from chapter two will be revisited to highlight the application of bioethical principles to forensic science.

B. Practical Reasoning in Bioethics

The next section examines practical approaches to solving ethical dilemmas in clinical medicine. Jonsen's four topics methods as well as Buchanan and Brock's hierarchy approach are explored. The section concludes with case examples that highlight the importance of integrated decision-making.

B.i. Jonsen's Model for Decision-Making

Albert Jonsen, Mark Siegler, and William J. Winslade apply the principles defined in Principlism to real-life clinical medicine cases by using the principles to guide the decision-making process. Four topics are used to define the general structure of a clinical

case: medical indications, patient preferences, quality of life, and contextual features. These categories are referred to as the Four Boxes. All information regarding a case is classified in each of these boxes then the relationship between the principles and information is assessed. By analyzing the data that is sorted within each box, an ethical problem can be identified, and guide decisions about how to solve the dilemma.⁴⁴ As seen in examples regarding end of life care decisions, sometimes these ethical dilemmas arise because the physician and patient (or surrogate) do not agree about the proposed course of treatment. Instead of taking every one of these conflicts through the court system, the majority of hospitals have created ethics committees to consult on cases that involve ethical quandaries.⁴⁵

B.ii. Buchanan & Brock Model for Decision-Making

Another approach to resolving ethical dilemmas specifically addresses patients lacking competency to make medical decisions. Allan Buchanan and Dan Brock propose a hierarchy of principles for making decisions for patients who are unable to participate in the process. First, they propose the use of directives since this is considered the best method for respecting patient's wishes. Second, surrogates should use the substituted judgment approach to make decisions based on how they think the patient would have decided. Finally, if neither of these options work, surrogates should act on the patient's best interest.⁴⁶ The approaches proposed by Buchanan and Brock will be explored in depth to highlight the benefits and pitfalls of each. Advance directives allow patients to maintain a level of respect for personal autonomy since patients can communicate preferences about future care decisions should they lose their decision-making capacity. An advance directive can be a written document, oral statement to family or friends, or oral statement to a physician. In addition to advance directives, surrogate decision makers

can help protect individual autonomy for incompetent patients or patients deemed unable to make decisions regarding treatment.⁴⁷ Some patients may be experiencing a temporary state of incompetence and non-autonomy such as individuals who are unconscious. For these patients, the goal is to safeguard their future autonomy. For other patients, such as those with advanced dementia, it is important to respect their past autonomy.⁴⁸ Surrogate decision makers should be able to reflect the patient's value.

B.iii. Case Examples

Although the hierarchical approach proposed by Buchanan and Brocks attempts to uphold respect for patient autonomy, many situations arise, especially with dementia patients that prove this method unsuccessful. An integrated decision-making approach is a preferable method since it allows for increased communication between members participating in the decision making process and allows a patient's previous preferences from an advanced directive to be balanced with current best interests. Ideally, when individuals are diagnosed with an early cognitive impairment, such as dementia, conversations regarding health care preferences should begin. These conversations should include family members or other individuals who will eventually be the decision maker for the patient. This will provide future surrogates with necessary information about the patient's preferences and values, which will be used for future decisions.⁴⁹ Efforts to improve education and provide information related to advance care planning should be undertaken immediately. It is important for the individual diagnosed with dementia to plan for the future when they will eventually lose the mental capacity to participate in care decisions.⁵⁰

Dementia is a progressive disease that is rapidly increasing given the world's ageing population and longer life expectancies. Since dementia affects an individual's cognitive

abilities, patients with advanced dementia lack the capacity to make treatment decisions.⁵¹ Given the progressive nature of the disease, increased communication with the patient from the beginning of the diagnosis allows surrogates and physicians to understand the patient's wishes and values even as the condition advances. Background information regarding the prevalence and symptoms of dementia highlight the importance of improving decision-making methods for these patients. Two case examples are presented to understand the issues patients, surrogates, and health care personnel face when trying to uphold patient autonomy while acting in the best interest of the patient.⁵² These cases highlight the importance of communication when making decisions on behalf of dementia patients. Given the complexity of the cases, it is apparent that relying on a single tool to make decisions on behalf of a patient is unrealistic. An integrated approach aids the decision making process for these patients by allowing the surrogates and physicians to discuss the information in the advance directive, evaluate the patient's current quality of life, and receive input from the patient regarding treatment preferences. In order to maintain respect for patient autonomy while upholding the patient's best interest, an integrated decision-making approach is most beneficial for patients suffering from dementia.

The sexual assault example from chapter two will be revisited to highlight the application of bioethical principles to forensic science. Specifically upholding autonomy and the importance of informed consent reinforce the need for improved practices when working with survivors following a sexual assault. Additionally, the reasoning methods surrounding medical decision-making can inform the practices in forensic science.

C. Ethical Principles and Reasoning Applied to Forensic Science

The third section of the chapter applies the discussion on normative ethical principles (the first section of the chapter) and applied reasoning in bioethics (the second section of the chapter) to pivotal issues in Forensic Science. This part of the chapter begins by further exploring the justice principle by discussing the specifics of privacy and the common good using forensic DNA databases and research ethics. Since forensic science is a heavily research scientific discipline, it is important to also discuss research ethics. To grasp the significance of research ethics in Forensic Science, it is important to understand its history and the role of globalization. Again, a non-forensic example will be used in this section to emphasize the application of the ethical principles from the established field of research ethics. The chapter concludes with an analysis of the collection and use of forensic evidence as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.

C.i. Focus on Privacy and the Common Good

Protecting the common good by protecting society from criminal activities is a primary obligation of the government. However, this obligation must be upheld while maintaining respect for individual human rights. Definitions of privacy and the common good are explored to understand the interaction of the principles as they relate to criminal investigations. Particularly in the United States, but worldwide, there is an essential obligation to uphold individual privacy, autonomy, and liberty.⁵³ Since individuals vary in the information they deem private, it is important to provide multiple definitions related to the discussion regarding genetics data. Numerous definitions exist for privacy. The three primary privacy categorizations are physical privacy, privacy sphere, and informational privacy. An ethical obligation exists to uphold the privacy principle.

Additionally, the civil liberties outlined in the United States Constitution support this human right. The Fourth Amendment specifically protects individuals against unreasonable searches and seizures.⁵⁴ Police activity that results in the collection of evidence is defined as a seizure when there is an interference with an individual's possessory interests. This section will analyze the collection and use of forensic evidence as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.

Privacy rights cannot exist devoid from all other ethical principles. There is a need to balance personal liberty and the common good. Catholic social teaching establishes human dignity as the foundation from which other principles such as the common good develop. The principle of human dignity establishes the goodness and dignity of each human, while the common good affirms that humans are social beings that can only achieve happiness through interdependence on each other. All individuals have a responsibility to promote/protect the common good.⁵⁵ Human dignity upholds the idea that all individuals are entitled to be free from abuse and exploitation, while the common good promotes the dignity of each person and persons can only grow in community with others. Therefore, human dignity and common good principles must interact to achieve fulfillment.⁵⁶

Catholic teachings provide two interpretations for the concept of the common good. The first states that humans were created by God to live in social unity with each other and not in isolation. All people should participate in society to benefit the common good. A second interpretation describes how individuals benefit from improvements of the common good. The Declaration on Religious Liberty states that the government should

contribute to the common good by protecting public order. There are three prerequisites for public order: justice, public peace, and morality.⁵⁷ The examination of proper practices in criminal investigations focuses on the government's requirement to protect public order and safety. Additionally, the Constitution establishes civil liberties and the preamble specifically states that the purpose of the Constitution is to establish justice and provide protection for everyone.⁵⁸ Therefore, in Catholic social teaching as well as the Constitution of the United States, it is evident that a balance between individual privacy rights and promoting the common good is necessary for society to flourish.

C.ii. Focus on Research Ethics

Since forensic science is a heavily research scientific discipline, it is important to analyze research ethics. Of particular interest is multinational research given its international impact and the focus on upholding privacy while contributing to the common good. Multinational research is an ever-growing business that provides an example of the vulnerability facing populations in developing countries.⁵⁹ According to Clinicaltrials.gov as of December 8, 2015, over 190 countries are conducting research, with numerous trials being conducted in a multinational format. A multinational format means that one country funds the research while it is performed in another country. The involvement of multiple countries introduce cultural differences that need to be accounted for in the research protocol. Additionally, numerous ethical guidelines exist to govern research involving human subjects. While there is overlap in the foundational standards, there is not worldwide agreement surrounding the application of universal guidelines. Furthermore, all research trials involving human subjects must undergo an ethical review process to ensure proper procedures and protections are in place. Due to cultural differences and the possible difference in guidelines being followed, each

country establishes their own ethical review committees. One possible solution to alleviating issues associated with multinational research is to establish collaborative ethical review committees.⁶⁰ The role of informed consent as it relates to human subject research will be explored to highlight the benefits of collaborative ethical review committees. The collaborative ethical review committees ensure participants' privacy is upheld, while the research contributes to the common good.

C.iii. Applied Reasoning in Forensic Science

This section will re-examine the need for an ethical balance and use DNA databases and familial DNA searching as examples. Philosophical reasoning methods will be applied to these examples. Often the greater the threat is to society, the more willing people are to sacrifice personal freedoms. Public policy must balance individual privacy rights against the benefits for law enforcement or the public good. For example, it is essential that DNA databases be structured and maintained in a way that respects individual privacy, while providing the intended benefit of promoting the common good.⁶¹ There are three common methods used to resolve these conflicting interests: utilitarian, rights-based, and duty-based. Utilitarianism seeks to provide the greatest good for the greatest number of individuals. In relation to DNA databases, a utilitarian approach includes increasing DNA profiling if it is shown to maximize social welfare. A rights-based method establishes that certain rights should not be sacrificed for the greater good, such as the right to life. Rights are balanced against competing rights of others. Finally, a duty-based approach holds that certain moral obligations are unchanged by the rights of others or the consequences of our actions. The Nuffield Council on Bioethics promotes a rights based approach when trying to balance public and personal moral interests. This approach respects individual liberty, autonomy, and privacy, while

understanding the need to restrict some of these rights in certain circumstances.⁶² In Kant's view using human beings as merely a means to end is prohibited. This approach relates to the use of familial DNA searching, where it can be argued that the unauthorized use of personal information undermines the dignity of the person, even if they are unaware that the search is occurring.⁶³

When examining the balance between individual privacy and the protection of the common good, the principle of proportionality is fundamental. This method of analysis examines the ends, means, and effects of a particular policy. Three formulations of the proportionality principle exist. First is the balancing test, which requires that the end the law or policy aims to achieve be balanced against the means used to achieve that end. Next, the necessity test states that if a particular objective can be achieved through multiple means, the one that causes the least harm to the individual or community should be implemented. Third, the suitability test determines if the means are appropriate to accomplish a particular aim. For example, the suitability test would examine if the means used, such as familial DNA searching, were proportionate to the goal of achieving crime control.⁶⁴ Amitai Etzioni argues for a communitarian philosophy where the goal of a flourishing society is to carefully balance individual rights, like privacy, and the common good.⁶⁵ When analyzing if privacy concerns and common good are out of balance Etzioni proposes four criteria to assess the balance. First, identify that a clear and major threat to the common good exists. Second, detect other types of measures to enact before restricting privacy. Next, ensure privacy-curbing measures are minimally intrusive. Finally, measures should prevent undesirable side effects.⁶⁶

Chapter 4: Ethical Culture in Forensic Science

This chapter will explore the ethical culture within forensic science laboratories to explain the contribution of ethical reasoning skills within organizational structures and in codes of conduct. The facets of an ethical culture as defined by Craig E. Johnson provide a framework to assess the current state of forensic science laboratories.⁶⁷ Improvements to the current system include transitioning to independent laboratories, setting up mechanisms to reduce bias, and upholding a code of ethics. Analysts must achieve scientific accuracy while maintaining honesty and impartiality.⁶⁸ Serious ethical problems can arise within forensic laboratories when the law enforcement or legal cultures negatively infiltrate the forensic science culture. Forensic laboratories need to remain unbiased therefore; the organization should be independent of other law enforcement entities. Since it is unrealistic to convert hundreds of forensic laboratories into independent organizations, other safe guards need to be implemented in order to allow the forensic scientist to maintain impartiality.⁶⁹ Beyond the organizational structure, numerous codes of conduct exist for forensic scientists across many professional organizations. Implementation of a uniform code of ethics for forensic scientists is a tool to improve the ethical culture within laboratories and among all members of the forensic science community.⁷⁰ The work of the National Committee on Forensic Science, Organization of Scientific Area Committees for Forensic Science, and State Commissions such as the Texas Forensic Science Commission indicate positive improvements for forensic science.⁷¹

A. Organizational Structure

In 2009, the National Academy of Sciences (NAS) issued a report titled “Strengthening Forensic Science.” Numerous factors were identified that led to the

examination of the validity and reliability of forensic laboratories. The NAS report raised serious concerns about the lack of independence of forensic laboratories. The report identified that insufficient resources and budgetary funding resulted in case backlogs across the majority of forensic science laboratories. The report recommended laboratories “be independent of or autonomous within law enforcement agencies.” Independence would help resolve many of the cultural pressures and allow laboratories more budget control.⁷²

A.i. Ethical Culture

Multiple cultures exist within the criminal justice system. There is a law enforcement culture, science culture and legal culture.⁷³ It is important to recognize that these organizations interact in a partnership on some level with the common goal of justice, but their approach is different. Forensic analysts are crucial members in the justice system. Analysis of the science culture embedded within the law enforcement culture reveals factors that contribute to forensic science failures.⁷⁴ Features within an organization that stimulate ethical conduct define the ethical culture.⁷⁵ Forensic laboratories like any other organization must transform into an ethically centered organization. Both formal and informal elements influence moral actions from employees.⁷⁶

Like ethicists, forensic scientists must remain unbiased. While every individual will have personal opinions about the cases he/she is working, this cannot affect the scientific analysis, particularly the explanation of the results. The autonomy of the lab is critical to establishing and maintaining an ethical culture. By moving to an independent lab, a natural barrier is established to reduce the bias forensic scientists face.⁷⁷ Since it is unrealistic to convert hundreds of forensic laboratories into an independent organization, other safe guards need to be implemented in order to allow the forensic scientist to

maintain independence and limit bias. One example is the use of linear sequential unmasking.⁷⁸ Another safeguard would be limiting the interaction between the forensic scientists working on a case and the police or lawyers.

A.ii. Examples

A forensic laboratory in Houston, TX provides an example of a laboratory that transitioned from law enforcement control to an independent structure. The Houston Police Department crime laboratory highlights issues related to a laboratory performing within a law enforcement structure including improper testing leading to wrongful convictions, lack of resources, and ineffective management. The laboratory underwent an arduous process to achieve independence from the police department in an effort to rectify prior issues.⁷⁹ While the Houston Police Department crime laboratory's transition to the independent Houston Forensic Science Center illustrates the positive impact of an independent structure, it is important not to equate independence with perfection. Another laboratory that opened under an independent structure continues to face scrutiny. Investigations at the Department of Forensic Sciences in Washington D.C. revealed improper DNA analysis and firearms testing.⁸⁰ The bigger issue underlying the problems at the DC laboratory may be caused by political influence and interference.⁸¹ The laboratory's independent structure threatens the ability of law enforcement and prosecution to bias testing and results.

B. Codes of Ethics

Forty years ago, Law and Forensic Science Professor, James Starrs implored forensic scientists to abide by ethical and professional guidelines.⁸² A code of ethics is a formal element that enhances the ethical culture of an organization and indicates both internally and externally the importance of ethical behavior within an organization.⁸³ Forensic

scientists are members of the criminal justice system charged with upholding justice through science. Ethical misconduct within forensic science leads the public to lose trust in forensic science laboratories.⁸⁴ Implementation of a uniform code of ethics for forensic scientists is a tool to improve the ethical culture within laboratories and among all members of the forensic science community.⁸⁵ One of the foremost problems is enforcing a code of ethics. Currently, forensic science professional societies and laboratories have different codes of ethics. Although the forensic science community has not universally accepted a unified code of ethics, federal and state recommendations continue to move in that direction.⁸⁶ Adherence to a universal code of ethics will not prevent every instance of misconduct by forensic scientists. Rather implementation of a universal code of ethics with proper enforcement mechanisms will improve the identification of misconduct and promote corrective action.⁸⁷ Upholding a unified forensic science code of ethics improves the culture of forensic science at all levels, from the individual practitioners to the laboratory organization.

B.i. Current Codes of Ethics

Forensic scientists are members of the criminal justice system, but their ethical responsibilities differ from those of law enforcement and lawyers. Additionally, forensic scientists encounter unique challenges not faced by other scientists.⁸⁸ While all scientists have a responsibility to conduct scientific analyses according to proper procedures, forensic scientists must present results in court. Additionally, forensic scientists' duty to uphold justice through science greatly benefits the public. For decades, many forensic scientists were not held to enforceable ethical standards. Until recently, only professional forensic science societies and certification organizations provided ethical guidelines for forensic practitioners.⁸⁹ The code of ethics or codes of professional conduct address

honesty, integrity, and objectivity. Furthermore, the codes stress the importance of professional competence as well as clear and objective presentation in reports and testimony.⁹⁰

B.ii. Universal Code of Ethics

Codes of ethics within the forensic community formed in professional organizations.⁹¹ It was not until 2008 that accreditation requirements mandated a code of ethics within a laboratory.⁹² The need for all forensic scientists to uphold a professional code of ethics is evident in the negative headlines that capture public attention. Ethical misconduct is highly publicized. These transgressions cause the public to lose faith in the abilities of forensic scientists and laboratories.⁹³ While unethical behavior taints a limited number of cases, the conduct of one examiner can cast doubt over thousands of cases.⁹⁴ Public recognition of an enforceable and adequate code of ethics enhances a profession's credibility. Additionally, ethical performance is key to excellent performance. Former laboratory manager, Douglas Lucas, emphasizes the importance of doing the right thing while never forgetting to do things right.⁹⁵

The 2009 NAS report recommended a unified code of ethics for forensic science. A code of ethics enhances the ethical culture of an organization and indicates the importance of ethical behavior within an organization. As members of the criminal justice system, forensic scientists are charged with upholding justice through science. Ethical misconduct within forensic science leads the public to lose trust in forensic science. Adherence to a universal code of ethics will not eliminate ethical misconduct by forensic scientists, but can improve the identification and correction of such wrongdoing.⁹⁶

The National Commission on Forensic Science (NCFS) was a Federal Advisory Committee that operated from April 2013 to April 2017.⁹⁷ This group also recognized the benefits of a uniform code. The NCFS subcommittee recommended the National Code of Professional Responsibility for Forensic Science and Forensic Medical Service Providers. The NCFS recommended all forensic science providers, certification and accreditation bodies, and professional societies adopt the code. On March 22, 2016, the NCFS adopted the National Code of Professional Responsibility as a recommendation to the Attorney General. On September 6, 2016, Attorney General Loretta Lynn announced the implementation of the new code of professional responsibility for all Department of Justice (DOJ) laboratories.⁹⁸

Chapter 5: Reasoning Models

The earlier chapters have established ethical issues within forensic science. This chapter transitions to the broader topic of reasoning in order to highlight the contribution of ethical reasoning skills to forensic science. This chapter will examine the work of American philosopher Charles Sanders Peirce that focuses on solving problems or resolving doubt using three types of reasoning methods. Peirce's development of three reasoning types stem from his view of semiotics. The core of semiotics revolves around the ideas and study of sign. Background information of Peircean semiotics lays the foundation for how an individual interacts with the world through signs. This leads into an individual's belief structure. For it is not until a person is in genuine doubt, where their current belief structure does not align, that inquiry can begin. The three types of reasoning proposed by Peirce are abduction, deduction, and induction. A summary of Peirce's expansive explanations regarding abduction highlights the complexity and

importance of this type of reasoning in scientific inquiry. Further breakdown of the modes within each type of reasoning along with examples provide necessary information to understand how the reasoning processes can be applied in the world. This chapter concludes by highlighting forensic case study comparisons that explore how the reasoning method utilized can influence an investigation.

A. Semiosis Background

Semiotics describes how individuals interact with the world through signs. Further investigation of Peircean semiotics leads to the understanding of an individual's belief structure. When an individual is confronted with a situation that does not make sense given their current belief structure they experience genuine doubt. In order to solve this doubt and update their beliefs an individual must use inquiry. The methods of inquiry are the three reasoning methods Peirce explains. Abductive, inductive, and deductive reasoning are methods to form new ideas, test them, and reason between ideas. The forms of reasoning can be described as the way individuals interact with the world through signs. Future studies demonstrate the importance of abduction to maintain ethical practices and the limitations of deduction.

A.i. Sign Interpretation

An individual's beliefs are the sign structures one has created over time. If one undergoes a sign structure change then a belief structure change occurs. The only way for a change to occur is when someone is open to doubt. Peirce proposed that we create or accept new beliefs when we are in a condition of inadequacy that he called "genuine doubt".⁹⁹ This state of genuine doubt arises from experience; hence, it is naturally imbedded in a relevant context or situation. Being in a state of genuine doubt can be uncomfortable, painful, and irritating and therefore can compel individuals to create new

beliefs or alter existing beliefs to move to or establish some new state of belief.¹⁰⁰ Peirce proposed four methods through which we can fix beliefs/resolve doubt: tenacity, authority, a priori, and experiment.¹⁰¹ When doubt occurs, individuals must go through a reasoning process, which allows the belief, and thus sign structure to change or be confirmed. In argument formation or logic, deductive and inductive reasoning are common modes of reasoning. Peirce proposed a third method of reasoning termed abduction.¹⁰² Abduction proposes or creates hypotheses. Deduction explains hypotheses, moving from necessary consequences that may be tested. Induction is the testing of hypotheses, which evaluates the value of the hypotheses.¹⁰³

A.ii. Abductive Reasoning

Abductive reasoning is unfamiliar to many, yet it is a common reasoning process in practice. When a person encounters an experience that cannot be sufficiently explained by existing knowledge, sign structures, abduction arises because there is doubt. Abductive reasoning refers to the creation of new ideas and deals with potential or possibility. Signs are used to make sense of a new experience that cannot be explained by the current belief structure.¹⁰⁴ The method of discovering hypotheses is abduction according to Peirce.¹⁰⁵ Six modes of abductive reasoning have been identified and refined from Peirce. The six abductive reasoning modes are Omen/Hunch, Symptom, Metaphor/Analogy, Clue, Diagnosis/Scenario, and Explanation.

In forensic science and healthcare when the best forensic investigators or medical doctors start cases, they are in genuine doubt and are compelled to use the skill of experimentation through abductive reasoning. Resolving doubt through experimentation allows a forensic scientist or healthcare practitioner to examine their personal belief system. Trying to understand one's personal beliefs is hard because resolving doubt is

uncomfortable and energy intensive. Yet belief maintenance is critical so that these professionals can be lifelong learners and practitioners.¹⁰⁶ As an investigative case is developing, the inferences made, and abductive scenarios created all reside in a context that has ethical implications (e.g., common good, justice) to it. Another way to discuss this is the individual's Lebenswelt¹⁰⁷ and how the inference making process in that Lebenswelt is ethical. A brief example of this complex rhizomatic context is a murder case in Wisconsin where the forensic examiner clearly interpreted the results correctly (identified a contaminated DNA sample), but then stated this was not a problem related to interpreting the piece of evidence (ethical inference making issue).¹⁰⁸

B. Examples Related to Investigations

This chapter will also highlight case study comparisons that explore how the reasoning method utilized can influence an investigation. Sexual assault and homicide investigations were investigated from a reasoning perspective to determine if investigators tend to follow an abductive model of reasoning. A content analysis was performed to identify the reasoning processes that occur in a criminal investigation. The analysis revealed that a reliance on deductive reasoning led to errors and ultimately a wrongful conviction. Employing abductive reasoning and Peircean experimentation explained the reasoning process employed by good investigators who worked through doubt and tested their explanations. The findings of this study identify the contribution of ethical reasoning skills in forensic science.

B.i. Case studies

This research examined investigations from a reasoning perspective to identify ethical reasoning skills forensic investigations. Peircean semiotics, specifically, abductive reasoning provides a unique and powerful way to educate forensic students in the area of

reasoning and decision points. Do investigators tend to follow an abductive model of reasoning? Three criminal investigations are used in this study. The first one, the murder of Jeffrey Farkas, is a well-known homicide case and has been featured on the show *Ice Cold Killers*. The second, the Dutch Case of the Ball Point Pen Murder is also well known because of the strange series of events as the case moved through the legal system in the Netherlands. The third is a more recent case of serial robberies and sexual assaults.

The purpose of this research was to examine the reasoning processes that occur in criminal investigations in comparison to a model of abductive reasoning in an effort to identify the contribution of ethical reasoning skills in forensic science. In addition, the abductive modes create a concrete framework that students do not normally receive during their training. With the interviews and document research, the modes do not fall in a linear fashion. In the Dr. Farkas case, the explanation of who the murderer was fell apart twice during the investigation as more information was gathered and new scenarios had to be built. As demonstrated briefly in the results, there is an interaction or reciprocal nature to abduction during the scenario development process leading to explanation.

B.ii. Analysis

In these cases and other cases being explored, early explanations that do not go back and focus on the evidence at hand appear to be the most problematic. If the focus is on just the explanation and going back to see how the data fit, much more deductive in nature, errors seem to occur. This is highlighted best in the Ballpoint pen case. The key part is to focus on the evidence you have and build from there. In the end, reasoning errors build up over time propagating through the system over time and creating situations where the case cannot be brought to trial, creates a mistrial, or false negative-acquittal. On the other hand, people could be wrongly imprisoned due to focus on the

explanation. This is more than basic pattern searching, which can lead to incorrect inferences.¹⁰⁹ The key is the development of the pattern and then the testing of that pattern with new data (evidence). This type of Peircean experimentation is the skill set that needs to be developed and understood to be used to its fullest capacity during investigations. In addition, good investigators, let doubt exist and work through it. Doubt is not a negative component of investigation. It can be harnessed and used to develop the explanation to test over time. Subsequently, good investigators also realize when they must test some piece of the current scheme or scenario they have as doubt builds.

Chapter 6: Educational Tools for Ethical Reasoning

This chapter applies the insights of the previous chapters to discuss the development of education tools created to foster ethical reasoning skills. Improved reasoning skills enhance ethics consultations in healthcare or forensic science. This chapter emphasizes the importance of educating students on the use of abductive reasoning skills in order to promote ethical behavior by describing how and why educational tools for fostering ethical reasoning skills in forensic science was created. This chapter will describe the development of each of the modules and in-class activity contained in the ethical reasoning curriculum. Additionally, preliminary results regarding the effectiveness of the modules to teach students about reasoning patterns and the connection between forensic science and ethical conduct will be discussed.

A. Creation of Education Tools Focused on Ethical Reasoning

Reasoning skills are critical for effective and ethical decision-making. During ethics consultations proper reasoning skills are a core requirement. Educational tool utilizing problem-based learning was created to foster ethical reasoning skills in forensic science.

A.i. Goals/objectives

There are two primary goals for creating educational tools based on ethical reasoning. First the content should foster ethical reasoning skills and second make the content accessible. Ethical reasoning is a diverse skill that applies to numerous disciplines. Successful resolution of ethical dilemmas requires proper reasoning skills. The first goal is to develop material that uses problem-based learning where students can fully engage and cultivate enriched ethical reasoning skills. Within each module, specific learning objectives outline what the students will be able to do upon completing the module. Initially, the objectives are basic to ensure students fully comprehend the foundational content surrounding reasoning types and ethical principles. These learning objectives relate to declarative knowledge that student will gain. As the modules progress, the learning objectives focus on procedural knowledge. These advanced objectives focus on the student understanding how and when to apply different reasoning methods. Module development began by outlining the learning objectives. Informed by the learning objectives instructional activities and assessments were created to ensure all content directly ties to specific learning objectives. Defined learning objectives also aid student learning by directing their focus on the objectives that are outlined.

The second goal is to create online modules in order to ensure the content is accessible to an expansive audience rather than creating educational content strictly for a single classroom setting. The information is presented in five online modules that can be shared across universities and organizations using the Open Learning Initiative (OLI) platform created by Carnegie Mellon University.¹¹⁰ Additionally, an in-class activity was developed to supplement the online content.

A.ii. Problem-based Learning

The content and activities within each module build to resemble a problem-based learning pedagogy. Students engage with the learning material by solving open-ended problems. Varied assessments throughout each module ensure understanding of key concepts then case vignettes enhance student learning and examine skill development.

The first unit focuses on the identification of the three different types of reasoning models: abductive, deductive, and inductive reasoning.¹¹¹ Another module focuses on different learning models (e.g., behaviorism, cognitive information processing, cognitive bias). The next module connects the three types of reasoning with the applications in healthcare, forensic science, and forensic investigation. Activities in this module include transcripts from cases identified in the earlier research as well as materials and video clips from shows such as *Forensic Files* and *Dateline*. The modules progress from simple to complex case examples. The use of real life case examples is imperative for students to understand the impact of their future actions.

A fourth module focuses on ethical principles. In relation to forensic science, the principles of common good and justice will be emphasized.¹¹² The content and activities will allow students to understand the role of various members within the criminal justice field (i.e. investigator, forensic scientist, lawyer, judge).¹¹³ The connection between proper practices and ethical behavior will be highlighted. The fifth module further discusses abductive reasoning and the six modes.¹¹⁴ The module integrates the previous materials into full case studies that are completed by individuals or groups. These full cases present information at different times in the analysis in order to simulate how information is obtained in a clinical or forensic case.

B. Testing

The module based education tools were deployed at different times with different audiences to assess the effectiveness of the content. Two versions of the modules have been created and tested. The results from the first iteration informed improvements to the learning content and module design. Additionally, in the second iteration students completed multiple modules at different stages.

B.i. Testing Procedures

After module deployment, all the data collected was analyzed in order to assess the effectiveness of the content in relation to students' reasoning skills. Initial results were gathered by comparing answers from the pre- and post-test within a module. Beyond examining the pre- and post-test results, individual results from each of the activities were examined. Within OLI, all student answers from each assessment provided analyzable data. This data explored how many students got each question right or wrong as well as ranked all questions within an assessment based on difficulty. Additionally, information about the number of questions each student answered was examined to determine if the length of each activity was appropriate. Further analysis, using tools beyond those strictly available in OLI, was conducted to determine if the module was accurately teaching students the intended learning outcomes. The analysis tools in DataShop provided a deeper exploration of the results in order to improve student learning. This tool uses cognitive modeling to predict human behavior and elucidate areas of improvement.¹¹⁵

B.ii. Results/effectiveness

Results regarding the effectiveness of the modules to teach students about reasoning patterns and the connection between forensic science and ethical conduct will be discussed. Thirty-one students tested the initial iteration of the reasoning module. Results

from the pre-test showed that only three out of thirty-one students provided a definition for abductive reasoning. By the post-test, all thirty-one students could recognize the three types of reasoning methods and provide definitions. Further analysis at the question level indicates the effectiveness of each assessment with the module.

Chapter 7: Conclusion

The dissertation discusses the contribution of ethical reasoning skills in forensic science and explains the influences of ethical principles and reasoning methods in bioethics.

Analysis of ethical reasoning skills based on bioethical discourse may contribute to the emergence of a distinctive field of Forensic Ethics, but the argument in this dissertation focuses specifically on the contribution of ethical reasoning skills in forensic science.

Identifying the contribution of ethical reasoning skills is one method to address the misconduct and misapplication of forensic science that lingers in the field. Outlining the criminal investigation process and specifically examining how bioethical principles can alleviate ethical issues encountered during a sexual assault investigation frames the argument. An in depth exploration of the ethical principles and reasoning in bioethics provides a foundation for the educational content focused on ethical reasoning skills, particularly from the perspective of balancing privacy and the common good. The dissertation further explores the ethical culture in forensic science to explain the contribution of ethical reasoning skills within organizational structures and in codes of conduct. A brief philosophical background on the three primary reasoning models along with a content analysis study illustrates the impact of reasoning method on investigative outcomes. The dissertation culminates with the development of educational tools that foster ethical reasoning skills in forensic science. The content is created in an accessible fashion utilizing a problem-based learning. The foundational concepts from bioethics are

embedded in the content. Preliminary results from the use of the content in a forensic science program indicates the effectiveness of the created education tools.

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Chapter 2: Criminal Investigation Process

This chapter will explore different facets of a criminal investigation, specifically a sexual assault investigation through a healthcare ethics lens. Applying a bioethics discourse to the criminal investigation process provides context for subsequent analysis throughout the dissertation. A general overview of a criminal investigation explores the relationship and roles of police officers and forensic analysts.¹ A detailed analysis of a sexual assault investigation identifies the various stakeholders including healthcare personnel, police, and forensic analysts and illustrates the ethical questions that arise during the investigation. Ethical questions particularly arise at various human decision points throughout the process. It begins with the survivor's initial decision to consent to a sexual assault kit collection following through to reporting as well as tracking the progress of the sexual assault kit from collection to storage and testing.² Examining the process from a healthcare ethics perspective identifies the steps where preserving survivor autonomy and consent is critical in order to uphold justice. An examination of recent recommendations published in the NIJ report "National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach" are supported by a healthcare ethics analysis. Additionally, applying enhanced communication practices from healthcare ethics to a sexual investigation can improve investigation methods.³ One method for improving communication employs an advocate with ethical training similar to a healthcare ethics consultant.

A. Overview of Investigation Process

Before exploring the specifics related to a sexual assault investigation, it is important to have a general understanding of the investigation process. This brief overview outlines the role of the police and forensic laboratory during criminal investigations. The criminal investigation process begins with the police investigation then proceeds to the forensic laboratory where various scientific analyses may provide results for use by law enforcement

and the judicial system. Forensic scientists issue scientific reports regarding the findings from the various analyses. If criminal charges are filed against an individual, the investigation transitions to the courtroom. Forensic scientists may be called to testify in court regarding the conclusions of forensic testing.⁴

A.i. Police Investigation

When a crime is committed, police officers are the first responders to the scene. The initial responding officers are responsible for securing the scene. In many cases, specialized detectives report to the scene to interview witnesses and lead the investigation.⁵ In most jurisdictions across the United States, police officers also serve as crime scene investigators. For complex scenes, a team of specially trained forensic scientists may be called to the scene to provide additional support during evidence collection. The crime scene investigators are responsible for documenting the scene through drawings and photographs as well as collecting and preserving evidence. Crime scene investigators commonly perform fingerprint processing, but all other evidence proceeds to a forensic science laboratory for analysis.⁶ When submitting evidence, the police request different types of analyses and often include case information, such as the nature of the crime and where the items were collected. Additionally, police may communicate with the analysts via phone or email. Based on the results of an investigation the district attorney can file criminal charges against a suspect. The forensic testing results can contribute to the case against a suspect and allow the district attorney to move forward with judicial proceedings.⁷

A.ii. Forensic Science Analyses

Numerous forensic science disciplines exist and provide important information. Forensic scientists analyze circumstantial or indirect evidence. This evidence can be reconstructive or associative in nature. Reconstructive evidence such as bloodstain pattern analysis can aid in determining events surrounding a crime. Associative evidence is the most commonly

examined type of evidence. This type of evidence can associate or dissociate a suspect to a crime. Types of associative evidence include hairs, fibers, body fluids, paint, bullets, and fingerprints. This type of evidence can associate a particular individual with the evidence or provide information about the class-characteristics of the evidence.⁸

The primary forensic disciplines commonly found within a forensic science laboratory include Serology/DNA, Fingerprints, Firearms and Toolmarks, Toxicology, Drug Chemistry, and Trace Evidence.⁹ Serology is the identification of human body fluids and DNA analysis is the genetic identification of unknown material (i.e. body fluid, tissue, bone). The Fingerprint section or Latent Prints section compares unknown fingerprints to known prints for identification purposes. The Firearms/Toolmarks section compares the markings on a fired bullet or cartridge casing or a tool mark impression to determine whether it was fired from a particular firearm or made by a particular tool. This section also performs serial number restoration, tests the functionality of firearms, and reconstructs shooting incidents.¹⁰ The Toxicology section analyzes poisons to identify the substance and determine the quantity in cases with a legal implication. Drug chemists identify and measure illicit material by using presumptive and confirmatory tests. While Trace Evidence conducts the most diverse analyses by examining material such as hair, fiber, paint, and gunshot residue. Additional forensic science disciplines include engineering sciences, odontology, entomology, anthropology, digital and multimedia sciences, psychiatry and behavioral sciences, and pathology.¹¹

The number of forensic disciplines performing analyses on a case is completely dependent on the type of the case and the evidence that is collected. For example, in the majority of forensic science laboratories policies restrict DNA analysis in theft cases due to limited resources. Given the high number of theft cases, the amount of evidence from these cases would cause the DNA backlog to exponentially increase across the country.

Alternatively, DNA analysis is the most common type of analysis for sexual assault cases.¹² Case triage is critical within a forensic laboratory to ensure the proper analyses are being conducted on submitted evidence. Since some items may require multiple forensic analyses, it is important to determine the order of such testing. For example, a firearm from homicide case can undergo latent print analysis, DNA testing, and firearms analysis. If the firearm was processed by the firearms section first, any viable fingerprints or DNA could be obliterated. Therefore, coordination between the forensic disciplines is critical for successful analysis.¹³

The next section will delve into a sexual assault case investigation. The predominant evidence in these types of cases is a sexual assault kit (SAK). An SAK includes many items that are sent to a forensic laboratory for analysis primarily by the DNA section. Swabbings are collected from multiple orifices to collect any of the perpetrator's DNA that may be present in the form of skin cells, saliva, or semen. Additionally, combings from pubic hair and fingernail clippings are collected. The documentation includes notes and photographs of any injuries. Beyond evidence collected directly from the survivor's body, the individual's clothing is also collected. While the contents of a kit can vary, typical items include swabs, envelopes, tubes for blood samples, paper bags and paper, comb, and documentation form. The DNA section of the laboratory tests these items to identify the perpetrator's DNA on the survivor.¹⁴

B. Sexual Assault Case Example

A sexual assault investigation provides a general overview of a common criminal investigation. While no two investigations are the same, using a sexual assault investigation as a general example highlights the numerous stakeholders involved in the investigation process and the ethical issues at various decision points. Additionally, sexual assault is a unique case type that incorporates healthcare staff into the collection of vital evidence.¹⁵ This

type of investigation provides a nice example to analyze and apply practices from healthcare ethics.

Sexual assault investigations are complex and require collaboration between many stakeholders. This paper examines possible pathways for an investigation starting with the collection of a sexual assault kit at a hospital. Any investigation is complex and not commonly understood by the general population. A sexual assault investigation includes unique elements such as the involvement of healthcare professionals and advocates as well as time constraints related to evidence collection.¹⁶ Furthermore, even when a survivor provides consent to have a sexual assault kit (SAK) collected at the hospital it does not automatically initiate a police investigation. Often survivors consent to a kit collection without understanding that additional steps must be taken for the kit to proceed through the process. For the process to proceed many jurisdictions require survivors to report the assault to the police. After reporting, it will be the discretion of the police and laboratory whether the SAK is analyzed. Additionally, analysis of a kit is not guaranteed to produce probative results.¹⁷ By not fully understanding the sexual assault investigation process and the potential path of an SAK kit, survivors are unable to fully engage in the informed consent process. This is an ethical violation of the survivor's autonomy and an ultimate injustice to both the survivor and society that needs to be addressed.

B.i. Overview

It is important to first understand the scope of sexual assault cases and the ethical issues that arise. Someone in the United States is sexually assaulted every 98 seconds.¹⁸ On average, greater than 230,000 sexual assaults occur per year.¹⁹ Of all the assaults that occur, an average of 34% are reported. This means approximately 2 out of 3 assaults go unreported.²⁰ There are multiple reasons survivors cite for not reporting. Some of these reasons include fear of retaliation, belief that the police would/could not do anything to help, belief that it was

not important enough to report, and reported to a different official.²¹ Even when cases are reported, only 6 perpetrators out of 1,000 cases spend time in jail.²² Due to the lack of reporting, stakeholders involved in sexual assault investigations must make every effort to improve methods for those that survivors who do engage in the process.

The primary methods for reporting a sexual assault are by calling 911, contacting a local police department, or visiting a medical center.²³ This analysis examines the potential pathway of a sexual assault case when a survivor proceeds directly to a hospital following an assault. A survivor's decision to go to a hospital is one of the earliest human decision points following a sexual assault. It is difficult to determine the exact number of sexual assault survivors that decide to receive medical treatment at a hospital facility. The Bureau of Justice Statistics (BJS) from 2005-2010 reports 58% of survivors were injured during a sexual assault and of these individuals, 80% received treatment at a medical facility.²⁴ Since this number only accounts for survivors who are injured, there are no statistics related to the total number of survivors who proceed to a hospital facility in order to have a SAK collected, regardless of injury.

A survivor's arrival at the hospital triggers a multidisciplinary response. The hospital may contact an advocate who offers emotional support and information to the survivor. Additionally, in some jurisdictions, the hospital notifies law enforcement that an incident occurred, but this does not influence the survivor's future reporting decision.²⁵ For example, in Connecticut police receive notification if the survivor provides consent for police notification or if the case meets mandatory reporting criteria.²⁶ At the hospital, the survivor receives medical care and can elect to undergo a sexual assault medical forensic exam.²⁷ Prior to 2005, survivors did not have the ability receive a forensic medical exam unless they reported the assault to the police. The Violence against Women and Department of Justice

Reauthorization Act of 2005 provided a non-report option, which mandated survivors could receive a medical forensic examination regardless of the reporting decision.²⁸

Should a survivor consent to a medical forensic exam, preferably a sexual assault nurse examiner (SANE) or sexual assault forensic examiner (SAFE) with specialized training conducts the exam.²⁹ If the hospital does not have a SANE or SAFE on staff, another medical professional conducts this exam. The process includes obtaining a complete medical history, coordinating the treatment of injuries, documenting and collecting biological and physical evidence, and referring the survivor to other medical or nonmedical support. This examination is a highly invasive process that lasts for several hours. The biological and physical evidence collected is referred to as a sexual assault kit (SAK).³⁰ The survivor must provide informed consent before a forensic exam can be completed. Often the specially trained SANE is responsible for assessing the survivor's capacity to consent to this procedure.³¹ Regardless if a forensic examination is performed or not, a survivor will receive full medical care that can include medication to prevent infection or pregnancy.³²

Following a SAK collection, the survivor may file charges with the police. If the survivor chooses to file charges, police procure custody of the SAK from the hospital. Based on the facts of the case, police decide if the SAK should be sent to the forensic laboratory for testing. If the kit is sent to the laboratory, based on testing by the serology/DNA unit, the kit may or may not be analyzed. Elements that affect the forensic testing include the presence and identification of biological fluid, the amount of DNA detected, and the ability to obtain an interpretable genetic profile.³³

B.i.(a). Ethical Questions

During a sexual assault investigation, numerous ethical questions arise typically at various decision points throughout the process. From the outset, sexual assault investigations require a multidisciplinary approach and lack of collaboration among members of the sexual

assault team threaten the success of an investigation and the ability to uphold justice.³⁴ Next, survivors do not understand the entire investigation process, which can lead to a violation of their autonomy.³⁵ Furthermore, issues regarding consent are paramount to the collection and testing of a SAK.³⁶ Next, the storage of kits by law enforcement often depends on the reporting status of the case. This leads to abandoned kits unaccounted for on hospital shelves.³⁷ Additionally, survivors must agree to speak to police officers and file charges before a forensic analysis may be conducted. Police and laboratory analysts ultimately determine testing status relative to case information and resources, rather than upholding consent and serving the greater good by emphasizing justice through automatic testing.³⁸

Conflict among Sexual Assault Team

Sexual assault cases require a multidisciplinary approach.³⁹ A Sexual Assault Response Team (SART) includes members of law enforcement, forensic nurses, and rape crisis advocates. A qualitative study published in 2017 conducted interviews with 24 SART responders to describe how the members interact with each other.⁴⁰ While the benefits of SARTs include better communication between the different service providers and improved forensic evidence collection, tensions among team members persists. Research has indicated that conflicts stem from members not fully understanding the role of each other and lacking clear boundaries between members. Additionally, confidentiality and information sharing obligations differ between the members causing friction. These conflicts can negatively affect the productivity of the SART as well as lead to dissatisfaction among team members. Lack of collaboration among members of the sexual assault team threaten the success of an investigation and the ability to uphold justice.⁴¹

Survivor Not Understanding Investigation

Any investigation is complex and not commonly understood by the general population. A sexual assault investigation includes unique elements such as the involvement of healthcare,

law enforcement, and rape crisis advocates as well as time constraints related to evidence collection. For example, the collection of an SAK kit only occurs within the first 120 hours following the event.⁴² Many survivors are unaware of the time constraint. Valuable evidence can be destroyed should the survivor shower following the event or wait an extended period before reporting. Furthermore, even when a survivor consents to have an SAK collected at the hospital it does not initiate a police investigation. Although the policy shift in 2005 allows survivors to have a forensic medical examination without coordinating with law enforcement, many police agencies do not have well defined policies for handling non-report evidence.⁴³ Often survivors consent to a kit collection without understanding that they will need to speak to the police. It will then be the discretion of the police and laboratory whether the SAK is analyzed. Additionally, analysis of a kit is not guaranteed to produce probative results.⁴⁴ Since the survivor does not understand the entire process, she/he is unable to fully consent to SAK collection, testing, or reporting. This is a violation of the survivor's autonomy. Additionally, this leads to a potential injustice for the survivor as well as society.

Sexual Assault Kit Storage

In the United States, over 200,000 untested sexual assault kits have been identified with many more yet to be recognized. This number is incomplete due to the lack of counting and tracking systems within police agencies it is difficult to account for all kits present in a facility.⁴⁵ In 2011, NIJ awarded research grants to Houston Police Department and Wayne County (Detroit), Michigan focused on examining unsubmitted SAKs. Detroit identified 11,303 unsubmitted SAKs from 1980-2009 by manually counting the kits. In Houston, 16,863 SAKs from 1982-2009 were in police custody.⁴⁶ Before exploring why large number of unsubmitted kits exists nationwide, it is important to understand the evolution of DNA testing. DNA testing did not exist until the mid-1990s and it was not until the late-1990s that modern techniques were implemented. Furthermore, the creation of a national DNA database

occurred in 1994, but it was not widely used until the early 2000s. The evolution of DNA testing has greatly changed the criminal justice system. Had kits been tested prior to the new methods results would not have been as informative as current methods. Returning to causes of the backlog, Detroit assessed why so many unsubmitted kits exist in their jurisdiction by reviewing 20 years worth of records and conducting interviews. They identified 6 risk factors: victim-blaming, no written policy for submitting SAKs to the laboratory, budget cuts, high turnover in police leadership, lack of advocacy services, and strained relationships along with lack of training among the involved agencies. In Houston, the leading reasons for the large number of unsubmitted kits were the expense of DNA testing, limited resources for police investigators, and a system requiring police to request a kit be analyzed.⁴⁷ The Joyful Heart Foundation's initiative to End the Backlog identifies five primary factors that contribute to the backlog. They are lack of protocols for testing kits, lack of training which impacts whether a kit is submitted, if the identity of the perpetrator is known the kit will not be tested, lack of resources for testing, and outdated lab policies.⁴⁸ Untested kits represent an injustice for each survivor as well as society, as many perpetrators remained free to victimize again.

As seen in the high numbers of SAKs within the Detroit and Houston jurisdictions, untested SAKs are a massive issue. However, what does this have to do with the hospital? When trying to determine the number of untested kits present in a jurisdiction, audits with the police departments and the laboratory are conducted. This means that any kits sitting in hospital storage are not counted. If a survivor decides to have a SAK collected, but refuses to talk to police, the hospital may store the kit for up to 2 years in case the survivor decides to speak to police within that timeframe. If the survivor never reports the crime to police, the kit will remain untested and eventually discarded.⁴⁹ Based on anecdotes from a local SANE, it is clear that survivors do not understand the entire process. Essentially, they are agreeing to

have a kit collected and they want to know the results, but they do not realize that by not speaking to the police there is no chance for the kit to be tested.

Sexual Assault Kit Testing (case-by-case v. test-all)

The forensic testing of SAKs is not a straightforward process. As already described, in most jurisdictions kits are sent to police custody after the survivor formally files a report with law enforcement. At that time, the police decide whether to send the kit to the forensic laboratory. The decision to send a kit to the laboratory is another human decision point made by the investigating officer/detective.⁵⁰ This decision rests on many factors, but in the end is a judgment call made by law enforcement. Often when the suspect is known to the survivor, the kit will not be sent forward since no additional information regarding identity can be obtained.⁵¹ If law enforcement decides to send a kit forward, the laboratory then makes a decision about testing. Currently within the field, there is disagreement about the process and advocates for improving justice for sexual assault survivors propose a test-all approach. In this scenario, all kits collected are sent to the forensic laboratory for testing.⁵² The issue of consent is not a primary focus of this argument. Some jurisdictions specifically identify that consent from the survivor is needed for the kit to proceed to the laboratory, but others do not clarify. For example, Pennsylvania law outlines that within 15 days of receiving written consent for testing, the evidence must be sent to the laboratory. The laboratory then has 6 months to complete analysis, if testing is not completed in this time the evidence is counted as part of the backlog and must be reported back to law enforcement.⁵³ Arguments between a case-by-case testing versus test-all policy requires an analysis of the autonomy and justice principles.⁵⁴

B.i.(b). Ethical Principles

The ethical questions raised during a sexual assault investigation are important to analyze and offer solutions. The ethical issues surrounding a sexual assault investigation largely

revolve around the principles of autonomy and justice. These issues must be thoroughly examined according to each of the principles since no standard hierarchy for applying these principles exists, it is necessary to balance the principles according to the ethical issue at hand. Since this paper focuses on the ethical principles of respect for autonomy through informed consent as well justice and the common good, it is important to briefly describe and review the concepts from a healthcare ethics perspective. These principles will be further expanded in chapter three.

Respect for Autonomy

The word autonomy is derived from the Greek language and in the context of bioethics refers to individual independence. The principle respect for autonomy falls under the larger fundamental principle of morality, which is respect for persons. Respect for persons means that each individual has moral value and dignity. Respect for autonomy is one component of this larger principle where every person has the moral right to choose and follow his or her own plan or actions.⁵⁵ The principle of respect for autonomy is satisfied by meeting three general conditions: an individual has the capacity to act intentionally, acts with understanding, and is free from controlling factors.⁵⁶ Informed consent is an example of applying the respect for autonomy principle. For instance, a research participant must be able to provide informed consent prior to the start of a study. In other words, the participant can freely agree or disagree to participate in the study without being influenced to make a decision. Additionally, the word informed means that the participant must be provided with the necessary information in order to make an educated decision as well as have the faculties to be able to make such a decision.⁵⁷

Informed Consent

State laws require informed consent prior to medical treatment, except in some emergencies. Informed consent is the process of obtaining consent through disclosure and

discussion, whereby the patient has enough information to make an informed decision, either consent or refusal.⁵⁸ In order for a patient to provide informed consent the patient must be competent, receive thorough information, act voluntarily, comprehend this information, and consent to the treatment.⁵⁹ While every person is guaranteed a right to autonomy, depending on the decision-making capability of the individual there are varying decisions the individual can make. This decision-making capability is commonly referred to as competence or decisional capacity. The terms competence and incompetence refer to the legal designation, where those deemed incompetent by the court system are appointed a guardian. Decisional capacity refers to the decision-making ability of a patient in the clinical setting.⁶⁰ For the purposes of this argument, the terms competence and decisional capacity will be used interchangeably to describe the assessment of a patient's decision-making ability in a clinical setting. A clinical assessment is performed and a patient is deemed to either have the capacity or incapacity to understand information and participate in the informed consent process. Comprehension or competence means that a person is able to understand the information they are receiving. This definition can be further refined to include ability and rationality as necessary components of competence. It is important to clarify that competence is assessed for each task and is not determined globally. Each decision requires a person to understand different information therefore for simple tasks competence can be achieved, but for tasks that are more complex, that same individual may be deemed incompetent.⁶¹ The voluntariness of a decision means that a person is free from coercion, persuasion, and manipulation. An individual must be free of controlling influences by another person or an individual.⁶²

The elements of competence and voluntariness are essentially preconditions, which a person must satisfy prior to being able to provide informed consent. If a person is competent and able to decide freely, focus shifts to the disclosure piece of informed consent. The

element of understanding is subjective and there is no clear definition related to the information that is disclosed. Ethically professionals only need to adequately inform a patient so they have a sufficient understanding of the information.⁶³ There are three standards of practice regarding disclosure. The first is the professional practice standard where the professional customs determine the amount and type of information that is disclosed. Several challenges with this standard include the fact that customary standards may not exist for all situations and this focuses on the professional standards rather than patient autonomy. The second is the reasonable person standard, which uses a hypothetical reasonable person as the standard against which information is measured as being necessary or significant. While this is a popularly applied standard, questions arise regarding the definition of a reasonable person. This requires physicians to make determinations about necessary information by comparing to an abstract and hypothetical person. The third model is the subjective standard. The information is determined by the needs of each individual person and not a hypothetical reasonable person. By applying this standard, an individual's unique needs are taken into account as far as the physician can reasonably determine those needs. Applying the subjective standard fully respects individual autonomy.⁶⁴

Justice

The principle of justice refers to the norms that ensure benefits, risks, and costs are distributed fairly. Many theories of justice exist, but a minimum requirement all theories have in common is the idea of equal treatment across equal individuals. This formal principle does not provide further details regarding how to determine or assess the equality between individuals. In order to apply the formal principle, material principles of justice must be used. The material principles provide information regarding the distribution of justice.⁶⁵ Material principles of justice include utilitarian (achieve the maximum amount of benefits), libertarian (each individual's right to choose), communitarian (what is best for the common good),

egalitarian (equal access for all), capabilities (protects capabilities and freedoms that are essential for a good life), and well-being (identifies what is required to maintain well-being). While these are commonly thought of as competing theories, many societies employ more than one of the principles based on the context of what is being distributed. These material principles of justice help to determine who is equal and who is unequal.⁶⁶

A further definition of justice identifies components of the principle as fairness, entitlement, and equality. A breakdown of the justice principle in health care ethics separates distributive justice, rights based justice, and legal justice. Distributive justice refers to the fair distribution of scarce resources. Respecting people's rights upholds rights based justice and legal justice respect morally acceptable laws.⁶⁷ Broadly, justice as it relates to criminal justice can be defined as fair and impartial treatment during conflict resolution. This simple definition is laced with many interpretations. What people consider fair and impartial varies. Some view fair and impartial treatment to mean moral treatment, which is subjective between individuals. Another interpretation means equal treatment among individuals. A third understanding is people get what they earn. Due to the varied explanations for justice, multiple models of justice exist within society.⁶⁸ Retributive or corrective justice administers punishment proportionate to the severity of the wrongdoing. Another model, compensatory justice, focuses on making the survivor whole, compensatory, by providing financial retribution for the injustice experienced by the survivor. While the restorative model reintegrates offenders back into society. The distributive justice model spreads the benefits and burdens equally across society.⁶⁹ Individuals view each model differently based on the outcome they desire. Therefore, a legal justice definition is necessary for criminal justice. Legal justice is the right to due process through the government's protection of individual rights.⁷⁰

The Magna Carta of 1297 provides the moral and ethical foundations of the justice system. The principles of freedom, democracy, justice and rule of law established by the Magna Carta remains present in the US Bill of Rights, the Universal Declaration of Human Rights, and the European Convention on Human Rights.⁷¹ In the United States, the Constitution is the ethical foundation for criminal justice professionals. Overall, the Constitution outlines the ethical contract between the government and the people by outlining individual rights. The fourth, fifth, sixth, eighth, and fourteenth amendments specifically outline individual rights that directly relate to the ethical responsibilities of criminal justice professionals.⁷² The fourth amendment protects individuals from unreasonable search and seizures. The Fifth Amendment guarantees an individual's right to due process, protection from double jeopardy, and right not to testify against himself. The sixth amendment describes that individuals have the right to a fair and speedy trial where they can confront the witnesses against them, and guaranteed legal counsel. The eighth amendment protects individuals from excessive bail or cruel and unusual punishment. In addition, the fourteenth amendment, like the fifth, emphasizes the right to due process and equal protection under the law.⁷³ These amendments are meant to uphold justice by outlining what is fair and just.⁷⁴

Common Good

The principle of justice is also captured within the concept of the common good. Catholic social teaching establishes human dignity as the foundation from which other principles such as the common good develop. The principle of human dignity establishes the goodness and dignity of each human, while the common good affirms that humans are social beings that can only achieve happiness through interdependence on each other. All individuals have a responsibility to promote/protect the common good.⁷⁵ Human dignity upholds the idea that all individuals are entitled to be free from abuse and exploitation, while the common good promotes the dignity of each person and persons can only grow in community with others.

Therefore, human dignity and common good principles must interact to achieve fulfillment.⁷⁶ In 1965, the Second Vatican Council released, *Gaudium et Spes*, also known as the Pastoral Constitution on the Church and the Modern World. This document provided the classic definition for the common good by stating it is the sum of all private and communal goods, which allow groups and individuals to access their own fulfillment. The common good includes items such as food, clothing, and housing, which are needed by each individual, as well as goods, that belong to the whole such as education, transportation, water, and air. The common good emphasizes the goodness of the whole as a whole as well as the goods that individuals need. The concept of a common good promotes the well-being of the whole and the well-being of each person. The common good also provides ethical guidance directing individual behavior to benefit the community.⁷⁷

Catholic teachings provide two interpretations for the concept of the common good. The first states that humans were created by God to live in social unity with each other and not in isolation. All people should participate in society to benefit the common good. A second interpretation describes how individuals benefit from improvements of the common good. The Declaration on Religious Liberty states that the government should contribute to the common good by protecting public order. There are three prerequisites for public order: justice, public peace, and morality.⁷⁸ The examination of sexual assault investigations focuses on the government's requirement to protect public order and safety. As previously seen the Constitution establishes civil liberties and the preamble specifically states that the purpose of the Constitution is to establish justice and provide protection for everyone.⁷⁹ Therefore, in Catholic social teaching as well as the Constitution of the United States, it is evident that promoting the common good and upholding justice is necessary for society to flourish.

B.ii. Healthcare Ethics Approach

In healthcare ethics, communication is key to successful resolution and prevention of ethical dilemmas. Improved communication through a sexual assault investigation can greatly improve the process while recognizing the importance of upholding survivor autonomy and consent. In addition to a healthcare ethics analysis, it is important to discuss a recent NIJ report, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach”. The 35 recommendations outlined in the report are a culmination of over two years’ worth of work by the Sexual Assault Forensic Evidence Reporting (SAFER) Act Working Group. Henceforth this report will be referred to as the SAFER report. This paper will highlight some of the recommendations related to sexual assault kit collection, storage, reporting, and testing, while providing support through a healthcare ethics (HCE) lens.⁸⁰ The importance of preserving survivor autonomy and consent throughout the process will be emphasized. It is important to note this examination only focuses on adult cases. While the importance of improved communication as well as preserving survivor autonomy and consent can be applied to pediatric cases, it will not be discussed in this article. A healthcare ethics approach focused on upholding ethical principles and utilizing improved communication can positively affect the sexual assault investigation process and contribute to the common good.

B.ii.(a). Improved Communication

Communication needs to improve between the survivor and members of the investigation team as well as among members of the sexual assault team. Members of the SART need to understand how their interaction with the survivor can directly affect the outcome of the investigation. Specifically focusing on untested sexual assault kits, it is important for all stakeholders in the criminal investigation process to recognize the ethical issues that can arise when SAKs remain untested and unaccounted for on hospital shelves. This shows a lack of

respect for patient autonomy because the survivor is unable to make an informed decision if they do not understand the full process for SAK testing. Additionally, unaccounted for kits represent a miscarriage of justice. Through improved communication, with the assistance of an ethics trained advocate, hospital staff (particularly a Sexual Assault Nurse Examiner)⁸¹ can better educate the survivor.⁸² By taking the time to ensure the patient understands the process, the patient is now equipped with the necessary information required to provide informed consent for the collection of the kit and decide whether to speak to the police. This method fully respects the patient's autonomy while upholding justice. The implementation of improved communication methods may lead to fewer kits abandoned on shelves and an ultimate increase in justice.

Among sexual assault team

As indicated earlier, conflicts among members of the Sexual Assault Response Team (SART) can negatively impact the team's effectiveness.⁸³ Numerous strategies exist for conflict management. Five distinct categories for conflict management described by SARTs are preventative, problem solving, forcing, unobtrusive, and resigned. Preventative strategies include regular interaction and ensuring members of the team understand each other's role.⁸⁴ Opportunities to engage with members of the SART whether formally or informally allows members to know each other on a personal level and build interpersonal relationships. Preventative strategies are also seen in healthcare ethics committees where regular meetings review past cases and provide an outlet to build team relationships.⁸⁵ An established case review process for sexual assault cases allows for the discussion of issues immediately following an investigation.⁸⁶ Another strategy employs a problem-solving framework to collect information about a conflict incident and develop a plan to solve the core cause. An alternative strategy attempts to force team members to alter their behavior. Forcing strategies attempt to establish turf boundaries. Other more subtle strategies, referred to as unobtrusive,

attempt to influence members of the team by less direct methods. Things such as thank you notes to award ceremonies are methods to influence behavior through positive reinforcement. Through unobtrusive means, it is possible to exemplify preferred behavior without directly confronting any individuals of the team. Rather than address conflict, some members of SART employ the resignation strategy where they do not engage because they fear negative consequence using a more direct strategy or they perceive to have no power to make a change.⁸⁷

A study published in 2015 compares the SART structure to the perceived effectiveness of the SART. Results gathered from interviews of 187 teams indicated that formalized SARTs who conducted evaluations were perceived to be more effective. The study recommends formalized structure and resources for SARTs to be effective. Additionally, processes to promote collaboration, like multidisciplinary cross-trainings, case-review, and program evaluation aid the team in progressing toward common goals.⁸⁸ The results of this study align with the preventative and problem-solving methods as being most effective for conflict management.⁸⁹ These effectiveness indicators are similar to healthcare ethics consultation services. HCE services should be formally incorporated into institutional policy and have access to necessary resources while being readily accessible to patients, families, and staff. Additionally, success requires ongoing evaluation.⁹⁰ An example of this type of structure is the Phoenix Police Department cold case unit, which utilizes a multidisciplinary approach to investigate backlogged sexual assault cases. The unit combines police detectives, prosecutors, and SANE nurses who triage cold cases and rank the cases by solvability. Regular meetings as well as cross training improves communication among the members of the unit and ensures all members understand the roles and responsibilities of each team member.⁹¹

With survivor

Properly informing the survivor following this traumatic incident is critical. Research shows that sexual trauma directly affects parts of the brain that control memory, cognition, and emotion processing.⁹² Therefore, communication is key when interacting with survivors. Improved communication between the SANE and survivor will promote a trusting relationship and allow the patient to make a fully informed decision. As discussed earlier, the forensic exam is a very invasive process and the survivors have false expectations that they will receive information. The SANE needs to fully explain the testing of SAKs to the survivor in a fashion that they can easily understand. One simple method to improve communication can be by implementing a tool. NIJ developed an interactive figure that nicely outlines the entire process of analyzing sexual assault kits from collection through laboratory testing (see Figure A1 in appendix).⁹³ This graphic is a tool that can improve communication between the SANE and the survivor and provide all survivors with standard information.⁹⁴ By taking the time to ensure the patient understands the process, the patient is now equipped with the necessary information required to provide informed consent for the collection of the kit and decide whether to speak to the police. This method fully respects the patient's autonomy.

Communication can also be improved through a multidisciplinary approach. Once a survivor arrives at the hospital, the SAFER report emphasizes the importance of a multidisciplinary approach. Survivors, advocates, health care providers, sexual assault nurse examiners, law enforcement, forensic laboratories, prosecutors, and other community response professionals compose a multidisciplinary team as defined by the SAFER report. The report further recommends the early involvement of advocates.⁹⁵ According to BJS, only 23% of survivors received assistance from an advocate between 2005-2010.⁹⁶ Using a healthcare ethics approach to expand on this recommendation, the advocate's role will be

further explored. In the current process, a medical professional, ideally a sexual assault nurse examiner (SANE) leads the treatment of the survivor. In accordance with the recent recommendations from the SAFER report, a HCE approach also agrees that an advocate needs to be involved from the beginning. This advocate should have a background in ethics consultation and through early engagement with the survivor can improve the informed consent process by providing information that satisfies the unique needs of each survivor. At this initial phase of the sexual assault investigation, while in the hospital, the survivor receives medical care and can consent to have a sexual assault kit (SAK) collected. It is the duty of the medical professional, i.e. SANE, to determine the survivor's decision-making capacity and provide the survivor with all the necessary information related to the SAK collection. This information allows the survivor to consent or decline an SAK collection.⁹⁷ It is also recommended that the advocate be involved in this discussion. The advocate should further explain the entire process an SAK can go through. The advocate should specifically identify decision points and provide accurate information. This additional information is necessary for a survivor to truly provide informed consent for an SAK collection and subsequent testing. No different from current practices, if the survivor refuses an SAK collection, the survivor still receives full medical treatment.

[Advocate compared to Healthcare ethics consultant](#)

The recommendation for an advocate to have a more pronounced role from the outset of engagement with the survivor as well as a background in ethical consultation is supported by comparing the advocate to a healthcare ethics (HCE) consultant. HCE consultants are trained to aid patients during difficult decisions by providing accurate information and facilitating a resolution of conflicts. Furthermore, the American Society for Bioethics and Humanities (ASBH) ethical code of conduct for individuals who engage in health care ethics consultation outlines seven professional responsibilities: be competent, preserve integrity, manage

conflicts of interest and obligation, respect privacy and maintain confidentiality, contribute to the field, communicate responsibly, and promote just health care within health care ethics consultation.⁹⁸ The professional responsibilities outlined in the ASBH code focus on competency, integrity and justice.⁹⁹ Broadly, these professional responsibilities also apply to an advocate.

Additionally, a HCE consultant is often familiar with a multidisciplinary approach. HCE consultants commonly work within a hospital ethics committee composed of physicians, nurses, ethicists, clergy and other hospital personnel who perform ethics consultations as individuals, a team, or the entire committee.¹⁰⁰ The most commonly employed method is a small team approach.¹⁰¹ The ethics committees can serve three primary roles. One as an ethical educator, in order improve ethics based education for the committee as well as the hospital community. The ethics committee can also develop policies. Finally, the committee reviews cases and consults on controversial cases. One key goal for a consultation is to identify and analyze the conflict then provide mediation to the disagreeing parties in order to bring about an ethical resolution.¹⁰² Through consultation, the HCE consultant respects the interests, views, and responsibilities of everyone involved.¹⁰³ An advocate should serve this same role when interacting with a sexual assault survivor. Given the multidisciplinary approach, the advocate provides information while respecting the interests of the other multidisciplinary team members. While this comparison of an ethics trained advocate specifically focused on the consultation responsibility of a healthcare ethicist, the trained advocate should also engage in broader education and policy review activities.¹⁰⁴

Informed Consent and the Advocate's Role

On paper, such as the NIJ “Analyzing Sexual Assault Kits” graphic (Figure A1 in appendix), the process a kit follows looks simple, but when a sexual assault survivor arrives at the hospital, a complex human interactive process begins that raises various ethical

hurdles. A non-medical staff advocate (i.e. not a doctor or nurse) with an ethics focus could allow the survivors to better understand and navigate the process. The unique difference of HCE personnel are their training and experience with providing information to aid patients during difficult, i.e. highly stressful, situations.¹⁰⁵ One of the critical steps prior to collecting a sexual assault kit is explaining the details to the survivor in order to obtain consent. A major role of the advocate should be working with the survivor to provide an understanding of the overall process and the survivor's personal choices. Without complete understanding of the future investigation process, survivors cannot adequately consent or refuse to a SAK collection. Following the consent for a kit collection, a separate consent occurs related to reporting the case to police and subsequent forensic testing of the kit. At each decision point requiring consent, the competency/capacity of the survivor to provide consent must be assessed. An advocate with an ethical training will be able to aid in determining competency along with the medical professionals.

It is important for hospital personnel to recognize the ethical issues that can arise when SAKs remain untested and unaccounted for on hospital shelves. This shows a lack of respect for patient autonomy because the survivor is unable to provide an informed decision if they do not understand the full process for SAK testing. Through improved communication, such as employed an ethics trained advocate and using improved education tools like the NIJ figure to promote understanding, hospital staff (particularly SANEs and advocates) can better educate the survivor. The implementation of improved methods of communication may lead to fewer kits abandoned on shelves and an ultimate increase in justice, while upholding personal autonomy for each victim.

B.ii.(b). Sexual Assault Kit Process

Returning to the process a sexual assault investigation follows, applying a healthcare ethics approach identifies improvements to overcome some of the ethical dilemmas. Each

step of the SAK process will be reviewed starting with collection. Enhancements already applied to this step indicate the community's dedication to improving the process. The use of improved communication methods will be reiterated. Following collection, the storage of an SAK typically depends on the reporting status. Finally, under current protocols the submission of SAKs to forensic laboratories relies on decisions by law enforcement.

Exploring SAFER recommendations for each step in the SAK process and applying ethical principles leads to improved methods for handling kits that uphold autonomy and justice.

Sexual Assault Kit Collection

Many improvements have already been implemented at the SAK collection step.

Primarily, the role of the SANE promotes improved evidence collection as well as improved communication. SANE programs originated in the 1970s in Memphis, Minneapolis, and Amarillo.¹⁰⁶ Over 600 jurisdictions across the United States have instituted SANE programs.¹⁰⁷ Multiple studies indicate increased prosecution rates and improved healthcare after implementation of SANE programs.¹⁰⁸ Likely factors include the quality and utility of the medical forensic evidence collected, ongoing case consultation with police and prosecution, and expert testimony offered at trial.¹⁰⁹ These programs provide “empowering care” by respecting survivor’s decisions while providing a trauma-informed approach and victim-centered care.¹¹⁰ Communication, partnership, and health promotion are the three primary objectives of patient-centered care.¹¹¹ When dealing with sexual assault survivors, communication primarily focuses on describing the collection process so that survivors understand and are prepared for the invasive nature of the collection. For example, a group of SANEs within the University of Pittsburgh Medical Center developed a sexual assault education video through the support of grant funding. The video aims to empower sexual assault survivors by educating them on the process and promote shared decision making in their care plan.¹¹² Though this is crucial information for understanding the collection of the

kit, it does not aid the survivor in understanding the process after kit collection. Further information needs to be provided to the survivor regarding the future processing of the kit. This is where the advocate should step in. As described above, the advocate should explain the entire process by highlighting critical decision points along with the options and outcomes associated with different pathways. This method fully respects the patient's autonomy and promotes justice for the survivor and society.

Properly informing the survivor following this traumatic incident is critical. Research shows that sexual trauma directly affects parts of the brain that control memory, cognition, and emotion processing.¹¹³ The collection step is a critical decision point and it is difficult to fully understand the survivor's cognitive capacity to consent. The timeframe to perform the collection is relatively short compared to other decision points in the process that can wait, such as reporting to police. Communication is key when interacting with survivors. Improved communication between the SANE, advocate, and survivor will promote a trusting relationship and allow the patient to make a fully informed decision. As Robert Veatch first discussed shared decision-making in 1972, the same principles apply today. Shared decision-making is strongly supported from an ethical perspective as it leads to improved professional-patient relationships, better decisions and better outcomes.¹¹⁴

While not all hospitals employ SANEs or have access to advocates, this does not diminish the need for improved communication with sexual assault survivors. Although this paper emphasizes the role of the advocate, the communication of accurate information with the survivor applies to any hospital personnel interacting with the survivor. This analysis focuses on the advocate obtaining ethical training, but the SANE could also obtain this education. The distinction has been made merely to distinguish between the duties of the SANE and advocate, but in smaller jurisdictions with limited resources, one individual could serve multiple roles. The need to uphold autonomy and informed consent is an ethical

responsibility that falls to the individual engaging with the survivor. Respecting the survivor's autonomy leads to improved investigations, which uphold justice and benefit the common good.

Sexual Assault Kit Reporting and Storage

The next major decision point following SAK collection is the decision to report the assault to law enforcement. Different reporting options exist such as reporting, anonymous reporting, third-party reporting, non-investigative reporting and unreported.¹¹⁵ As mentioned earlier the decision to report to police is a separate consent decision that does not need to happen immediately. Survivors have options related to reporting that need to respect their autonomy. Survivors cite many reasons for not reporting including fear of retaliation, shame, anger, hopeless, and fear of not being believed due to drug or alcohol use. Survivors may also worry about the legal, familial, or social repercussions that come from reporting a sexual assault. Additionally, survivors may delay reporting because they are not emotionally or physically ready to report.¹¹⁶ By enabling the advocate to describe the entire process and options associated with each decision point, the survivor's autonomy remains respected. The survivor needs to understand the reporting options available in order to proceed.

Regardless of the reporting decision made by the survivor, all SAKs should proceed to law enforcement for storage.¹¹⁷ It is not the hospital's role to store evidence long-term. The length of time kits are stored by hospitals before disposal if police do not maintain custody can vary greatly. If the survivor never reports the crime to police during that window of time, the kit will remain untested and eventually discarded.¹¹⁸ Evidence discarded by hospitals violates the survivor's autonomy as well as denies an aspect of justice by removing the option to report and test the kit later. Therefore, Regardless of reporting status, all SAKs should receive a unique identifier for tracking chain of custody. Establishing a unique identifier for all kits is recommended as a method to improve tracking and survivor

notification. A unique identifier is a means to maintain confidentiality for the survivor while establishing a method to track evidence should she/he report at a later time.¹¹⁹ This option to report respects the survivor's autonomy while promoting justice. Until the statute of limitations expires, the survivor maintains the right to formally report the sexual assault to law enforcement.¹²⁰ The act of collecting a SAK signifies a potential crime occurred and the SAK becomes primary evidence. Since a survivor can choose to report the crime any time before the statute of limitations expires, law enforcement has the duty to uphold the integrity of the evidence. This ethical obligation applies to law enforcement only. This recommendation for all kits to be stored by law enforcement agrees with the recent SAFER report. Although the case is now with law enforcement, the advocate continues to play a role. Based on the relationship between the survivor and the advocate additional information from the police can be channeled through the advocate, which again aids in communication with the survivor.

Sexual Assault Kit Testing

Following the potential path of an SAK, it is now in law enforcement custody. In accordance with the SAFER report recommendations and the position of the Office on Violence against Women, only SAKs with survivor consent should proceed to forensic testing.¹²¹ Multiple jurisdictions have enacted legislation requiring the testing of all reported SAKs in hopes of identifying serial offenders and bringing justice to survivors.¹²² From an ethical analysis and respecting survivor autonomy, this recommendation is supported.

The forensic testing of SAKs is not a straightforward process and multiple human decision points arise. As already described, kits are sent to police custody after the survivor formally files a report with law enforcement. At that time, the police decide whether to send the kit to the forensic laboratory. The laboratory then makes a decision about testing. These decision points raise ethical concerns. Law enforcement has an ethical obligation to respect

the survivor's autonomy while upholding justice. The decision to test or not test could violate this obligation. In order to balance this ethical obligation the decision to send the kit to the lab should be eliminated. If the kit belongs to a reported sexual assault, it should automatically be sent to the forensic laboratory for testing. Essentially this is a "test-all" recommendation that strictly applies to kits where the survivor consented to testing. Additionally, automatically testing all kits with consent eliminates a legal argument that can arise before trial if a kit was not tested. Mandatory testing of reported SAKs promotes legal justice and upholds survivor autonomy. While results may be inconclusive following testing, the mandatory testing removes any arguments made against the officer's decision to send the test forward. Mandatory testing eliminates the need for officers to defend their reasons behind not sending the kit forward for testing. Any cases lacking current consent for testing should be maintained by law enforcement in order to uphold the survivor's right to report in the future.

This test-all recommendation is ideal, but in many jurisdictions unrealistic due to limited resources. Many laboratories must make difficult decisions when deciding what cases to test given the finite resources. The decisions associated with this process require an ethical evaluation outside the scope of this paper. The SAFER report does provide recommendations related to the conservation of resources by discussing direct to DNA analysis that would conserve labor-intensive resources required during the screening step.¹²³ Further analysis regarding the balance of resources while promoting justice and respect for survivors within the laboratory-testing step is an area for future exploration. Forensic laboratories must find an ethical balance that fairly distributes resources in order to more widely promote justice.

This chapter explored different facets of the criminal investigation process to introduce bioethics discourse as the context for subsequent analysis. By examining a

sexual assault investigation from a healthcare ethics perspective, multiple decision points arise where upholding survivor autonomy and consent is vital, while promoting justice. The process an SAK follows is complex. Advocates within each jurisdiction need to be familiar with the decision points and potential testing pathways so that this information can be provided to the survivor at the beginning of the process and reiterated throughout the investigation. Improved communication using an ethics trained advocate comparable to an HCE consultant provides one method to enhance the investigation process. Additional recommendations, proposed by the SAFER report and confirmed by an ethical analysis, include the storage of SAKs by law enforcement to preserve evidence integrity and allow for delayed reporting as well as a test-all policy for reported kits. Applying a healthcare ethics perspective to sexual assault investigations leads to improved communication and recommended practices that uphold autonomy by maintaining informed consent while promoting justice for the survivor and society. In addition to protecting an individual's autonomy, improved practices associated with sexual assault investigations can lead to more cases being reported and ultimately improved justice for survivors and the public.

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- ¹¹⁷ National Institute of Justice, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach,” August 8, 2017, from NIJ.gov: <https://nij.gov/topics/law-enforcement/investigations/sexual-assault/Pages/national-best-practices-for-sexual-assault-kits.aspx>.
- ¹¹⁸ National Institute of Justice, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach,” August 8, 2017, from NIJ.gov: <https://nij.gov/topics/law-enforcement/investigations/sexual-assault/Pages/national-best-practices-for-sexual-assault-kits.aspx>.
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- ¹²⁰ National Institute of Justice, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach,” August 8, 2017, from NIJ.gov: <https://nij.gov/topics/law-enforcement/investigations/sexual-assault/Pages/national-best-practices-for-sexual-assault-kits.aspx>.
- ¹²¹ National Institute of Justice, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach,” August 8, 2017, from NIJ.gov: <https://nij.gov/topics/law-enforcement/investigations/sexual-assault/Pages/national-best-practices-for-sexual-assault-kits.aspx>; US Department of Justice Office on Violence Against Women, *Sexual Assault Kit Testing Initiatives and Non-investigative Kits*, White Paper (Department of Justice, January 2017).
- ¹²² The Joyful Heart Foundation’s End the Backlog Initiative, at www.endthebacklog.org See, for example, CO Rev. Stat. § 24-33.5-113(4)
- ¹²³ National Institute of Justice, “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach,” August 8, 2017, from NIJ.gov: <https://nij.gov/topics/law-enforcement/investigations/sexual-assault/Pages/national-best-practices-for-sexual-assault-kits.aspx>.

Chapter 3: Ethical Principles and Reasoning

This chapter lays the foundation for further analysis of forensic science according to the prevailing ethical principles and reasoning in bioethics. The first and second sections of the chapter on principles and reasoning in bioethics addresses the internationally recognized fundamental ethical principles in bioethics.¹ On the one hand, the “Universal Declaration of Bioethics and Human Rights” from the United Nations Educational, Scientific and Cultural Organization (UNESCO) outlines the fundamental bioethical principles that respect human dignity and human rights.² On the other hand, a theory of bioethics referred to as Principlism has become a dominant paradigm in the field insofar as it also presents a set of universal principles that have been applied in a widespread manner; these are explored in depth here.³ The principles evolved from the common morality or norms accepted by all people regardless of societal, religious, or other factors.⁴ Theologians, philosophers, and policy makers also influenced Principlism. In Principlism, there are four universal principles that provide a basic framework for biomedical ethics. While no principle is ranked above another, in clinical medicine the principles of beneficence and nonmaleficence are prominent. Physicians assess the patient’s condition, determine the risk/benefit analysis of the treatment, and advise patients on the proper course of action. In a clinical setting, it is vital to maintain and respect patient autonomy.⁵

The third section of the chapter applies the principles and reasoning that characterize bioethics to forensic science. This application of bioethics to forensic science is explored by focusing on the balance between privacy and common good particularly as they relate to the criminal justice system.⁶ Protecting the common good by protecting society from

criminal activities is a primary obligation of the government. However, this obligation must be upheld while maintaining respect for individual human rights. Definitions of privacy and the common good are explored to understand the interaction of the principles as they relate to criminal investigations. Particularly in the United States, but worldwide, there is an essential obligation to uphold individual privacy, autonomy, and liberty.⁷ Since forensic science is a heavily research scientific discipline, it is important to analyze research ethics. Of particular interest is multinational research given its international impact and the focus on upholding privacy while contributing to the common good. The chapter concludes by analyzing the collection and use of forensic evidence as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.

A. Bioethics Principles

The chapter begins by defining the ethical principles in bioethics. Within this initial section of the chapter, exploration of consent further enhances understanding of the respect for autonomy principle. Both consent and respect for autonomy were previously discussed in chapter 2. In this section, a healthcare focused context enriches understanding.

A.i. UNESCO Declaration and Principlism

To present an overview of universal normative approaches to bioethics, the analysis focus on the Universal Declaration on Bioethics and Human Rights by UNESCO and the universal theory of bioethics enunciated in what is referred to as Principlism.

A.i.(a). Historical Perspectives

Bioethics emerged as a new discipline in 1970 with Van Rensselaer Potter writing the first book on the subject. Potter describes bioethics as the combination of science and philosophy.⁸ Potter defined bioethics as “a new discipline that combines biological

knowledge with a knowledge of human value systems in an open-ended biocybernetic system of self-assessment.”⁹ The United Nations Educational, Scientific and Cultural Organization (UNESCO) engaged in bioethics in the early 1970s and in June 1992 formally established an International Bioethics Committee (IBC). Based on work by the IBC the General Conference adopted the Universal Declaration on the Human Genome and Human Rights in November 1997. Then in 2003, the International Declaration on Human Genetic Data was approved. At a round table meeting on bioethics in 2001 identified a need to draft a "universal instrument on bioethics." A working group within the IBC developed a report outlining the feasibility of developing a universal text on bioethics. In October 2003 at the 32nd session of the General Conference, the Member States mandated the development of universal bioethics standards. UNESCO adopted the "Universal Declaration of Bioethics and Human Rights" in 2005.¹⁰ The Declaration outlines fifteen fundamental principles from a global perspective. The Declaration "addresses ethical issues related to medicine, life sciences, and associated technologies as applied to human beings, taking into account their social, legal, and environmental dimensions."¹¹ The principles are complementary and interrelated. Through ethical reasoning, there is a need to balance the principles in a non-hierarchical relationship.¹² The first principle addresses respect for human dignity and human rights, which is a paramount principle from which the others evolve. The next few articles discuss the ethical principles of beneficence, non-maleficence, autonomy, consent and privacy.¹³ Many of the fifteen principles will be explored within the upcoming sections, which define the ethical principles that will be applied to forensic science.

As highlighted in the previous chapter regarding a sexual assault investigation, autonomy and consent is a fundamental ethical obligation. This section will expand on the respect for autonomy principle and the consent process by first discussing Principlism then detailing the components of informed consent. Healthcare-focused examples demonstrate the application of the principles and provide a more detailed understanding. Since the bioethical principles have not been applied to forensic science in the same manner, application in the bioethics realm will foster understanding. Areas in forensics where the principles can apply will be noted. Ethics and essentially the ethical principles that will be explored in this chapter are human-made concepts that exist in the artifactual world. Metaphors are used to move from the artifactual world to the factual world.¹⁴ For this reason, examples from healthcare will be used to highlight the application of ethical principles.

The theory of Principlism will be broadly explained by defining the principles and providing background on the influences that contributed to development of the theory.¹⁵ Although no principle has precedence over others under Principlism, the respect for autonomy principle highlights the importance of maintaining patient autonomy. A discussion regarding the requirements for informed consent will focus on defining competency or an individual's decision-making ability.¹⁶ Later in the chapter, examples regarding end of life care decisions will illustrate the application of the principles and decision-making models.

Tom Beauchamp and James Childress define Principlism as the set of principles that designate the most general normative standards of conduct for biomedical ethics.¹⁷ The four general principles are respect for autonomy, beneficence, nonmaleficence, and

justice. The principles evolved from the common morality or norms accepted by all people regardless of societal, religious, or other factors.¹⁸ Theologians, philosophers, and policy makers also influenced Principlism. These four principles provide a basic framework for biomedical ethics. The theological, philosophical, and policy input that influenced Principlism can be demonstrated by exploring influences related to the principle of autonomy. The contributions from theologians and philosophers regarding the relationship between doctors and patients laid the groundwork for this principle, which integrates into public policy through the Belmont Report published by the National Commission for the Protection of Human Subjects.¹⁹

The theologians have a rich history of ethical concepts rooted in both Roman Catholic moral theology and Protestant theological ethics, which applies the Church teachings as practical guidance. Many theologians contributed to conversations that helped mold the direction of bioethics, but one in particular, strongly added to the dialogues surrounding respect for persons or respect for autonomy. Paul Ramsey, a Protestant ethicist, was able to interpret the Catholic doctrines in a way that appealed to lay people. His writings discussed the moral requirements guiding physician-patient relationship, by reflecting on the sanctity of human life. He stated that no matter what religious beliefs one holds, utilitarianism cannot overcome the respect for each individual. Ramsey emphasized the existence of a loyalty and trust between the patient and the doctor.²⁰

Philosophers also recognized the need to participate in the bioethical conversations by applying their training to the new questions posed by the advancements in science and medicine. Many philosophers have contributed to the conversation regarding the importance of autonomy by stressing the creativity of an individual.²¹ Multiple

philosophers examined the role of autonomy as applied to medical ethics. K. Danner Clouser a philosopher appointed to the faculty of an American medical school wrote about medical ethics and the sanctity of life.²² Dan Callahan expanded the concept of sanctity of life by establishing a philosophical framework. He essentially said that it is up to human beings to determine the rules that protect the sacredness of human life.²³ Additionally, philosopher Hans Jonas maintained that utilitarianism cannot overtake the rights and respect of the individual, which aligns with the teachings of theologian Paul Ramsey.²⁴ Policy makers would further examine the teachings and writing of the theologians and philosophers. The key concepts regarding the rights of individuals was solidified in the field of bioethics by the legislation passed by the United States Congress.

In response to issues regarding research involving human subjects, including the Tuskegee scandal and fetal research, Congress passed the National Research Act in 1974 that established the National Commission for the Protections of Human Subjects of Biomedical and Behavioral Research (The National Commission). One of the tasks assigned to the National Commission was recommending regulations to protect human subjects participating in research. By gathering information from consultants and literature, including The Nuremberg Code and the Declaration of Helsinki, the National Commission outlined the principles of respect for persons, beneficence and justice.²⁵ While the focus of the Commission and the Belmont Report was originally intended to guide research involving human subjects, these principles became foundational in bioethics. These principles led to the requirements for informed consent, risk/benefit assessment, and just selection of research participants.²⁶

A.i (b). Four Universal Principles

While the Belmont Report created by the National Commission established principles to uphold when conducting research using human subjects, Beauchamp and Childress suggest Principlism as a moral theory that expands the use of the principles to all areas of bioethics and not limited to research involving human subjects.²⁷ The principles, respect for autonomy, nonmaleficence, beneficence, and justice, provide a basis for assessing moral and ethical quandaries. To appreciate the role of Principlism in bioethics it is imperative to understand the definition of each principle.²⁸

The word autonomy is derived from the Greek language and in the context of bioethics refers to individual independence. The principle respect for autonomy falls under the larger fundamental principle of morality, which is respect for persons. Respect for persons means that each individual has moral value and dignity. Respect for autonomy is one component of this larger principle where every person has the moral right to choose and follow his or her own plan or actions.²⁹ UNESCO identifies the principle of respect for human dignity, which is equal for all humans and refers to the inherent worth of each person regardless of age, race, or sex. Human dignity refers to respecting all humans.³⁰ Article five of the UNESCO declaration outlines the autonomy principle.³¹ In America, laws in all the states require informed consent prior to medical treatment, except in some emergencies. In order for a patient to provide informed consent the patient must be competent, receive thorough information, act voluntarily, comprehend this information, and consent to the treatment.³² Since competency is a pre-requisite for a person to engage in the informed consent process, it is vital to understand how a person's decision-making capacity is evaluated. Additionally, the requirements of voluntariness

and disclosure will be explored to understand the core elements necessary for a patient to provide informed consent.³³

The principle of respect for autonomy is satisfied by meeting three general conditions: an individual has the capacity to act intentionally, acts with understanding, and is free from controlling factors.³⁴ Informed consent is the application of the respect for autonomy principle. Patients can freely agree or disagree to a course of action proposed by a physician without being influenced to make a certain decision. Additionally, the word informed means that the patient receives the necessary information in order to make an educated choice as well as have the faculties to be able to make such a decision.³⁵ The respect for autonomy principle supports other moral rules such as tell the truth, protect confidentiality, acquire consent and respect privacy.³⁶ The respect for autonomy principle and the role of informed consent will be explored further using end of life care decisions to examine the importance of patient autonomy.

The principles of beneficence and nonmaleficence have long been important principles in medical ethics. The book *Medical Ethics* by Thomas Percival essentially argued that beneficent and non-malevolent actions by the physician take priority over the patient's freedom to choose.³⁷ While the medical system no longer emphasizes these principles above others, the importance of these principles is highlighted by their long history of application in medical ethics. The principle of beneficence as defined in the Belmont report captures the concept of do not harm as well as maximize the benefits and reduce the harms.³⁸ Article four of the UNESCO Declaration, titled Benefit and Harm, identifies Under Principlism, Beauchamp and Childress break this concept into the separate principles of beneficence and non-maleficence. These principles are best

described together to fully understand the differences. The principle of beneficence means taking action to benefit or help others, while the principle of nonmaleficence means refraining from causing harm to others.³⁹ The rules of beneficence include helping persons with disabilities or those in danger. Basic rules that fall under the principle of nonmaleficence include do not kill, cause pain, or deprive others of a benefit. The principles of beneficence and nonmaleficence can be grouped into four moral obligations or norms. First, one should not impart harm which aligns with the principle of the nonmaleficence. Next one should prevent harm, remove harm, and promote good. These three obligations relate to the principle of beneficence.⁴⁰ In some circumstances, it is impossible to eliminate all possible harms; therefore, a risk-benefit analysis is used to evaluate the expected benefits compared to the risks. This analysis applies the principles of beneficence and nonmaleficence to an actual scenario.⁴¹

The fourth principle, justice, refers to the norms that ensure benefits, risks, and costs are distributed fairly. Many theories of justice exist, but a minimum requirement all theories have in common is the idea of equal treatment across equal individuals. This formal principle does not provide further details regarding how to determine or assess the equality between individuals. In order to apply the formal principle, material principles of justice are used to define the properties a person must possess in order to qualify for a particular distribution.⁴² Material principles of justice include utilitarian (achieve the maximum amount of benefits), libertarian (each individual's right to choose), communitarian (what is best for the common good), egalitarian (equal access for all), capabilities (protects capabilities and freedoms that are essential for a good life), and well-being (identifies what is required to maintain well-being). While these are

commonly thought of as competing theories, many societies employ more than one of the principles based on the context of what is being distributed. These material principles of justice help to determine who is equal and who is unequal.⁴³

A.ii. The Focus on Consent

Within the framework of Principlism, no principle is ranked above another, but too often in clinical medicine, the principles of beneficence and nonmaleficence prevail. Physicians assess the patient's condition, determine the risk/benefit analysis of the treatment, and advise patients on the proper course of action. In a clinical setting, it is vital to maintain and respect patient autonomy.⁴⁴ The principle respect for autonomy falls under the larger fundamental principle of morality, which is respect for persons. Respect for persons means that each individual has moral value and dignity. Respect for autonomy is one component of this larger principle where every person has the moral right to choose and follow his or her own plan or actions.⁴⁵ In the clinical ethics setting, respect for autonomy means that the physician should never ignore or override the preferences of the patient. A patient has the right to accept or reject any recommendations made by the physician. Physicians have a natural power because patients come to them for help based on their knowledge and experience. Due to the nature of some illnesses, patients may not be able to express their preferences. Physician paternalism may occur in these types of situations where the physician determines the best course of action based only on his or her own recommendations. It is necessary for patients and physicians to form a relationship where both the physician recommendations and the patient preferences guide the course of action.⁴⁶ In America, laws in all the states require informed consent prior to medical treatment, except in some emergencies. In order for a patient to provide informed consent the patient must be competent, receive thorough

information, act voluntarily, comprehend this information, and consent to the treatment.⁴⁷

Since competency is a pre-requisite for a person to engage in the informed consent process it is vital to understand how a person's decision making capacity is evaluated.

Additionally, the requirements of voluntariness and disclosure will be explored to understand the core elements necessary for a patient to provide informed consent.

A.ii.(a). Relating Consent with Autonomy & Decision-Making

The principle of respect for patient autonomy generally refers to the importance of an individual's right to make decisions for themselves. If a person is deemed to have the necessary decision-making capacity, is free from coercion, and is informed, that patient has the right to accept or decline treatment.⁴⁸ Even when a patient's decision-making capacity is impaired, it is important to maintain respect for the person through surrogate decision-making that upholds the preferences and values of the patient.⁴⁹ Informed consent is the application of the respect for autonomy principle. Patients can freely agree or disagree to a course of action proposed by a physician without being coerced to make a certain decision. Additionally, the word informed means that the patient receives the necessary information in order to make an educated choice as well as has the faculties to be able to make such a decision. Informed consent is a requirement in the healthcare setting.⁵⁰ The importance of the respect for autonomy principle in clinical practice evolved in response to changes in both the research and clinical setting. Given the importance of the respect for autonomy principle the role of informed consent will be explored further to better understand how the principle is upheld for patients suffering from dementia.

As explained above, the principle respect for autonomy establishes that every person has the moral right to choose and follow his or her own plan or actions related to

treatment decisions. In clinical ethics, respect for autonomy means that the physician should never ignore or override the preferences of the patient. A patient has the right to accept or reject any recommendations made by the physician through the process of informed consent.⁵¹ Informed consent is both an ethical and legal obligation that protects an individual's most basic rights as a human and upholds integrity and self-determination.⁵² It is important to understand the components of informed consent and further explore the criteria related to decision-making capacity as it applies to patients with dementia and examples related to end of life care.

Informed consent is a key requirement when adhering to the principle of respect for patient autonomy. A patient has the right to agree or disagree with the treatment plan suggested by the doctor. In order to provide consent, or refusal, a person must have the decisional capacity to make such a decision, receive sufficient information from physicians, be able to understand that information such as the risks/benefits, and provide a voluntary decision free from coercion or undue pressure.⁵³ This does not mean that a person needs to make the decision isolated from recommendations and support from the physician and family members. Rather the patient must be free from coercion or deception, which can control the patient's decision.⁵⁴ Patients who are deemed to have the capacity to make decisions are able to understand the basic information about their current medical state. Generally, this information includes facts about the proposed treatment, benefits and risks of the treatment, alternatives to the treatment or consequences of non-treatment. Additionally, they have the ability to weigh the risks and benefit of different treatment options. From that information, patients can assess the situation according to their own personal values and arrive at a decision. This decision

should remain consistent over time and can be communicated with the health care professionals.⁵⁵ Informed consent is a process that requires communication and trust. It is more than a physician explaining the treatment and receiving a signature of consent. The process involves communication between the physician and patient along with other family and support members, who will aid that patient in the decision-making process.⁵⁶ This communication process can protect from medical paternalism. Medical paternalism means the physician determines the best course of action based only on his or her own recommendations. Given a physician's role in healthcare as having the knowledge and experience to treat patients, medical paternalism may occur especially in cases where the patient may not be able to express his or her preferences.⁵⁷ It is necessary for patients and physicians to form a relationship where both physician recommendations and patient preferences guide the course of action.

The first criteria of informed consent requires that a person have the decision-making capacity necessary to understand the prognosis, consider various treatment options, and communicate their decision. Although this capacity is a key component for supporting patient autonomy, establishing a person's decision making capacity can be hard to define.⁵⁸ Decisional capacity includes several skills: understanding, assessing, valuing, reasoning, and articulating a choice. Essentially this is a person's ability to make a decision. This is different from a person's willingness to make such a decision.⁵⁹ The patient must be able to understand his own medical condition as well as the benefits, burdens, risks, and alternatives to the proposed treatment. Next, the patient must be able to reason and deliberate about the treatment choices. Finally, the patient must be able to make and communicate a decision.⁶⁰ In addition, decision-making capacity is assessed on

a sliding scale and different levels of capacity are needed for different decisions. Typically, a clinical assessment is performed and a patient is deemed to either have the capacity or incapacity to understand information and participate in the informed consent process for a specific decision. The Mac Arthur Competence Assessment Tool and the Capacity to Consent to Treatment Instrument are two validated assessment tools that are commonly used to determine decision-making capacity.⁶¹ Even if a patient lacks the ability to participate in a complex decision, they may have the capacity to make other decisions. Additionally, incapacity is not determined by status. For example, being elderly or diagnosed with dementia does not automatically mean the individual is unable to participate in the decision-making process.⁶² Competent individuals have full-control of making treatment decisions, while incompetent patients have a limited decision-making ability and usually require a surrogate decision maker.⁶³

For patients suffering from dementia, determining competency or capacity to participate in the decision-making process can be difficult to assess. The dementia diagnosis does not automatically define patients with an incapacity to participate in the decision-making process, but no standard method currently exists for determining the competency of dementia patients. Competency or capacity cannot be determined by stage of dementia or the severity of the cognitive impairment. It is important to recognize that one can still be competent in some aspects and not in others. Like with any other patient competency must be assessed on a sliding scale and be assessed relative to each decision.⁶⁴ Cognitive fluctuations can make determining decision-making capacity for patients with dementia extremely difficult to assess. Cognitive fluctuations are defined as “periods of behavioral confusion, inattention, and incoherent speech alternating with

episodes of lucidity and capable task performance.” Researchers have shown that the ability to understand medical treatment situations and choices is most affected in patients with dementia. In order to overcome cognitive fluctuations, physicians trying to assess decision-making capacity should choose a day or point in time where the patient is in good shape compared to other points in time.⁶⁵ Although dementia is a progressive illness, there is evidence to show that decision-making capacity can be affected at early stages of the disease.⁶⁶ Additionally, in early stage dementia patients may or may not be aware of memory loss.⁶⁷ More research is needed to understand if there is a correlation between the patient’s awareness level and decision-making ability.⁶⁸ When a patient reaches end stage dementia their impaired capacity no longer allows them to participate in the decision-making process. At this point a mechanism is needed that will maintain respect for the patient’s autonomy. Advanced directives and surrogate decision-makers are the most common methods for upholding patient autonomy.

A.ii.(b). Relating Consent with Competence, Voluntariness, and Disclosure

Since competency is a foundational requirement for informed consent, it is important to first understand the different levels of competency. While every person is guaranteed a right to autonomy, depending on the decision-making capability of the individual there are varying decisions the individual can make. This decision-making capability is commonly referred to as competence or decisional capacity. The terms competence and incompetence refer to the legal designation, where those deemed incompetent by the court system are appointed a guardian. Decisional capacity refers to the decision-making ability of a patient in the clinical setting.⁶⁹ For the purposes of this argument, the terms competence and decisional capacity will be used interchangeably to describe the assessment of a patient’s decision-making ability in a clinical setting. A clinical

assessment is performed and a patient is deemed to either have the capacity or incapacity to understand information and participate in the informed consent process. Competent individuals have full-control of making treatment decisions, while incompetent patients have a limited decision-making ability and usually require a surrogate decision maker.⁷⁰

In order for a patient to be considered competent, he or she must have the ability to understand the information physicians are providing, appreciate the possible consequences of treatment based on the medical diagnosis, communicate a choice, and rationally determine his or her own values compared to the physicians recommendation.

⁷¹ The decision-making capacity of an individual is best assessed on a sliding scale rather than a binary judgment. If a patient is presented with a treatment that has a high benefit potential and low probability of risk, the patient need only have a low decisional capacity. Whereas for interventions that have high risks with limited benefits a greater decisional capacity is needed.⁷² If a person is deemed competent the patient has full control over the decisions that can be made.⁷³ Meaning that a person capable of fully and freely making decisions can refuse life-sustaining treatment even if that treatment is recommended by the doctors or deemed ordinary. The term ace of trump or gold standard is used for decisions made by a competent person because regardless of other people's input a competent patient's decision is final and takes precedence. Examples of refusing life-sustaining treatment include the decision not to use a ventilator or resuscitate a terminally ill patient. Another example of a competent individual refusing treatment is a Jehovah's Witness who refuses a blood transfusion given their religious background. Although a blood transfusion may be viewed as a reasonable or ordinary treatment, the patient has the right to refuse. The patient's right of autonomy and privacy take precedence.⁷⁴ It is

important to note that although a patient may refuse treatment the doctor can try to explain the beneficial treatment and encourage treatment.⁷⁵

Depending on a patient's illness or injury he or she may transition from a state of competence to a state of incompetence.⁷⁶ An advance directive can be established by a competent individual to aid the decision-making process if that person becomes incompetent. Advance directives can assign a surrogate decision maker and even give instructions regarding end-of-life care.⁷⁷ The first type of advance directive is a proxy directive, which appoints a surrogate decision maker. These are also called durable power of attorney as it maintains authority even when the patient loses the capacity to revoke it. Another type of advance directive is a treatment directive or living will, which provides details about the person's wishes regarding certain types of treatment. The absence of a directive does not mean the patient automatically wants extraordinary means of treatment. Also, living wills do not automatically mean the patient wants to forgo treatment or refuse CPR in the event of cardiac arrest.⁷⁸ Treatment directives provide health care professionals with explicit documentation showing that the patient has considered end-of-life care issues and made certain decisions, thus enhancing patient autonomy. Having an advance directive can help relieve anxiety family members may feel about making these types of decisions. The directive also accounts for the patients' autonomy even at a time when the patient may no longer be competent to make decisions.⁷⁹

American law, emphasizes the importance of individual autonomy, but problems arise for incompetent patients or patients deemed unable to make decisions regarding treatment.⁸⁰ In order to still respect autonomy, the goal is to get as close as possible to the

gold standard. Article 7 of the UNESCO declaration acknowledges that special privileges be given to individuals lacking the capacity to consent. The declaration highlights the best interest of the person be accounted for and that capacity needs to be considered in terms of legal and medico-ethical capacity.⁸¹ Typically, in situations involving incompetent persons, surrogates make treatment decisions. Since not all patients have advance directives, most often a family member acts as the surrogate decision maker. Surrogates are held to certain legal and ethical standards in order to maintain consistency with the individual patient's autonomy. There are three general standards for surrogate decision-making recognized by the courts and derived from the *Conroy* case.⁸² The first is subjective or substituted judgment, which is based on the patient's known wishes. This means that only the personal views of the patient are used to make the decisions. Issues may arise with this standard though because it is not always possible to know the decision the patient would make in a particular situation. In addition, this standard can only apply to surrogates deciding for individuals who were previously competent and made their future treatment options clear.⁸³ Although the subjective judgment standard is favored by the court systems, it may not always be feasible therefore, other standards are necessary to guide surrogate decision-making. The second standard is the mixed subjective and objective standard, also known as the limited-objective standard. This standard incorporates the evidence of a patient's wishes as well as the best interests of the patient. The third standard is the pure objective or best interest standard. When no information is available regarding what the incompetent patient would want the decision is made purely based on the patient's best interests.⁸⁴ The role of surrogates and the

importance of maintaining patient autonomy will be further explored in relation to end of life treatment decisions.

The voluntariness of a decision means that a person is free from coercion, persuasion, and manipulation. An individual must be free of controlling influences by another person or an individual. This concept is explicitly stated in the Nuremberg Code.⁸⁵ There are many influences another person can have on an individual faced with making a decision. Not all of the influences are negative and the impact of these influences can vary greatly depending on the situation. Beauchamp and Childress describe three categories of influence: coercion, persuasion, and manipulation. Coercion occurs when a person intentionally uses the threat of harm or force as a way to control another person. This control does not allow the individual to determine his or her own course of action. Rather the coercion directs the person to make a certain decision due to the threat or possibility of harm. The feeling of being threatened is not enough to constitute coercion; an actual threat must be issued. The second type of influence is persuasion, where another person tries to appeal to reason. The final category is manipulation, which is motivating another person to make a certain decision by means other than coercion and persuasion. One example may be informational manipulation, where a person deliberately withholds information, lies, or exaggerates with the intent to make the decision maker believe false information and thus negate his or her ability to make an autonomous choice. It is nearly impossible to eliminate all possible influences; rather people tend to make decisions among competing influences. In biomedical ethics, it is important to establish safeguards so that influences do not become controlling and threaten autonomous choice.⁸⁶

The elements of competence and voluntariness are essentially preconditions, which a person must satisfy prior to being able to provide informed consent. If a person is competent and able to decide freely, focus shifts to the disclosure piece of informed consent. The element of understanding is subjective and there is no clear definition of the information that is disclosed. Ethically professionals only need to adequately inform a patient so they have a sufficient understanding of the information.⁸⁷ There are three standards of practice regarding disclosure. The first is the professional practice standard where the professional customs determine the amount and type of information that is disclosed. Several challenges with this standard include the fact that customary standards may not exist for all situations and this focuses on the professional standards rather than patient autonomy. The second is the reasonable person standard, which uses a hypothetical reasonable person as the standard against which information is measured as being necessary or significant. While this is a popular standard applied in United States, questions arise regarding the definition of a reasonable person. This requires physicians to make determinations about necessary information by comparing to an abstract and hypothetical person. The third model is the subjective standard. The information is determined by the needs of each individual and not a hypothetical reasonable person. By applying this standard, an individual's unique needs are taken into account as far as the physician can reasonably determine those needs.⁸⁸

A.iii. Beneficence-based and Autonomy-based Models

In order to fully explore the issue of maintaining patient autonomy while acting in the patient's best interest, a discussion of the historical influences of the ethical principles respect for autonomy and beneficence is required. The practice of medicine was founded on the principle of beneficence or the obligation to act in the patient's best interest.⁸⁹ It

was only in the past 100 years and especially given the bioethics movement that the principle of respect for autonomy or individual choice became a central focus for clinical medicine.⁹⁰ A history of the principles in medicine along with a definition of each principle according to the moral theory of Principlism provides a foundation from which the analysis of decision-making for advanced dementia patients will be analyzed.⁹¹

A.iii.(a). Beneficence-based Model

For 2,400 years, the practice of medicine followed the Hippocratic tradition whereby the physician-patient relationship followed a beneficence-based model. The beneficence model gives the physician complete discretion while the patient is not involved in the decision-making process. This model is premised on the practice that physicians should avoid causing harm, as outlined in the nonmaleficence principle, as well as actively prevent harm, remove harm, and promote good. Ethically physicians were obligated to act in a way to medically benefit the patient based on the physician's judgment. It was believed that only physicians had the knowledge and skill necessary to know what would benefit the patient. The beneficence model was further solidified with the writings of British physician Thomas Percival. His 1803 writing, *Medical Ethics*, upheld the tradition that the patients' best medical interests are most important. In the United States, early American physicians tried to adopt these Percivallian principles. The first codes adopted by the American Medical Association (AMA) were based on Percival's model. The Percivallian language did not change until 1980 due to the bioethics movement. For over 2,000 years, the Hippocratic tradition and Percivallian principles defined the physician-patient relationship. The physician had full authority to do what he deemed to be medically beneficial for the patient and the patient was to trust and be obedient to the physician.⁹²

The principle of beneficence refers to the obligation the healthcare community has to providing the best care for the patient or acting in the patient's best interest. The book *Medical Ethics* by Thomas Percival argued that beneficent and non-malevolent actions by the physician take priority over the patient's freedom to choose.⁹³ Although the medical system no longer emphasizes these principles above others, the importance of these principles is highlighted by their long history of application in medical ethics. The principle of beneficence as defined in the Belmont report captures the concept of do not harm as well as maximize the benefits and reduce the harms.⁹⁴ While the principle of nonmaleficence refers to the professional obligation to do no harm. Typically, in order to uphold the beneficence principle some action is taken, such as providing medication for a patient suffering from an infection. On the other hand, physicians should refrain from certain actions like providing ineffective treatment due to risk of further harm. Since almost all treatments have some level of risk it is necessary to perform a risk-benefit analysis to ensure the benefits outweigh the risks.⁹⁵ This analysis requires an assessment of the risks and benefits of a treatment with a focus on the best interests of the patient. Therefore, each case must be evaluated individually to determine what is best for the patient at that time.⁹⁶

A.iii.(b). Autonomy-based Model

American physicians struggled to maintain the British medical principles and beneficence-based model due to American ideology that emphasized liberty, individualism, and self-sufficiency. Additionally, where patients were being treated rapidly began to change. The number of hospitals in the United States drastically increased from 1870-1920 from <200 to >6,000. By 1960, less 1% of patients were being seen at home where a strong physician-patient interaction was commonly formed. This

breakdown of the physician-patient relationship strongly contributed to an increase in malpractice lawsuits. Due to the increased lawsuits, the foreign practice of obtaining patient consent began. The shift from a beneficence model to a model that respects patient autonomy was a response to the lawsuits more than a moral decision.

Experimentation involving human subjects also contributed to the shift towards a more patient focused model. The experimentation on human subjects that occurred by the Nazis during World War II also highlighted a lack of ethical guidelines. The resulting Nuremberg Code declared that voluntary consent is mandatory for research involving human subjects. The need for a new decision making process was further highlighted by Henry Beecher's expose of questionable research practices in the United States.

Additionally, the public exposure of the death of Baby Doe and the Harvard Brain Death Committee actions case highlighted the ethical failings of medical professionals. Baby Doe was born in 1960 with Down syndrome and a surgically correctable intestinal blockage, but her parents refused surgery and allowed the baby to die 15 days later due to starvation. Around the same time, the Harvard Brain Death Committee developed a new definition for brain death and developed medical criteria whereby once an individual was declared dead according to the new definition their organs could be preserved for transplantation. The committee wrongly assumed the definition of death would gain wide acceptance. Instead, it made the public uneasy about trusting physicians.⁹⁷ While the Quinlan case gave public exposure to issues related to respecting patient autonomy. The Karen Ann Quinlan case was the famous New Jersey Supreme Decision to remove ventilator support from a young woman in a persistent vegetative state. The decision

upheld the patient's right to accept or decline life-prolonging medical treatment. Since Quinlan was no longer competent, her guardian/surrogate could make that decision.⁹⁸

These events contributed to the bioethics movement, which ushered in efforts to protect the rights of people and added perspectives from lawyers, philosophers, and theologians to conversations previously dominated by medical professionals.⁹⁹ In response to issues regarding research involving human subjects, including the Tuskegee scandal and fetal research, Congress passed the National Research Act in 1974 that established the National Commission for the Protections of Human Subjects of Biomedical and Behavioral Research (The National Commission). One of the tasks assigned to the National Commission was recommending regulations to protect human subjects participating in research. By gathering information from consultants and literature, including The Nuremberg Code and the Declaration of Helsinki, the National Commission outlined the principles of respect for persons, beneficence and justice.¹⁰⁰ While the focus of the Commission and the Belmont Report was originally intended to guide research involving human subjects, these principles became foundational in bioethics and would guide the development of ethical framework for clinical practice. These principles led to the requirements for informed consent, risk/benefit assessment, and just selection of research participants.¹⁰¹ The informed consent model respects a person's right to participate in the decision-making. The use of informed consent provided a mechanism to protect patients. By providing adequate information, a patient can make an informed decision about treatment without controlling pressure.¹⁰²

This first section of the chapter explained the most widespread universal principles in bioethics. The next section focuses on how these normative principles generate different approaches to practical reasoning in bioethics.

B. Practical Reasoning in Bioethics

While real-life examples such as end of life care illustrate the importance of patient autonomy, a practical approach must be defined to aid in solving ethical decisions in clinical medicine. Albert Jonsen, Mark Siegler, and William J. Winslade apply the principles defined in Principlism to real-life clinical medicine cases by using the principles to guide the decision-making process. Four topics are used to define the general structure of a clinical case: medical indications, patient preferences, quality of life, and contextual features. These categories are referred to as the Four Boxes. All information regarding a case is classified in each of these boxes then the relationship between the principles and information is assessed. By analyzing the data that is sorted within each box, an ethical problem can be identified, and guide decisions about how to solve the dilemma.¹⁰³ As seen in examples regarding end of life care decisions, sometimes these ethical dilemmas arise because the physician and patient (or surrogate) do not agree about the proposed course of treatment. Instead of taking every one of these conflicts through the court system, the majority of hospitals have created ethics committees to consult on cases that involve ethical quandaries.¹⁰⁴

Another approach to resolving ethical dilemmas specifically addresses patients lacking competency to make medical decisions. Allan Buchanan and Dan Brock propose a hierarchy of principles for making decisions for patients who are unable to participate in the process. First, they propose the use of directives since this is considered the best method for respecting patient's wishes. Second, surrogates should use the substituted

judgment approach to make decisions based on how they think the patient would have decided. Finally, if neither of these options work, surrogates should act on the patient's best interest.¹⁰⁵ The approaches proposed by Buchanan and Brock will be explored in depth to highlight the benefits and pitfalls of each. Advance directives allow patients to maintain a level of respect for personal autonomy since patients can communicate preferences about future care decisions should they lose their decision-making capacity. An advance directive can be a written document, oral statement to family or friends, or oral statement to a physician. In addition to advance directives, surrogate decision makers can help protect individual autonomy for incompetent patients or patients deemed unable to make decisions regarding treatment.¹⁰⁶ Some patients may be experiencing a temporary state of incompetence and non-autonomy such as individuals who are unconscious. For these patients, the goal is to safeguard their future autonomy. For other patients, such as those with advanced dementia, it is important to respect their past autonomy.¹⁰⁷ Surrogate decision makers should be able to reflect the patient's value.

B.i. Jonsen's Model for Decision-Making: Medical Indications; Patient Preferences; Quality of Life; Context

The four boxes used to categorize information establishes a clinical framework when examining clinical ethics issues. Each of these boxes is related to one or more of the principles defined in Principlism. The topic of medical indications is based on the principles of beneficence and nonmaleficence. Patient preferences refers to the principle of respect for autonomy. While quality of life encompasses the principles of beneficence, nonmaleficence, and respect for autonomy. Finally, the topic of contextual features relates to the principle of justice. These four boxes capture the essential information for any clinical case and the unique specifics of each case. Within each box a series of

questions help clinicians obtain all necessary information. The four-box method is meant to guide clinicians and others involved in a clinical ethics case by collecting data in a way that can be assessed in relation to the standard ethical principles and similar cases. From this assessment, the ultimate goal is to resolve the ethical dilemma.

Medical Indications

Medical indications is the first category assessed when examining an ethical problem in clinical medicine. This category examines all the pertinent medical facts about a patient's condition. These include both the physiological and psychological condition. This information leads doctors to determine the type of diagnostic or therapeutic treatment necessary. The common goals in medicine are prevention, cure, and care of illness and injury. By examining the facts of the patient's condition, the doctor can determine the goal of treatment and provide recommendations to the patient. The goals and recommendations should be in-line with the principles of beneficence and nonmaleficence. Therefore, in medical ethics, beneficence means actions should benefit the patient and nonmaleficence means the activities should prevent further injury or reduce risk. In order to assess these two principles, a reasoning model that assesses benefit-risk ratio is used. In clinical medicine, almost no intervention is strictly beneficial with no possible risk of harm. Therefore, a ratio regarding what amount of risk is acceptable given the intended benefit must be determined by the physician and included in the recommendation to the patient. It is then up to the patient to evaluate this information.¹⁰⁸ As it relates to informed consent, this box captures the information that should be disclosed to the patient.

Patient Preferences

The next topic, patient preferences, analyzes what the patient chooses when faced with a medical decision based on the patient's experiences, beliefs, and values. The principle of respect for autonomy guides this topic. As previously defined, this principle upholds that each individual has the moral right to decide his own plan of life and actions. Patients are free to accept or reject a physician's recommendations regarding treatment. Informed consent is the practical application of this principle. Physicians provide information supporting the treatment recommendation along with the benefits and risks of the option in addition to alternatives. Ideally, the patient understands this information, assesses each choice based on their personal preferences and chooses to accept or reject the recommendation by providing informed consent.¹⁰⁹

Quality of Life

The third topic evaluated in the clinical ethics framework is the concept of quality of life. The principles of beneficence and respect for autonomy influence the quality of life topic. Quality of life can best be defined as the amount of satisfaction people have and the value of their lives as a whole and in specific aspects such as physical health. Under topic one, the principle of beneficence focused strictly on physicians helping others or the concept of Beneficence as Help. Now this topic is focusing on the aspect of beneficence that relates to bringing satisfaction to others. This can be referred to as Beneficence as Satisfaction. Each patient defines what his or her quality of life is and makes a judgment about how the medical intervention will affect their level of satisfaction.¹¹⁰ Thus, respect for autonomy is a critical component when examining quality of life, because it is such a subjective judgment.¹¹¹ Many ethical questions are raised about the quality of life for

terminally ill patients. For example, patients in a permanent vegetative state may be considered to have a profoundly diminished quality of life.¹¹²

Contextual Features

The final evaluation examines the contextual features by accounting for the external influences that affect clinical decisions, such as family, religion, finances, legal, and institutional factors. The first three topics focus on the interactions between patient and physician, but medical decisions are not made strictly between these two parties. External forces influence the decisions. The ethical principle of justice best applies to this topic. Justice refers to the fair and equitable distribution of benefit and burdens across all participants. This focuses into the idea of fairness, where participants receive what they deserve.¹¹³

B.ii. Buchanan & Brock Model for Decision-Making: Advance Directives; Surrogacy; Ethics Committees

Another decision-making model proposed by Allan Buchanan and Dan Brock suggests a hierarchy of principles for making decisions for patients who are unable to participate in the process. First, they propose the use of directives since this is considered the best method for respecting patient's wishes. Second, surrogates should use the substituted judgment approach to make decisions based on how they think the patient would have decided. Finally, if neither of these options work, surrogates should act on the patient's best interest.¹¹⁴ The approaches proposed by Buchanan and Brock will be explored in depth to highlight the benefits and pitfalls of each.

Advance Directives

Advance directives allow patients to maintain a level of respect for personal autonomy since patients can communicate preferences about future care decisions should they lose their decision-making capacity. An advance directive can be a written

document, oral statement to family or friends, or oral statement to a physician. The first type of advance directive is a proxy directive, which appoints a surrogate decision maker. A proxy directive is also referred to as a durable power of attorney since it maintains authority even when the patient loses the capacity to revoke it. Another type of advance directive is a treatment directive or living will, which provides details about the person's wishes regarding certain types of treatment.¹¹⁵ The third type is a combined directive that indicates a surrogate decision-maker as well as instructions for care.¹¹⁶ Content within advanced directives can be broken down into four categories of information: formal requirements, decisional capacity/when the directive takes effect, rights and responsibilities of the proxies and health-care providers, and the scope and limitations of decisions to forego life-sustaining treatment.¹¹⁷ The absence of a directive does not mean the patient automatically wants extraordinary means of treatment. In addition, living wills do not automatically mean the patient wants to forego treatment or refuse CPR in the event of cardiac arrest. Treatment directives provide health care professionals with explicit documentation showing that the patient has considered end-of-life care issues and made certain decisions. Having an advance directive can help relieve anxiety family members may feel about making these types of decisions.¹¹⁸ Although advance directives provide significant benefits by providing information regarding a patient's prior wishes, an advance directive is not a cure-all for addressing all treatment decisions that a patient may be facing.

Directives may be vague, hard to interpret, or conflict with the patient's best interests. An issue with the standard-form documents used for advanced directives is the lack of readability given the legalese or complex wording. Additionally, these forms fail to

recognize diverse religious, cultural, or social values. Furthermore, capacity-related questions arise when determining when the directive takes effect. Some patients may be able to choose a health-proxy, but not have the ability to understand and reason about his or her medical condition. Alternatively, patients may have fluctuating capacity where one day they can make certain decisions, but cannot on others. An autonomy-focused practice maximizes the opportunities for patients to make their own decisions.¹¹⁹

While the legal right of competent adults to write an advanced directive is recognized by all 50 states and the District of Columbia, only about 20% of individuals have a written advanced directive.¹²⁰ Additionally, advanced directives are rarely updated to reflect changes as patients age. An institutional mechanism should be implemented that will promote continued communication with patients allowing advance directives and patient preferences to be updated routinely and especially when new health conditions are diagnosed.¹²¹ Advanced directives can make surrogate decision-making both easier and harder. When the directives interfere with a patient's best interest, it is unclear how to proceed. For dementia patients, most commonly the "then" self created the advance directives. Issues can arise with the patient's "now" self since the patient's current quality of life could not be accounted for when the advance directive was prepared.¹²² Smith, Lo, and Sudore propose a five-question framework to unravel the conflicts surrogates face when previous directives are at odds with best interests. The questions are: (1) Is the clinical situation an emergency? (2) In view of the patient's values and goals, how likely will the benefits of the intervention outweigh the burdens? (3) How well does the advance directive fit the situation at hand? (4) How much leeway did the patient provide the surrogate for overriding the advance directive? (5) How well does the surrogate

represent the patient's best interests? These questions are meant to aid surrogates and clinicians when the patient's previously expressed preferences seem to conflict with his or her current best interest.¹²³ This framework promotes increased communication between the physician and surrogate while balancing previous preferences indicated in the advance directive and current best interest in order to uphold patient autonomy.

Surrogate Decision Making

In addition to advance directives, surrogate decision makers can help protect individual autonomy for incompetent patients or patients deemed unable to make decisions regarding treatment.¹²⁴ Some patients may be experiencing a temporary state of incompetence and non-autonomy such as individuals who are unconscious. For these patients, the goal is to safeguard their future autonomy. For other patients, such as those with advanced dementia, it is important to respect their past autonomy.¹²⁵ Surrogate decision makers should be able to reflect the patient's value. Most often patients choose spouses or significant others as their surrogate decision maker.¹²⁶ There are five different types of surrogates. First, the patient may designate a surrogate in an advance directive. Next, a patient can informally appoint a surrogate by informing the health-care provider. Third, the court can appoint a surrogate or "guardian". Fourth, the health-care provider can designate a surrogate if none of the above options are available. Finally, a special surrogate may be appointed for patients with no other type of surrogate.¹²⁷ Once a surrogate is selected, the surrogate and physician should engage in collaborative decision making in order to fulfill the requirements of informed consent. The physician provides all necessary medical information to the surrogate such as medical options, risks, and benefits. The surrogate is then tasked with upholding the patient's values during the

decision making process.¹²⁸ The proxy must act in the best interest of the patient based on the patient's values and not the proxy's personal views or biases.¹²⁹

Surrogates are held to certain legal and ethical standards in order to maintain consistency with the individual patient's autonomy. There are three general standards for surrogate decision-making recognized by the courts.¹³⁰ The first is subjective or substituted judgment, which is based on the patient's known wishes, values, goals, and preferences.¹³¹ This means that only the personal views of the patient are used to make the decisions. The substituted judgment standard should be the goal surrogates try attain in order to uphold the patient's attitudes and values.¹³² Issues may arise with this standard because it is not always possible to know the decision the patient would make in a particular situation. In addition, this standard can only apply to surrogates deciding for individuals who were previously competent and made their future treatment options clear. Typically, to uphold this standard the surrogate follows an advanced directive in order to make decisions on behalf of the patient.¹³³ Although the subjective judgment standard is favored by the court systems, it may not always be feasible therefore, other standards are necessary to guide surrogate decision-making. The second standard is the mixed subjective and objective standard, which is also referred to as the best interest's standard. This standard incorporates the evidence of a patient's wishes as well as the best interests of the patient. The third standard is the pure objective or best interest standard. When no information is available regarding what the incompetent patient would want, the decision is made purely based on the patient's best interests.¹³⁴

Numerous studies have indicated that surrogate decision makers are incorrect approximately 30% of the time due to their inability to effectively reflect patient interests

according to the substituted judgment standard.¹³⁵ This could be because a number of studies have found that surrogates were unaware of what was expected because they did not receive clear directives from the medical staff.¹³⁶ Surrogates specifically making decisions for dementia patients also feel unsupported, especially when the patient is in a care facility. Approximately 90% of advanced dementia patients will be cared for in a nursing home.¹³⁷ Typically, patients spend a year or more in a long-term care facility.¹³⁸ Given the deficiencies in cognitive capacity and the low prevalence of advance directives, these patients are especially vulnerable to over- or under- treatment.¹³⁹ Although surrogate decision making is common at this stage of the disease, surrogates feel unprepared and unsupported in the nursing home setting. Most often surrogates must make treatment decisions related to eating and drinking issues, infections, and pain.¹⁴⁰ Surrogates often feel anxious about making these types of decisions given the potential consequences.¹⁴¹ Additionally, surrogates often feel an enormous emotional burden and sense of guilt.¹⁴² A 2013 study explored the ethical factors family surrogates consider when making medical decisions for hospitalized older adults. The study grouped the factors into two primary groups: patient-centered factors and surrogate-centered factors. The patient-centered factors can further be broken down into three themes: respecting the patient's input, using past knowledge of the patient to infer the patient's wishes, and considering what is in the patient's best interests. The surrogate-centered factors include surrogate's wishes as a guide, surrogate's religious beliefs, surrogate's interests, and family consensus. This study illustrates the complexity of surrogate decision-making that expands beyond the principles of autonomy and beneficence. While patient preferences remained a major factor, surrogates expressed the need for more information. Information

about patient preferences should be gathered from advanced directives, substituted judgment, and/or patient input when possible.¹⁴³ Additionally, health care professionals should discuss information related to types of decision surrogates will be confronted with throughout the progression of the illness, especially related to end of life care.¹⁴⁴

Ethics Committees

In medicine, most decisions are made between the patient and physician, but due to the growing complexity of ethical issues, outside intervention may be needed. An ethics committee can consult on difficult cases where the medical team and the patient or surrogate do not agree with the recommended course of treatment. This committee can provide mediation between the parties who disagree.¹⁴⁵ The ethics committees can serve three primary roles. One as an ethical educator, in order to improve ethics based education for the committee as well as the hospital community. The ethics committee can also develop, review, and revise policies. Finally, the committee can review cases and consult on controversial cases. In the *Quinlan* case, the court suggested that hospital ethics committees make or aid with decisions about forgoing life-sustaining treatment.^{146,147} The above four-box method can serve as a useful tool for ethics consultants to use in order to collect the necessary information about the case and develop a resolution.¹⁴⁸ In a 1998 study, an examination of ethics committees found that the composition of an ethics committee can vary greatly, but is predominately populated by physicians and nurses.¹⁴⁹

In 2014, the American Society for Bioethics and Humanities (ASBH) approved an ethical code of conduct for individuals who engage in health care ethics consultation either individually or as part of a committee. The Code of Ethics and Professional Responsibilities for Health Care Ethics Consultants explicitly focuses on the clinical

ethics consultation portion and not the other functions consultants or committees provide. The ASBH code outlines seven professional responsibilities: be competent, preserve integrity, manage conflicts of interest and obligation, respect privacy and maintain confidentiality, contribute to the field, communicate responsibly, and promote just health care within health care ethics consultation.¹⁵⁰ Given the important role health care ethics consultants have in clinical settings especially in regards to patient care, this code serves to enhance the professionalism with the field.¹⁵¹ Since ethics consultants review and deliberate on difficult ethical problems, these individuals need to be held to their own ethical code of conduct. The professional responsibilities outlined in the ASBH code focus on competency, integrity and justice.¹⁵²

By holding ethics consultants and committees to the highest ethical standards within the field of bioethics, the committee's ability to consult on cases in a clinical setting is strengthened.¹⁵³ In regards to clinical consultation, the goal of an ethics committee is to resolve disputes between physicians and patients or families before they proceed to the court system. Disputes are often resolved through informal negotiation or mediation. Recommendations made by a committee are usually only advisory, but they can have a huge impact on resolving ethical problems by opening lines of communication and providing a different perspective. Depending on the mechanism of the committee, binding decisions may be possible.¹⁵⁴ Healthcare ethics consultants must have the education and training necessary to provide effective consultation.¹⁵⁵ Familiarity with the concept of Principlism and the adaptation of these principles into the four-box method can aid healthcare ethics consultants.¹⁵⁶ As demonstrated by the examples related to end of life care, when faced with competing recommendations regarding the treatment plan,

consultants must be mindful of and respect patient autonomy by ensuring proper informed consent procedures.

B.iii. Case Examples: Integrated Decision-Making; Dementia; End-of-Life Care

Although the hierarchical approach proposed by Buchanan and Brocks attempts to uphold respect for patient autonomy, many situations arise, especially with dementia patient that prove this method unsuccessful. An integrated decision-making approach is a preferable method since it allows for increased communication between members participating in the decision making process and allows a patient's previous preferences from an advanced directive to be balance with current best interests. Ideally, when individuals are diagnosed with an early cognitive impairment, such as dementia, conversations regarding health care preferences should be begin. These conversations should include family members or other individuals who will eventually be the decision maker for the patient. This will provide future surrogates with necessary information about the patient's preferences and values, which will be used for future decisions.¹⁵⁷ Efforts to improve education and provide information related to advance care planning should be undertaken immediately. It is important for the individual diagnosed with dementia to plan for the future when they will eventually lose the mental capacity to participate in care decisions.¹⁵⁸

Integrated Decision Making

An integrated decision-making process for patients with dementia should assimilate patient values, information from advance directives, surrogate interaction, and physician recommendations. A common approach already used in the healthcare community is shared decision-making. This method allows patients to collaborate with caregivers in order to express their preferences and values. An integrated approach expands on the

concept of shared decision-making by including the future surrogate decision making. Both patients with dementia and the caregivers benefit from shared decision making due to an increase in feelings of well-being and autonomy.¹⁵⁹ The World Health Organization also emphasizes the importance of supported decision-making for patients suffering with dementia. Supported decision-making bridges the gap between the time when the patient is fully able to make decisions and then no longer able to decide. The patient and surrogate should be involved throughout every stage of dementia thereby allowing the surrogate to understand the patient's past preferences and wishes when the patient loses the ability to participate in the decision-making process. More research needs to be performed to examine the effectiveness of a supported decision-making model, but based on prior research, providing surrogates with better information about patient's preferences improves the ability of surrogates to make decisions that align with the patient's values and wishes.¹⁶⁰

As a means to enhance communication in the shared or supported decision-making model, decision aids provide patients and families with structured information about a clinical choice and can enhance clinical decision-making. A study was conducted to examine the decision process related to feeding problems for patients with advanced dementia. A group of surrogates received an audio or print decision aid on feeding options while the control group received usual care. The decision aid was shown to improve the quality of decision-making by surrogates. The aid provided surrogates with a better understanding of the treatment options and reduced decisional conflict. Additionally, the surrogates who used the aid were more likely to discuss treatments with a health care provider.¹⁶¹ Another research group in the Netherlands developed an

interactive web-based tool called the *DecideGuide* to facilitate the process of shared decision making for patients with dementia. The *DecideGuide* has three primary functions. The first is a chat function that allows patients, caregivers, and case managers the ability to communicate even from a distance. The second function, *deciding together*, aids decision making through questionnaires. The final function, *individual opinion*, allows the patient to document their personal opinions and preferences. While it was difficult for the dementia patients to use the assistive technology, they did find the tool beneficial to increasing communication.¹⁶² The problem related to the ability to use the tool will gradually decrease given the technology driven society we currently live in.

While it is clear to see that interaction with the patient and surrogate decision maker can improve the decision-making process additional support from health care professionals is essential for quality end-of-life care. This type of support is often not administered in the hospital or nursing home setting. Greater communication is needed between health care providers, nursing home providers, and surrogate decision makers. Surrogates and patients should be notified of common decisions that arise during end-stage dementia so that advanced directives and choices can be made while the patient is able to express individual preferences.¹⁶³ Additionally, increased communication with qualified professionals such as a nurse can ease anxiety by translating medical information and exploring values and goals.¹⁶⁴ The best method for upholding patient autonomy for those diagnosed with dementia involves dynamic and continuous communication with the patient, family, and medical team. This communication must go beyond an advance directive.¹⁶⁵ An integrated approach allows the patient's preferences

to be heard throughout the entire process. The surrogate then uses the patient's values when participating in the decision-making process after the patient has lost competency.

Dementia

Dementia is a progressive disease that is rapidly increasing given the world's ageing population and longer life expectancies. Since dementia affects an individual's cognitive abilities, patients with advanced dementia lack the capacity to make treatment decisions.¹⁶⁶ Given the progressive nature of the disease, increased communication with the patient from the beginning of the diagnosis allows surrogates and physicians to understand the patient's wishes and values even as the condition advances. Background information regarding the prevalence and symptoms of dementia highlight the importance of improving decision-making methods for these patients. Two case examples are presented to understand the issues patients, surrogates, and health care personnel face when trying to uphold patient autonomy while acting in the best interest of the patient.¹⁶⁷

According to the World Health Organization website as of April 2016, 47 million people worldwide are currently suffering from dementia with 7.7 million diagnosed each year.¹⁶⁸ Alzheimer's disease accounts for 60-80% of dementia cases. Someone in the United States develops Alzheimer's disease every 66 seconds.¹⁶⁹ Out of the top 10 leading causes of death in the United States, Alzheimer's is the only cause of death that cannot be prevented, cured, or slowed.¹⁷⁰ Other forms of dementia include vascular dementia, dementia with Lewy bodies, mixed dementia, and frontotemporal lobar degeneration. Recent studies suggest mixed dementia is more prevalent than previously recognized and many patients diagnosed with Alzheimer's disease may have multiple brain abnormalities related to more than one form of dementia.¹⁷¹ Over 13 million

Americans are expected to receive a dementia diagnosis by the year 2030.¹⁷² Life expectancy ranges from 4-9 years after the initial dementia diagnosis.¹⁷³ No single test exists to diagnose the various forms of dementia; rather physicians often collaborate with a neurologist and use multiple tools and approaches to make a diagnosis. Such methods include collecting medical history and family input regarding the patient's behavior, cognitive tests, physical and neurological examinations, blood tests, and brain imaging.¹⁷⁴

Dementia is characterized as an illness to the brain. Neurons in various parts of the brain have been damaged or destroyed resulting in a decline of cognitive functions.¹⁷⁵ This condition is chronic and progressive in nature. A person's mental ability, personality, and behavior changes.¹⁷⁶ The rate at which the symptoms advance from mild to moderate to severe differ from person to person.¹⁷⁷ Dementia is classified as a major neurocognitive disorder because it causes a decline in cognitive function and performance of everyday activities. Memory, speech, language, judgment, reasoning, planning and other thinking abilities are captured under cognitive function while examples of everyday activities include making a meal and paying bills. Eventually the damage and destruction of neurons inhibits patients from being able to walk or swallow. At the end stage of the disease, patients require constant care and are bed-ridden until death.¹⁷⁸ Symptoms of moderate to severe Alzheimer's disease or other forms of dementia commonly include confusion, frustration, anxiety, and distress about being unable to recognize people and places. Some patients may also experience contentment and engage in activities. For the majority of patients, they experience both extremes, essentially good days and bad days.¹⁷⁹ Memory deficits, inability to recognize family members, limited speech, incontinence, and dependency on others for all activities are

characteristic of advanced dementia.¹⁸⁰ Individuals with dementia will decline to the point where they are unable to participate in the decision making process unless they die earlier from other causes. Dementia patients lose the ability to comprehend issues related to their medical condition and they are not able to evaluate their needs or express their wishes.¹⁸¹ Gerontological literature often differentiates the “then” self and the “now” self when discussing patients with dementia. The “then” self existed prior to severe Alzheimer’s disease and the “now” self lives in the present with little, if any, memory of the past.¹⁸²

Two cases from the American Medical Association Journal of Ethics highlight issues related to the decision-making process when caring for patients with dementia. The first case discusses 70-year-old Mr. Abbot who was admitted into the hospital due to respiratory distress from pneumonia. This diagnosis will likely require intubation. Overall Mr. Abbot is in good health besides his dementia. He enjoys activities at his nursing home and visits with family on a weekly basis. Many year prior, Mr. Abbot created an advanced directive that stated if he were demented and unable to recognize family or friends, he would prefer no resuscitation steps be taken if necessary. Given his current condition, his family insists that the advanced directive should not be followed since their father has a good quality of life. The family believes intubation is the best treatment.¹⁸³

The second case example involves Mrs. Erickson, a 72-year-old woman suffering from hypertension, mid-stage Alzheimer disease, and congestive heart failure causing aortic stenosis. She was admitted to the hospital because of heart failure and advanced stenosis. Mrs. Erickson had created an advance directive 15 years earlier that indicated she wanted all available medical interventions. When she had prepared the directive, she

did not have Alzheimer disease and was able to control her mild hypertension. She indicated her only daughter as the durable power of attorney for health care decisions, but her daughter passed away several years ago. Mrs. Erickson's next of kin is her 19-year-old granddaughter, Caitlin, who is unaware of the advanced directive or her grandmother's preferences related to end-of-life care. One possible therapeutic treatment option involves aortic valve replacement through surgical means, but the resident physician is uneasy about this approach. He does not feel the patient would choose this treatment given her current health. Caitlyn has been informed of the risks and benefits for various options, yet she remains unsure of how to proceed.¹⁸⁴

Both of the cases involve an Alzheimer's patient that is currently suffering from additional medical concerns. Additionally, both of the patients prepared an advanced directive prior to being diagnosed with dementia. Each patient is facing an invasive medical treatment where it is unclear how to apply the advance directive. Questions have been raised about the application of the directive given each patient's current quality of life, which was not accounted for when the advance directive was written. Arguments are being made on behalf of each patient that the individual would not make the same decision today as they stated in the directive. It is unclear if the patient's values and preferences are being respected in the current situation based on the limited case information provided, but it is clear that a better decision-making method is necessary to solve these types of dilemmas. It is in these types of situations that an integrated decision-making model is needed that maintains patient autonomy while acting in the patient's best interest. The decision-making process should integrate patient values, information from advance directives, surrogate interaction, and physician recommendations.

The individuals in the case examples, Mr. Abbot and Mrs. Erickson, both established advance directives prior to their dementia diagnosis. Mr. Abbot is a 70-year-old with advance dementia, but otherwise in overall good health until being admitted to the hospital with pneumonia. His advanced directives declares no resuscitation measures should he become demented. Although his family members are aware of the advanced directive, they feel treatment is necessary since up until that point he was enjoying his day-to-day activities. The second case involves 72-year-old Mrs. Erickson who suffers from dementia, hypertension, aortic stenosis, and congestive heart failure. Her 15-year-old advance directive indicates that all medical interventions should be performed. For both cases, the ethical question is whether the advanced directive should be followed. In Mr. Abbot's case, should no treatment be administered? For Mrs. Erickson, should surgery be performed?

While an advanced directive is considered the best method for respecting patient autonomy it is difficult to discern what the patient truly intended. For example, did Mr. Abbot want his directive to take effect the moment he did not recognize a family member, essentially his first "bad" day or did he mean for it to take effect when he no longer had "good" days? Given these questions about the advance directive, it is important to engage the surrogate in the decision-making process as well as the patient. If Mr. Abbot is still able to enjoy daily activities, he may be able to communicate current preferences related to treatment that can be evaluated in addition to the advance directive and surrogate preferences. The integrated decision making approach would allow the preferences outlined in the advance directive to be evaluated in relation to any current input from the patient. Additionally, the surrogates knowledge of the patient's value

especially in relation to Mr. Abbot's current quality of life is included in the integrated decision making approach. A viable option is for the family to choose intubation treatment for a time-limited trial. Since the advance directive is unclear and given Mr. Abbot's current quality of life and best interest, this would be an acceptable treatment option.¹⁸⁵

In the other case, Mrs. Erickson's advance directive, which was prepared when she was living a healthier and independent life, was never updated when her health status changed. For this case, it is clear that Mrs. Erickson needs assistance with all her daily activities, but it is unclear to what extent she can participate in treatment discussions. Although she likely lacks full decision-making capacity, based on her Alzheimer's diagnosis and her reliance on assistance for completing daily living activities, she may still be able to express values, goals, and treatment preferences. A combination of patient preferences and sound medical judgment are necessary for decision making thereby trying to maximize both the respect for autonomy and beneficence principles. A few recommendations can be made for this case. First, Mrs. Erickson should be included in treatment discussions to any extent possible. Next, the medical necessity of the surgery must be assessed and communicated to Mrs. Erickson and her granddaughter. Depending on the necessity and viability of the surgical treatment, a palliative treatment may be recommended. Use of an integrated approach allows for enhanced communication between all involved parties instead of strictly relying on instructions from an outdated advance directive.¹⁸⁶

These cases highlight the importance of communication when making decisions on behalf of dementia patients. Given the complexity of the cases, it is apparent that relying

on a single tool to make decisions on behalf of a patient is unrealistic. An integrated approach aids the decision making process for these two patients by allowing the surrogates and physicians to discuss the information in the advance directive, evaluate the patient's current quality of life, and receive input from the patient regarding treatment preferences. In order to maintain respect for patient autonomy while upholding the patient's best interest, an integrated decision-making approach is most beneficial for patients suffering from dementia.

End of Life Care

Physicians have an obligation to obtain informed consent before beginning or eliminating treatment. The patient may not always be capable of giving informed consent, particularly during decisions related to end of life care. The scenarios of withdrawing life-sustaining treatment and administering pain relief to terminally ill patients examine the differences when a patient maintains autonomy versus when it is transferred to a surrogate. Issues that face the patient or the surrogate decision maker(s) will be explored to highlight the importance of upholding personal autonomy regardless of the patient's ability to decide.¹⁸⁷

The majority of patients who pass away in hospitals do so after the withdrawal of life-sustaining treatment (LST). Within the critical care unit over 90% of deaths are preceded by the decision to withdraw LST.¹⁸⁸ Competent patients have the right to refuse life-sustaining treatment LST, but many situations arise where a patient becomes incompetent due to a serious accident or illness and LST may have already begun. Surrogates are often faced with difficult decisions regarding the withdrawal of such LST. A study conducted in 2008 examined the experience family members undergo when making the decision to withdraw LST. While only one person is the legal surrogate decision maker, the study

found that the decision to withdraw LST is usually a family decision. This study specifically examined acute, unexpected life-threatening illness or injury where the patient was unable to participate in the decision making process. Trust and clear communication between physicians and family members are essential for shared decision-making. When presented misleading information or approached too quickly about withdrawing treatment, family members lost trust in the physicians and were less willing to agree with recommendations. The study concluded that each family is unique and due to the heavy burden of LST decisions must be allowed time to process the prognosis before making a decision. Family-readiness is an important component of the process and must be respected by physicians.¹⁸⁹ Further exploration will examine landmark cases involving the withdrawal of ventilation and nutrition with focus on individual autonomy in each scenario.¹⁹⁰

The *Quinlan* case in 1976 was the first legal case in the United States where the American consensus regarding the morality and legality of forgoing medical treatment was examined.¹⁹¹ This case re-articulated the right to privacy and importance of autonomy.¹⁹² Karen Ann Quinlan was twenty-one years old when she slipped into a coma and eventually into a persistent vegetative state (PVS), which is where the brain stem continues to function, but the cerebral cortex has lost all function and there is no reasonable hope for recovery. Patients in PVS may be able to breathe independently, but they lack all awareness. Meaning they do not experience thoughts, feelings, or emotions of any kind.¹⁹³ Karen was hooked up to a ventilator and feeding tube. After months with no improvement her father, who had been appointed guardian, asked that the ventilator be removed.¹⁹⁴ The New Jersey hospital refused fearing homicide charges. Karen's family

took the issue to the courts and won the case.¹⁹⁵ In 1976, the ventilator was removed. In addition to granting Karen's father the right to cease treatment, the court ruled that the right to privacy extended to a patient's decision to decline medical treatment. This affirmed that a competent patient has the right to accept or decline life-prolonging medical treatment.¹⁹⁶ Since Karen was no longer competent, her guardian/surrogate could make that decision. The New Jersey Supreme Court made it clear that this was not a case of euthanasia.¹⁹⁷ The decision clearly defined that the patient's autonomy is fully transferred to the surrogate. In this case, Karen's father provided the informed consent necessary to withdraw treatment.

Sixteen years after the *Quinlan* case, a nutrition removal case entered the superior court system. The US Supreme Court decided the *Cruzan* court case in 1990. This case examined disagreement about the removal of a feeding tube from Nancy Cruzan who had been in a persistent vegetative state for over six years.¹⁹⁸ The court upheld the right of a competent person to refuse medical treatment based on the fourteenth amendment. The court also established that there is no functional difference between withdrawing and withholding treatment. The decision further pointed out the rights of competent people to create living wills and advance directives. Additionally, the court stated that clear and convincing evidence might be needed before a surrogate can withdraw or withhold treatment. This part of the decision is problematic because the idea of clear and convincing evidence is a burdensome requirement. A more patient autonomy focused method would be to consider the best interest of the patient. The *Cruzan* case continues to be misunderstood since the decision did not establish any legal requirements at a federal level. Rather each state has laws and legal precedents that dictate the evidence needed to

withdrawal treatment.¹⁹⁹ As seen in the *Quinlan* case a more patient autonomy focused method allows decision-making to be fully transferred to a surrogate who acts in the best interest of the patient.²⁰⁰ Instead of transferring full-autonomy to the surrogate, some degree of evidence is needed before the surrogate can make the decision to withdraw or withhold treatment. While the level of evidence needed is defined by state laws and is not universal, the surrogate's ability to provide informed consent can vary from case to case.

Another question that arises during end of life care is whether it is ethically and legally right to administer pain medication to an imminently dying patient even though the medication can hasten or co-cause death. In rare cases, a patient builds up a tolerance to the pain medication and an increased dose is needed to alleviate the pain.²⁰¹ This increased dose can result in respiratory suppression thereby contributing to the death of the individual. This action is deemed morally acceptable and ethically right as long as the patient's wishes were taken into account. It is important to note that the amount of medication given is the quantity needed to relieve pain. The ultimate goal is to relieve the patient's pain. Death is a by-product and not the intended outcome. Therefore, it is unacceptable for a physician to provide a dosage that far exceeds the amount necessary to relieve pain.²⁰²

When applying Principlism to these types of cases, respect for autonomy, beneficence, and nonmaleficence must be balanced. The medication is offered as a benefit (beneficence) to the patient in order to reduce the patient's suffering. However, one can argue that the nonmaleficence principle would forbid this action since it ultimately leads to the death of the individual and therefore could be viewed as causing harm. By weighing and balancing these two principles iteratively, this act can be deemed

morally acceptable since the ultimate goal of providing the drug is to alleviate the pain. While death can also result, it is not the intention or ultimate goal. In addition, it is up to the patient whether he or she wants to receive the pain relief. If the patient is competent, he or she will need to provide informed consent. In some instances, the patient may prefer to forgo the treatment in order to remain coherent.²⁰³ The principle of double effect can be used to complement the application of Principlism and deem this action morally acceptable.

The principle of double effect is a form of ethical reasoning, developed by Roman Catholic moral theologians, used to determine if an action is morally acceptable. This principle is applied to situations where it is impossible to avoid all harm, thus a decision must be made to determine which harmful action is preferable. The principle of double effect is commonly applied to end of life decisions that involve the administering of pain relievers to terminally ill patients.²⁰⁴ This principle is used to assess actions that have both positive and negative effects. Essentially the goal of the action is for a positive benefit, while the undesirable effect is an unintended effect.²⁰⁵ Four conditions must be satisfied for an action to be deemed morally acceptable under the principle of double effect. The four conditions are the act in itself must not be morally wrong, the bad effect must not cause the good effect, the agent must not intend the bad effect, and the bad effect must not outweigh the good effect.²⁰⁶ A shortcoming of this principle is the lack of consideration for patient preferences and lack of consent/autonomy. While the principle of double effect can support the argument for administering pain medication, the patient should make the ultimate decision.²⁰⁷

If a patient chooses to forgo life-sustaining treatment, physicians should focus on providing palliative care, which is the relief of pain and suffering.²⁰⁸ Offering this type of relief takes a skilled professional who is adept at administering the correct dosage while understanding and applying the ethical principles. Due to stringent protocols and oversight by medical licensing boards, physicians may be overly cautious about administering pain medication in fear of it being viewed as abuse. This can lead to the ethical problem of under-medicating a patient. Better collaboration is needed between the licensing boards, medical centers, and medical societies to create better policies. Another ethical dilemma can result from the side effects associated with administering the amount of pain medication necessary to alleviate pain. Often patients are unable to communicate because the medication has made them unconscious. The goal is to obtain the maximum amount of pain relief with the minimum loss of consciousness and communication. Ultimately, if the patient is able to express their wishes using informed consent these should be upheld above all.²⁰⁹

C. Ethical Principles and Reasoning Applied to Forensic Science

This third section of the chapter applies the discussion on normative ethical principles (the first section of the chapter) and applied reasoning in bioethics (the second section of the chapter) to pivotal issues in Forensic Science.

The ethical issues identified in the earlier chapter regarding sexual assault investigations highlight the importance of upholding the respect for autonomy principle in forensic science. Too often survivors do not understand the entire investigation process, which can lead to a violation of their autonomy.²¹⁰ Furthermore, issues regarding consent are paramount to the collection and testing of a sexual assault kit (SAK).²¹¹ This

shows a lack of respect for patient autonomy because the survivor is unable to make an informed decision if they do not understand the full process for SAK testing.

One of the critical steps prior to collecting a sexual assault kit is explaining the details to the survivor in order to obtain consent. A major role of the advocate should be working with the survivor to provide an understanding of the overall process and the survivor's personal choices. Without complete understanding of the future investigation process, survivors cannot adequately consent or refuse to a SAK collection. Following the consent for a kit collection, a separate consent occurs related to reporting the case to police and subsequent forensic testing of the kit. At each decision point requiring consent, the competency/capacity of the survivor to provide consent must be assessed. As discussed, competency/capacity is assessed on a sliding scale for each decision point. Although the dementia example illustrated a pronounced lack of decision-making capacity, the same principles must be applied when assessing a sexual assault survivor's decision-making capacity. These individuals have experienced an intense trauma, which may affect their decision-making capacity. Additionally, survivors may be suffering from permanent cognitive disabilities or temporary mind-altering substances.

C.i. Focus on Privacy & the Common Good

Chapter two's examination of a sexual assault investigation raised the issues between respecting autonomy while promoting justice. This part of the chapter further explores the justice principle by discussing the specifics of privacy and the common good using forensic DNA databases and research ethics. Since forensic science is a heavily research scientific discipline, it is important to also discuss research ethics. Of particular interest is multinational research given its international impact and the focus on upholding privacy while contributing to the common good. Again, a non-forensic example will be used in

this section to emphasize the application of the ethical principles from the established field of research ethics. The chapter concludes with an analysis of the collection and use of forensic evidence as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.

Privacy rights cannot exist devoid from all other ethical principles. There is a need to balance personal liberty and the common good. Catholic social teaching establishes human dignity as the foundation from which other principles such as the common good develop. The principle of human dignity establishes the goodness and dignity of each human, while the common good affirms that humans are social beings that can only achieve happiness through interdependence on each other. All individuals have a responsibility to promote/protect the common good.²¹² Human dignity upholds the idea that all individuals are entitled to be free from abuse and exploitation, while the common good promotes the dignity of each person and persons can only grow in community with others. Therefore, human dignity and common good principles must interact to achieve fulfillment.²¹³

Catholic teachings provide two interpretations for the concept of the common good. The first states that humans were created by God to live in social unity with each other and not in isolation. All people should participate in society to benefit the common good. A second interpretation describes how individuals benefit from improvements of the common good. The Declaration on Religious Liberty states that the government should contribute to the common good by protecting public order. There are three prerequisites for public order: justice, public peace, and morality.²¹⁴ The examination of proper practices in criminal investigations focuses on the government's requirement to protect

public order and safety. Additionally, the Constitution establishes civil liberties and the preamble specifically states that the purpose of the Constitution is to establish justice and provide protection for everyone.²¹⁵ Therefore, in Catholic social teaching as well as the Constitution of the United States, it is evident that a balance between individual privacy rights and promoting the common good is necessary for society to flourish.

Advancements in deoxyribonucleic acid (DNA) testing have provided extensive benefits to the community by aiding criminal investigations as well as exonerating the wrongfully convicted. A common practice is the storage of DNA profiles for future searches. The ultimate goal of DNA databases is to solve crimes and ultimately save lives.²¹⁶ The Combined DNA Index System (CODIS) created by the United States Federal Bureau of Investigation (FBI) in 1990 is the leading DNA database system in the world. CODIS aids law enforcement investigations by connecting stored reference profiles with evidence samples.²¹⁷ While there are profound benefits of forensic DNA databases, serious concerns arise regarding individual privacy rights. The collection of DNA samples from convicted offenders, arrestees, or other samples must be examined to ensure proper practices are in place that do not violate a person's individual right to privacy. Additionally, once data is stored in the database the mechanisms used to search the information must be properly designed and regulated to ensure personal rights are not violated in an effort to increase the number of cases solved. Improved oversight and protocols that are strictly enforced can ensure the proportionality of protecting individual rights is properly balanced with the obligation to protect the common good.

An ethical analysis of DNA databases is needed to assess the balance between individual privacy rights and the role of the government in terms of promoting the

common good through justice. Protecting the common good by protecting society from criminal activities is a primary obligation of the government. However, this obligation must be upheld while maintaining respect for individual human rights. Definitions of privacy and the common good are explored to understand the interaction of the principles as they relate to the operation of forensic DNA databases.

C.i.(a). Privacy

The government has an obligation to protect the public from criminal activities while at the same time respecting human rights. When examining the ethics surrounding forensic DNA databases, the ethical issues surrounding privacy are paramount.²¹⁸ The UNESCO Declaration describes privacy and confidentiality in Article nine. Privacy and confidentiality are related to autonomy and consent. Article nine states that personal information should be respected and only used for purposes previously consented to by the individual.²¹⁹ Particularly in the United States, but worldwide there is an essential obligation to uphold individual privacy, autonomy, and liberty.²²⁰ Since individuals vary in the information they deem private, it is important to provide multiple definitions related to the discussion regarding genetics data. Numerous definitions exist for privacy. The three primary privacy categorizations are physical privacy, privacy sphere, and informational privacy. For the purposes of this discussion, all three categories are defined with particular attention to physical and informational privacy.²²¹ Physical privacy is defined as one's freedom from having contact or exposing one's body to others. The privacy sphere expands on the definition of physical privacy by encompassing freedom of not only intrusions to the body, but also property. The privacy sphere typically refers to personal space. Finally, informational privacy is the control one has over any information about his or herself regardless of how the sample was collected. The concept of privacy

changes across cultures and time thus a singular definition is futile. Privacy concerns related to genetics testing fall under physical and informational privacy.²²² The collection of a saliva or blood sample could violate a person's physical privacy. Informational privacy refers to personal information that is not already public knowledge, is typically regarded as sensitive, and therefore information one wishes to withhold. Once a DNA sample is processed, the information in a person's genome falls under the category of informational privacy.²²³

An ethical obligation exists to uphold the privacy principle. Additionally, the civil liberties outlined in the United States Constitution support this human right. The Fourth Amendment specifically protects individuals against unreasonable searches and seizures.²²⁴ The Fourth Amendment states:

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.²²⁵

While this amendment establishes the prohibition of unreasonable searches and seizures, the courts must determine if a search or seizure has occurred. In the *Katz v. United States* decision, the reasonable expectation of privacy framework was established. A search occurs when the individual has an expectation of privacy and the society acknowledges that the expectation of privacy is reasonable. Police activity that results in the collection of evidence is defined as a seizure when there is an interference with an individual's possessory interests. Based on the *Katz* decision, when police seize bodily fluids from an

individual, the courts consider it as a seizure.²²⁶ Therefore, the collection of biological samples for DNA testing is considered a seizure according to the courts based on the Fourth Amendment, but the argument must shift to determine if the seizure is reasonable or unreasonable. The collection and use of an individual's DNA data are explored as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.

C.i.(b) Common Good

The primary definitions for the common good were provided in chapter two and thus will only be briefly re-emphasized in this section before moving on to examples in the research ethics setting and related to forensic DNA databases.

At times, the individual right to privacy may be in conflict with the common good.²²⁷ As discussed earlier, human dignity is the foundation from which the concept of the common good develops. The common good affirms that humans are social beings that can only achieve happiness through interdependence on each other. All individuals have a responsibility to promote/protect the common good.²²⁸ The Pastoral Constitution on the Church and the Modern World released by the Second Vatican Council in 1965 provided the classic definition for the common good by stating it is the sum of all private and communal goods, which allow groups and individuals to access their own fulfillment. The common good includes items such as food, clothing, and housing, which are needed by each individual, as well as goods, that belong to the whole such as education, transportation, water, and air. The common good emphasizes the goodness of the whole as a whole as well as the goods that individuals need. The concept of a common good promotes the well-being of the whole and the well-being of each person. The common

good also provides ethical guidance directing individual behavior to benefit the community.²²⁹

In Aristotle's teaching, the common good and the good of an individual are inseparable whereby the good of community is superior to an individual's good. Aristotle based morality on the pursuit of good purposes or ends.²³⁰ Thomas Aquinas often cited Aristotle and expanded the idea by linking the common good to God. History of the common good begins with Greek moral philosophy, transcends European Christian theology, and modern Christian spirituality.²³¹ Catholic teachings provide two interpretations for the concept of the common good. The first states that humans were created by God to live in social unity with each other and not in isolation. All people should participate in society to benefit the common good. A second interpretation describes how individuals benefit from improvements of the common good.²³²

The Declaration on Religious Liberty states that the government should contribute to the common good by protecting public order. There are three prerequisites for public order: justice, public peace, and morality.²³³ Additionally, in the UNESCO Declaration article twenty-seven limits the application of principles based on laws. Such laws include protecting public safety and public health as well as preventing crime.²³⁴ At the end of the chapter, an analysis of forensic DNA databases focuses on the government's requirement to protect public order and safety while balancing individual privacy rights.

C.ii. Focus on Research Ethics

To grasp the significance of research ethics in Forensic Science it is important to understand its history and the role of globalization.

C.ii.(a). History & Globalization

Before examining forensic DNA databases in relation to privacy and the common, it is important to further explore these concepts through the lenses of an established discipline. Since forensic science is a heavily research scientific discipline, analysis of research ethics aids in understanding of the principles, which transcend to forensic science. Of particular interest is multinational research given its international impact and the focus on upholding privacy while contributing to the common good. Multinational research is an ever-growing business that provides an example of the vulnerability facing populations in developing countries.²³⁵ According to Clinicaltrials.gov as of December 8, 2015, over 190 countries are conducting research, with numerous trials being conducted in a multinational format. A multinational format means that one country funds the research while it is performed in another country. The involvement of multiple countries introduce cultural differences that need to be accounted for in the research protocol. Additionally, numerous ethical guidelines exist to govern research involving human subjects. While there is overlap in the foundational standards, there is not worldwide agreement surrounding the application of universal guidelines. Furthermore, all research trials involving human subjects must undergo an ethical review process to ensure proper procedures and protections are in place. Due to cultural differences and the possible difference in guidelines being followed, each country establishes their own ethical review committees. One possible solution to alleviating issues associated with multinational research is to establish collaborative ethical review committees.²³⁶ The role of informed consent as it relates to human subject research will be explored to highlight the benefits of collaborative ethical review committees. The collaborative ethical review committees

ensure participants' privacy is upheld, while the research contributes to the common good.

The globalization of research dramatically expanded starting in the 1990s. The impetus was the ever-expanding reliance on medication and the search to develop and test new drugs. During the 1990s, many clinical trials moved from the United States to Eastern Europe, then in the 2000s to Latin America, and most recently Asia and Africa have become clinical trial hot spots. Some of the reasons for the move include cost savings, easier enrollment of participants, and possibly less regulation.²³⁷ Due to the number of medications Americans and Western Europeans are taking, the pool of human subjects available for clinical trials is continually shrinking.²³⁸ This shift to multinational-based research, which is sponsored by one country and hosted in another presents a number of ethical challenges. First, cultural differences must be accounted for in the research protocol.²³⁹ Next, investigators must be fluent in the number of ethical research guidelines applicable to international research.²⁴⁰ Finally, the review process can add significant hurdles due to independent review boards with varying levels of experience following different guidelines.²⁴¹

Profound cultural diversity exists between countries. The differences can be seen in socioeconomic, cultural, and political contexts. A country's economic standing can have a tremendous impact on the research performed.²⁴² Each country has differing educational levels, economic resources, political structure, and cultural traditions. These differences can contribute to the vulnerability of potential research populations. Generally, vulnerability refers to the possibility of being hurt physically or emotionally.²⁴³ Commonly the concept of vulnerable populations is understood as

categories of individuals who lack individual autonomy to provide consent, such as children. In the case of international research, the concept of vulnerable populations extends to groups with compromised decision-making capacity. For example, in India the population struggles with poverty and unaffordable health care causing many individuals to participate in research trials in order to receive medical treatment. In these cases, even individuals who are properly informed and provide consent remain vulnerable due to their lack of options. These individuals still have the potential to be harmed if proper protections are not provided.²⁴⁴ The language barrier between sponsoring country and host country also creates barriers. All of these differences can influence research ethics within that country.²⁴⁵ Given the cultural differences, it is necessary to understand and respect the other culture especially when the research sponsors are from a different country usually with a stronger research infrastructure.

Regardless of the cultural differences, protection of human subjects must take priority. There are inherent differences between western norms and values and those of other countries. U.S. based researchers need to understand how these difference will influence the review procedure and how the research is carried out. For example, research protocols that do not agree with local culture may be rejected by the host-country even if they meet all U.S. requirements. Additionally, in developing countries the research infrastructure may not be as established as in western culture making it difficult for that country to review research protocols that require advanced scientific expertise in order to identify the potential risks and benefits. These type of complex procedures may take extensive time to review with a series of exchanges between host-country and principal

investigator.^{246,247} Additional cultural differences will be explored as they relate to the process of informed consent.

Numerous guidelines regarding ethical conduct when performing research using human subjects have been developed since 1947. The first internationally recognized document, the Nuremberg Code, was created in response to the cruelties performed by the Nazi doctors in Germany during World War II.²⁴⁸ Since that time the United Nations General Assembly, World Medical Association, the Council for International Organizations of Medical Sciences (CIOMS), and the World Health Organization (WHO) have created influential guidelines.²⁴⁹ Following the Nuremberg Code, the World Medical Association established the Declaration of Helsinki in 1964. This Declaration has undergone multiple revisions, with the most recent update in 2008.²⁵⁰ The International Ethical Guidelines created by CIOMS in collaboration with the WHO in 1993 and revised in 2002 were developed specifically with the intent of being applied to research conducted in developing countries.²⁵¹ Additional guidelines include the Belmont Report, Guidance on Good Clinical Practice, and the Guidelines for Good Clinical Practice for Trials on Pharmaceutical Products from the World Health Organization. While the Declaration of Helsinki and the CIOMS guidelines are the most accepted guidance worldwide, the United States has its own set of guidelines, most notably the Common Rule.²⁵²

Universal agreement exists for the fact that research involving human subjects must adhere to ethical standards, but many issues arise when trying to determine the appropriate ethical standards to follow especially in multinational research. There are numerous international guidelines that can be applied and these guidelines are not always

in perfect alignment.²⁵³ Additionally, the debate regarding double standards questions whether a universal set of standards can be applied to all research or if variations are acceptable given economic, political, or cultural differences among nations.²⁵⁴ In general, the most well defined ethical standards should be applied to multinational research in order to prevent researchers from moving to countries still developing standards.²⁵⁵ Using established standards helps to protect the human subjects involved in clinical trials.

In order to safeguard against possible exploitation, ethical review is necessary. The current research landscape has a number of review committees that range from well-established committees following specific regulations within a country to other countries with under-developed committees that lack resources and training. All of these committees are generally acting independently.²⁵⁶ Given the disjointed nature of the oversight committees, problems arise when conducting multinational research. Questions arise such as 1) which country's committee should review research proposals, 2) if multiple reviews occur which committee takes precedence when disagreements arise, and 3) which ethical guidelines should be applied to the proposal review?²⁵⁷

An independent review of research is essential to ensure the research proposal is ethical, the researchers do not have a conflict of interest, and to ensure public accountability. The 1964 revision to the Declaration of Helsinki added the requirement for independent review.²⁵⁸ Based on guideline changes, in 1965 the National Institute of Health (NIH) Director James Shannon implemented a review process for research protocols in the United States (U.S.) to ensure ethical integrity.²⁵⁹ The need for review is primarily in response to the expansiveness and complexity of research involving human subjects. Since that time there has been significant growth of institutional review boards.

In the United States, an Institutional Review Board (IRB) peer reviews research protocols to ensure the ethical soundness of the design.²⁶⁰ IRBs review all research involving human subjects conducted in the U.S. as well as research conducted outside the U.S. when federal funds are used. The U.S. model for IRBs can be categorized as institutional, independent, or private. Institutional IRBs are those within government agencies, at the state level, or within an academic institution. Independent IRBs are usually within a corporate structure and not associated with a research institution. Private IRBs are very diverse and typically include in-house boards for companies conducting research at their own facility. Regardless of structure, virtually all IRBs in the U.S. follow regulations from the Office for Human Research Protections (OHRP) and the Food and Drug Administration (FDA). Since these regulations are U.S. specific and not recognized internationally, it is common for research that is conducted in other countries to be reviewed by a local board.^{261,262} The policies that govern U.S. IRB organizations has also seen extensive progress including the creation of an accrediting organization that can ensure research institutions are in compliance with the Common Rule. The Common Rule promotes responsible conduct and ethical study design by outlining the basic requirements for informed consent and guidance for IRBs.²⁶³ While the Common Rule provides overarching guidance for IRBs, it is written with very general language leading to a great deal of interpretation and flexibility in the application. By improving the differences in interpretation and application, a stronger system will be in place for IRBs to promote and enforce responsible, ethical research conduct.²⁶⁴

Research ethics committees as they are commonly referred to in other countries may follow guidance from the World Health Organization (WHO), the Council for

International Organizations of Medical Sciences (CIOMS), or the International Conference on Harmonisation (ICH). Developing countries often adopt either CIOMS or ICH guidelines and make amendments to better represent the local culture. Typically, research ethics committees do not have the same authority as U.S. IRBs and thus can only provide recommendations, while IRBs can withdrawal approval or suspend the investigator.²⁶⁵ However, in some developing countries the procedures for local review are under-developed. In addition, it may be hard to establish a research ethics committee in some of these countries due to limited resources, such as financial support, scientific expertise, and limited training.²⁶⁶ Furthermore, disagreements may arise between the review committee from the country sponsoring the research and the host country.²⁶⁷ Challenges that arise when different countries review protocols can be categorized into five general areas: lack of expertise, procedural challenges, limited review capacities, differences in review criteria, and lack of trust.²⁶⁸

Due to numerous ethical guidelines, it can be challenging for countries to decide which one shall be followed and implemented during review procedures. In the 2000 report by the U.S. National Bioethics Advisory Commission (NBAC) on international research, a distinction was made between substantive and procedural ethical requirements. The NBAC defines substantive ethical requirements as those embodied in the fundamental principles of bioethics: respect for persons, beneficence, and justice. These constitute ethical standards that should be applied universally. While procedural requirements may vary according to cultural and other differences encountered in multinational research. The numerous guidelines that have been developed to govern research involving human subjects, do a poor job of distinguishing ethical standards from

ethical procedures.²⁶⁹ A few of the major guidelines will be examined to understand the similarities and differences that can cause confusion for multinational research.

The Nuremberg code, an ethical code for research using human subjects, was developed by judges in the United States based on the trials of the Nazi doctors after World War II. In 1946, twenty-three Nazi physicians and administrators were accused of war crimes and crimes against humanity. The Nuremberg code is the first international doctrine to protect the rights of research subjects.²⁷⁰ The code is composed of 10 rules to protect human research subjects. The code describes the requirements necessary to achieve informed consent, which includes that a person must be competent, provide voluntary consent, and be provided with enough information in order to understand the decision at hand. One of the major limitations of this code is that it was established by the United States in response to the Nazi physicians who are deemed as barbarians and therefore many physicians do not think the Nuremberg Code affects them. While the focus on informed consent does not seem to fit the Nazi crimes, the judges sought to prevent this event from happening again. Although the code has been influential in guiding research ethics, it is incomplete and fails to mention issues regarding multinational research.²⁷¹

The World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects was first developed in 1964 and has been through multiple revisions since that time.²⁷² The Nuremberg Code served as the foundation for the Declaration of Helsinki.²⁷³ The Declaration was meant to account for shortcomings in the Nuremberg Code and focus on the issue of physicians using patients for research. The Declaration of Helsinki is regarded as one of the most well-known and

widely accepted international guidelines for medical research ethics. The Declaration begins by defining the moral status of clinical research as either therapeutic or non-therapeutic.²⁷⁴ Next principles that should be applied to all medical research, including balancing risks and benefits, requirements for informed consent, justice considerations and the need for independent review, are explained.²⁷⁵ Balancing risks and benefits or risk assessment means that the expected benefits outweigh the possible risks the subject may encounter.²⁷⁶ Informed consent ensures that each subject is adequately informed of the research goals, methods, possible benefits and risks of the study. If the subject is unable to provide consent due to legal incapacity, the legal guardian can provide substituted consent.²⁷⁷ The requirement for independent review was established during the 1974 revision and states that an independent committee should review all research protocols. This requirement led to the establishment of institutional review boards (IRBs) in the United States and research ethics committees in other countries.²⁷⁸ The final section discusses principles for the combination of research and medical care with an emphasis on the procedure having a diagnostic, prophylactic, or therapeutic value.²⁷⁹ Compared to the Nuremberg code, the Declaration of Helsinki focuses on the role of the physician and the need to balance scientific interest and patient interest. As revisions have been made, more attention is focused on patient interests.²⁸⁰ One of the shortcomings of the Declaration of Helsinki is that it does not directly address research issues in developing countries.²⁸¹

The Council for International Organizations of Medical Sciences (CIOMS) proposed another internationally recognized set of guidelines in 1982. As a joint collaboration with the World Health Organization (WHO), CIOMS proposed the International Guidelines

for Biomedical Research Involving Human Subjects. The Nuremberg Code, Declaration of Helsinki, and Universal Declaration of Human Rights influenced these guidelines.²⁸² It was not until 1993 that the CIOMS Guidelines for Biomedical Research Involving Human Subjects were officially formed and disseminated. Multiple revisions have been made with the latest revisions in 2002, which attempted to respond to issues encountered in multinational research.²⁸³ After the 1993 revisions, ethical issues arose regarding the clinical trials being conducted by external sponsors/investigators in low-resource countries.²⁸⁴ The CIOMS guidelines establish that universally accepted principles should be applied to all research involving human subjects, but the application of the principles should account for cultural values. The universal principles of respect for persons, beneficence, and justice should be followed when conducting research involving human subjects. This guidance provides 21 specific guidelines including topics of informed consent, research involving children, prisoners, and subjects in underdeveloped communities, compensation, and duties of ethical review committees.²⁸⁵ The guidelines also encourage externally sponsored research be reviewed by the host country to ensure the proposed research responds to the health needs and priorities of the host country as well as meets the countries ethical standards. For example, the informed consent procedures should be in line with local customs and traditions.²⁸⁶

C.ii.(b). Consent in Research: Understanding, Voluntariness, Disclosure

Informed consent is an ethical practice that has been in place since the late 19th century. The general background of informed consent was provided earlier in the chapter, therefore this section will highlight the specifics of informed consent as it applies in the research setting. The overarching ethical principle of respect for autonomy encompasses the need for informed consent.²⁸⁷ Individuals must be given the option to accept or

decline participation in a research study. The participant must have the ability to understand and make decisions, receive all necessary information about the research, understand that information, and freely consent without coercion.²⁸⁸ There are three fundamental criteria necessary for informed consent. For valid informed consent, the participant must be competent/understand, be informed, and decide voluntarily. The first requirement of valid consent requires a competent participant to make the decision or a suitable surrogate who can give consent for any individual without full decision-making capability. Comprehension or competence means that a person is able to understand the information they are receiving and are capable of making decisions.²⁸⁹ Competency as it applies to research is the decision-making ability of an individual. For example, adults are generally thought to be competent, while children are assumed incompetent or lacking in decision-making ability. Capacities needed for competent decision-making include understanding, communication, reasoning, and deliberation.²⁹⁰ Next, federal regulations in the United States specify the information that researchers are required to provide for a participant to make a decision. This includes a statement that confirms the project is for research purposes not therapy, along with the purposes and description of the research. Risk, benefits, and alternatives must be included as well. Furthermore, the confidentiality practices in place must be disclosed.²⁹¹ The final condition required for consent is that it must be voluntary, meaning that the participant was not coerced or manipulated into giving consent. Most importantly the participants must understand that participation is voluntary and they can withdraw at any time, along with the contact information for the primary researcher should questions arise. By satisfying the three requirement for informed consent, the researchers ensure the participant makes

autonomous choices.²⁹² These components of informed consent are straightforward in theory, but difficult in application.²⁹³

Previously, extensive arguments surrounded whether informed consent is a universal norm. In 1996, Pfizer tested a new drug, Trovan, on children in Nigeria. After the *Washington Post* broke the story in 2000, the parents of the African children brought lawsuits against the company, arguing that informed consent was not obtained. The court found that informed consent is a universal norm that should be enforced and practiced globally.²⁹⁴ As outlined in each of the above guidelines, the concept of informed consent is captured in each of the internationally recognized guidelines. When CIOMS first presented their guidelines some critics argued that this concept was merely based on American and international standards (i.e. Nuremberg Code and Declaration of Helsinki) and was a form of ethical imperialism by the Western countries. Since that time numerous non-Western countries have accepted the requirement for informed consent. For example, the Indian Council of Medical Research requires individual informed consent, but the nature and form of the consent depends on a number of factors.²⁹⁵

Understanding

The first element of informed consent is competence/understand. Since competence has previously been defined, this section will focus on understanding. The element of understanding is subjective and there is no clear definition regarding the information that should be disclosed to subjects participating in research to ensure they do understand. Ethically professionals only need to adequately inform a participant so they have an acceptable understanding of the information. Standards related to disclosure will be explored later. The requirement that an individual understand the information about the study in order to give informed consent raises issues in multinational research. For

example, due to educational and cultural differences and the need for translation, researchers must be particularly cognizant of the need to provide an appropriate amount of information so that participants can give genuine consent. Attempts to ensure participants receive the appropriate information at a level they understand requires the researchers to undergo the process of translation and back-translation in order to achieve an accurate interpretation and translation.²⁹⁶

In the book “Ethics in Global Health”, Ruth Macklin describes a meeting she attended to discuss a collaborative research study with the U.S. Centers for Disease Control (CDC) and physicians from the People’s Republic of China. The study would involve informed consent since it was meant to be a randomized placebo control. Much discussion transpired between the American researchers and the Chinese physicians. Due to the language and understanding barrier, the Chinese physician believed that informed consent meant informal consent. The concept of consent was foreign in Chinese medical practice and the idea of using a placebo control study was unheard of at that time. Eventually all researchers reached the conclusion that abiding by the requirements for informed consent was necessary as this standard should be applied universally and will ultimately increase moral progress.²⁹⁷ This example displays the need for proper translation that not only applies to the participants, but to any research partners. It becomes even more challenging to translate technical terms into a different language, when the concept does not exist in that country. Due to a gap in understanding more time must be spent working to overcome this hurdle and ensure proper informed consent is obtained. A key portion of the interpretation and translation process will be dependent on

the translators who must be treated as equal members of the research team, undergo proper training, and ensure patient confidentiality.²⁹⁸

Voluntariness

The voluntary component of consent entails that a person is free from external influence when deciding whether to participate in research. The participant is free to refuse participation and to withdraw at any time. An individual must be free of controlling influences. The voluntariness of a decision means that a person is free from coercion, persuasion, and manipulation.²⁹⁹ This concept was first stated in the Nuremberg Code and expanded by Beauchamp and Childress. Coercion occurs when a person intentionally uses the threat of harm or force as a way to control another person. This control does not allow the individual to determine his or her own course of action. Rather the coercion directs the person to make a certain decision due to the threat or possibility of harm. The feeling of being threatened is not enough to constitute coercion; an actual threat must be issued. The second type of influence is persuasion, where another person tries to appeal to reason. The final category is manipulation, which is motivating another person to make a certain decision by means other than coercion and persuasion. One example may be informational manipulation, where a person deliberately withholds information, lies, or exaggerates with the intent to make the decision maker believe false information and thus negate his or her ability to make an autonomous choice. It is nearly impossible to eliminate all possible influences; rather people tend to make decisions among competing influences.³⁰⁰

Problems arise with consent in cultures where it is customary for a spouse or community to give consent instead of the individual.³⁰¹ Regardless of the social structure individual informed consent is still needed and cannot be replaced by a spouse or

community decision, rather these can supplement the individual consent.³⁰² Additionally, benefits that are offered to research participants may be viewed as coercive or putting undue pressure on the participant to provide consent. Some examples include payments or reimbursements for the participant's time. Also, offering free medical care or free medication in developing countries may influence them to consent without fully understanding the risks. In order to overcome any undue influence from these types of incentives it is necessary for someone knowledgeable about the local culture to determine what benefits are ethically acceptable.³⁰³ An additional influence may be the participant's overarching respect for the medical staff. Consent may be given merely because a doctor asked the person to participate. In these types of cases, someone else needs to conduct the consent process so that the volunteer feels free to refuse to participate.³⁰⁴ This essentially creates one degree of separation between the participant and the physician conducting the research, which removes unintended influences that the participant may feel due to respect and trust for the doctor.

Disclosure

Key information that must be disclosed to research participants are the risks and benefits. In order to determine the net risk-benefit ratio for both the individual participants and society the risks need to be outlined and minimized and the benefits must be identified. The benefits must outweigh the risks. Only health related benefits derived directly from the research should be considered. Secondary benefits such as payment should not be considered as it can skew the risk-benefit ratio. By comparing the outlined risks and benefits the net risk-benefit ratio can be determined.³⁰⁵ The ideal of a favorable risk-benefit ratio is expressed through the principles of nonmaleficence and beneficence. Although it is often impossible to eliminate all risk, the research should be safe for all

members.³⁰⁶ As discussed earlier in reference to informed consent, the risks and benefits must be clearly stated and understood for the participant to consent. The risk and benefits must be analyzed not only at the individual level, but also at the societal level. IRBs are responsible for assessing the risks and benefits of the research. Therefore, there are certain steps IRBs can take to improve the process of assessing the risk-benefit ratio. First, IRBs must receive all necessary information from the researchers. Next, direct comparisons of risks and benefits must be analyzed. These comparisons should classify the risks and benefits according to the type, size and duration, and likelihood. Additionally, IRBs need to address inclusion benefits or indirect benefits.³⁰⁷ Consistently applying these criteria would satisfy a thorough review of the risk-benefit ratio, thereby strengthening the overall review process.

C.ii.(c). Ethical Review Committees: Cultural Differences; Benefit Sharing; Examples

As demonstrated through the examination of the role of informed consent in multinational research, a number of issues can arise. In order to alleviate disagreements the formation of collaborative ethical review committees is necessary. The concept of collaborative committees would encourage review procedures that both host and sponsoring country support.³⁰⁸ The United Nations Educational, Scientific and Cultural Organization (UNESCO), WHO, and CIOMS all encourage collaborative review. CIOMS recommends the review responsibility be given to a single IRB for consensus or that a single review committee be established with members from each involved institution.³⁰⁹ Any type of collaborative model would enhance U.S.-based IRBs by enhancing their understanding of the host countries cultural norms and health priorities. The host-country would gain knowledge about ethical review requirements and advanced scientific methodology.³¹⁰

Barchi et. al. propose numerous mechanisms for ethical review. These systems are: independent reviews, shared information systems, open communication, use of consultants, division of review roles, and joint review. Independent reviews, which still dominate the field of research ethics, are conducted separately and the investigator serves as the primary contact for all IRB communications. The shared information systems approach uses standardized application forms, shared access to review documents, and an electronic submission system that supports shared access to documents. An open communication format encourages communication between review organizations and all members as well as designates point of contacts for questions. Occasionally the use of consultants for review may be preferable as an individual with specialized expertise can be used to fill a knowledge gap, whether that be scientific, regulatory, or experience with a local setting. Another collaborative model divides the roles, this can occur by designating one primary review board to provide final judgments or the primary board can allow for input from the local board before finalizing the review. A fully collaborative ethical review committee uses a joint review or combined IRB where members from multiple organization form a joint committee.³¹¹ Each of these mechanisms has pros and cons, but overall in order to increase efficiency, improve relationships between organizations, and ensure the safety of human subjects, a collaborative approach is needed.³¹² True collaboration will require research training and joint efforts to open communication.³¹³

Cultural Differences

A debate exists regarding whether universal standards should be applied to all research regardless of location or different standards applied for diverse environments. Given the number of ethical principles that exist, sometimes with conflicting guidance, it

seems impossible to apply a single standard. While a utopian view holds that a single standard should apply to all human beings serving as research participants, opponents justify different standards of care and treatment based on varying economic conditions.³¹⁴ Although it is completely unacceptable to lower the ethical standards between developed and developing countries, different is still debatable.³¹⁵ The double standard debate originated in a 1997 article by Lurie and Wolf and an editorial by Angell in the *New England Journal of Medicine*. The article evaluated fifteen clinical trials studying the prevention of vertical transmission of HIV/AIDS from pregnant mothers to babies. Lurie and Wolf alleged that the studies were unethical due to the placebo-controlled design. Angell's editorial argued that according to the Declaration of Helsinki and the CIOMS Guidelines, trial participants should receive the best standard of care available in the U.S. if it is a U.S. funded study.³¹⁶ Angell contended that ethical standards should not be dependent on the location of the research. Others justify a double standard due to differences in wealth and other resources.³¹⁷ A collaborative review would allow an interactive exchange of research expertise and cultural ideas so that one country is not imposing their own cultural standards onto another. This would ensure that the highest ethical standards are being enforced, but the application of the standard may vary based on cultural influences.³¹⁸

Benefit Sharing

The reasonable availability requirement was introduced to ensure the community where the research was conducted benefitted from the research. This was done to eliminate inherent exploitation by researchers conducting helicopter research or research using a community purely for sample collection with no intention of offering benefits to that community.³¹⁹ Four different approaches exist regarding how the host community

can benefit. First, the reasonable availability requirement states that the only ethically appropriate benefit is to provide the drug or intervention that was successfully tested. The 1993 CIOMS guidelines proposed this concept by establishing the general rule that the community participating in the research should receive any product successfully tested. Any exceptions should be stated and agreed on by all parties before the research has begun. The 2002 revised guidelines go on to state that reasonable availability must be assessed on a case-by-case basis.³²⁰ The second approach developed by the Nuffield Council provides participants with the best intervention as well as strengthens capacity development for the host country to conduct research.³²¹ Third is the fair benefits framework, which entitles participants and the host community to a fair level of benefits based on ten possible options. These options are broken down into benefits for the participant during research, benefits to participant and population during research, and benefits to population after research. Finally the human development approach requires that the host country benefit from the increase of basic human capacities. This approach seeks to address global injustice rather than focus on the exploitation of participants from developing countries.³²² The concept of distributive justice captured in the above benefit models promote the idea that both the host country and sponsoring country should benefit from positive research outcomes. Therefore, the fairness of the research considers the benefits and burdens the participants endure as well as the potentially beneficial outcomes that the community may benefit from.³²³ The revised Declaration of Helsinki emphasizes the importance of the host population benefitting from the research. The Declaration states that for medical research to be justified there must be a reasonable likelihood that the research population will benefit from the research results.³²⁴

During a clinical trial, healthcare is typically improved for the developing country where the research is performed, but these improvements usually cease at the conclusion of the research.³²⁵ Prior agreements between all parties that account for the interests of the sponsors, researchers, and research participants is the most common mechanism for establishing post-trial obligations. Due to the nature of research funding, public agencies are usually unable to provide interventions after the trial has ended. Whereas private sponsors have the ability to purchase such interventions which can then continue to be provided to the research participants. A partnership between public and private sponsors could expand the post-trial obligations while also increasing resources available to overcome research problems.³²⁶ A collaborative review committee could aid in ensuring both the host and sponsoring countries receive benefits as outlined in the research proposal. Additionally, a collaborative review process would benefit the host country by strengthening the local review board's ability to conduct future reviews.³²⁷

Examples

The next two real-life examples of collaborative research review processes highlight the benefits and challenges. The first example involves the National Children's Study, which implemented a federated IRB approach in 2010 to facilitate IRB review among multiple research sites in the United States. Although this example strictly involves sites in the U.S., the tiered approach they have implemented can provide a framework for future collaborative efforts between multinational partners.³²⁸ The other example explores the partnership between Kenya's Moi University and Indiana University. The struggles surrounding their efforts to create a joint IRB committee are explained to provide information of improvements that can be made for future partnerships wishing to pursue

such an endeavor.³²⁹ In both examples, the positive outcomes are included to reinforce the opportunities joint review offers.

The first example explores a federated IRB approach where multiple institutions who are participating in multi-site research can participate. While this example includes only institutions within the United States, it provides data to support a collaborative review process that could be expanded to international partners. The National Children's Study at the Eunice Kennedy Shriver National Institute of Child Health and Human Development initially developed and operationalized a federated IRB approach in 2010 in order to reduce the protocol review process for studies occurring at multiple institutions. The federated model allows for three review options: 1) total reliance on a lead IRB, 2) shared review, and 3) local review at each site following review by the lead IRB. By having a three-tier system each institution can choose whether to rely on a lead IRB or to maintain internal review. This allows each institution to select an IRB with the relevant experience necessary to properly review the protocol. The federated model ensures open lines of communication in order to emphasize trust and transparency across participating sites. All IRB decisions and summaries of minutes are shared amongst member institutions. The federation uses a web-based tracking tool to support all submissions and communications. Additionally, common review principles and assessment metrics are used by all member sites. A "federation compact" establishes the groundwork for the commitment each institution makes to protect research participants. The compact draws on information from the Belmont Report, the Consolidated Guidance on Good Clinical Practice from the International Conference on Harmonisation, as well as other sources that reflect the protection of vulnerable populations. While the federated

IRB program is still in its early stages, encouraging data supports decreased approval time despite increased IRB submissions. Additionally, the willingness of many institutions to voluntarily rely on the lead IRB supports the idea that a central IRB can be successful provided trust is maintained. Finally, the system allows for transparency and ease of communication in a timely manner.³³⁰ As stated earlier, although this model has only been tested across multiple U.S. based institutions, it provides a framework that could be applied globally. The flexibility of multiple tiers would allow host countries to still participate in the IRB process in order to account for cultural differences. For example, an institution signed up under the third tier reviews the IRB submission after the lead IRB and would be able to change informed consent procedures to better align with the local standards of conduct. Due to education level in some developing countries, a significant number of participants in a study may be illiterate or semiliterate.³³¹ Therefore, the need to acquire written, signed consent is inappropriate. Using this model, the requirement for signed consent could be waived or altered to be more appropriate for the subjects being protected. A cooperative committee would account for local concerns of the host country as well as satisfy the ethical requirements for both countries.³³²

The collaboration between Indiana University (IU) School of Medicine and Moi University in Eldoret, Kenya is an example of collaborative ethics review. The partnership between Indiana and Moi universities has been ongoing for over 20 years. In 2001, the partnership's mission expanded to include collaboration with the Academic Model Providing Access to Healthcare (AMPATH), which includes IU and Moi as well as 16 other North American universities.³³³ Moi and IU were separately reviewing all research protocols. Typically IU would complete the review in 2 months while it could

take Moi anywhere from 4-9 months. This presented a challenge that was amplified as the number of research projects increased. Thus, the idea of joint IRB started to be explored. The goal was to create a new Joint Ethics Review Committee between the two universities that would be responsible for reviewing and approving joint research proposals and provide training. Significant progress was made toward developing this joint committee, but ultimately Kenya's National Bioethics Committee (NBC) instructed that only Moi University's Institutional Research Ethics Committee (IREC) should be reviewing protocols and essentially a joint committee is not needed. While the idea of a joint committee was originally shut down, the IU-Kenya partnership continues to strengthen. As of May 2014, when reviewing collaborative projects, IU waits until review from IREC, which reduces duplicative work and turnaround time. Additionally, AMPATH's North American institutions are working toward a collaborative review agreement utilizing the Common Rule's "cooperative review" provision (45 CFR 46.114). If accepted this would permit institutions to designate one of the institutions for the review process. While IU and Moi recognize that undertaking a joint IRB is difficult they learned a few meaningful lessons that may impact others. First, the regulations established in each country did not prohibit or encourage the establishment of a joint committee. Also, even though both universities spoke to many people there are always more people and agencies to consult with and timing can be critical. For instance, the Kenyan NBC had not been officially consulted, yet they issued a statement discouraging the implementation of a joint committee. Finally, there is a constant struggle between North and South IRBs that must be overcome. While the North has more mature infrastructure, SOP environment and perceived power, they are not familiar with the

cultural conditions of the South where the research is taking place. This perceived perception of imperialism could have led to the NBC's statement.³³⁴

Given the globalization of research, the need to ensure ethical procedures across all countries has become a key focus in research ethics. When research is sponsored by developed countries and hosted in developing countries a number of issues arise. Cultural differences can present basic problems when trying to apply the universal principles in an area foreign to the sponsoring country who developed the research protocol. A number of ethical guidelines have been established to protect human subject involved in research. The Nuremberg Code served as the first internationally recognized doctrine. The Declaration of Helsinki and the CIOMS guidelines were developed with focus on participants involved in clinical trial research and externally sponsored research conducted in low-resource countries. While most countries have accepted the notion of fundamental principles that should guide research, the application of these principles can vary based on cultural influences. Thus, numerous independent ethical review committees exist to evaluate and comment on proposed research projects. With the increasing number of multinational studies, the independent evaluation of protocols is time-consuming and may not be properly protecting individuals. By examining the role of informed consent according to the basic requirements and the issues encountered during the application in multinational research, it is evident that creation of a collaborative ethical review committee is needed. A collaborative review process would account for cultural issues and the issues regarding double standards no longer apply. The examples of collaborative review processes from the National Children's Study and the Kenya-IU partnership demonstrate two types of models that may work as well as

highlighting the challenges facing international partnerships. Even with the challenges, a more collaborative method could prove exceedingly beneficial and well worth the work to overcome initial hurdles. This illustration of international research reflects the need to uphold individual autonomy while benefitting common good. The goal of research is to positively impact, for instance with improved medical treatments, but the vulnerable populations participating in the research must be properly protected.

C.iii. Applied Reasoning in Forensic Science

This section will re-examine the need for an ethical balance and use DNA databases and familial DNA searching as examples of applied reasoning in Forensic Science. Philosophical reasoning methods will be applied to these examples. Often the greater the threat is to society, the more willing people are to sacrifice personal freedoms. Public policy must balance individual privacy rights against the benefits for law enforcement or the public good. For example, it is essential that DNA databases be structured and maintained in a way that respects individual privacy, while providing the intended benefit of promoting the common good.³³⁵ There are three common methods used to resolve these conflicting interests: utilitarian, rights-based, and duty-based. Utilitarianism seeks to provide the greatest good for the greatest number of individuals. In relation to DNA databases, a utilitarian approach includes increasing DNA profiling if it is shown to maximize social welfare. A rights-based method establishes that certain rights should not be sacrificed for the greater good, such as the right to life. Rights are balanced against competing rights of others. Finally, a duty-based approach holds that certain moral obligations are unchanged by the rights of others or the consequences of our actions. The Nuffield Council on Bioethics promotes a rights based approach when trying to balance public and personal moral interests. This approach respects individual liberty, autonomy,

and privacy, while understanding the need to restrict some of these rights in certain circumstances.³³⁶ In Kant's view using human beings as merely a means to end is prohibited. This approach relates to the use of familial DNA searching, where it can be argued that the unauthorized use of personal information undermines the dignity of the person, even if they are unaware that the search is occurring.³³⁷

When examining the balance between individual privacy and the protection of the common good, the principle of proportionality is fundamental. This method of analysis examines the ends, means, and effects of a particular policy. Three formulations of the proportionality principle exist. First is the balancing test, which requires that the end the law or policy aims to achieve be balanced against the means used to achieve that end. Next, the necessity test states that if a particular objective can be achieved through multiple means, the one that causes the least harm to the individual or community should be implemented. Third, the suitability test determines if the means are appropriate to accomplish a particular aim. For example, the suitability test would examine if the means used, such as familial DNA searching, were proportionate to the goal of achieving crime control.³³⁸ Amitai Etzioni argues for a communitarian philosophy where the goal of a flourishing society is to carefully balance individual rights, like privacy, and the common good.³³⁹ When analyzing if privacy concerns and common good are out of balance Etzioni proposes four criteria to assess the balance. First, identify that a clear and major threat to the common good exists. Second, detect other types of measures to enact before restricting privacy. Next, ensure privacy-curbing measures are minimally intrusive. Finally, measures should prevent undesirable side effects.³⁴⁰

C.iii.(a). Forensic DNA Analysis: Process & Collection of DNA

Today, criminal cases commonly use DNA evidence, but the technologies to perform DNA analysis were only created in the mid-1980s.³⁴¹ DNA is a molecule that carries the genetic information that governs the development, function and reproduction of organisms. This information determines an individual's physical characteristics, identity, and hereditary information.³⁴² Every cell contains this blueprint. DNA is a double helix structure that looks like a twisted ladder. The rungs of this ladder like structure are made up of the nucleotide pairs, adenine-thymine and guanine-cytosine. It is the sequence of the pairs that makes each individual unique; except identical twins who have the exact same DNA sequence. The order or sequence of the nucleotide pairs represents a DNA fingerprint.³⁴³ Forensic DNA analysis, involves examination of the DNA sequence at multiple locations or loci to see if the same sequence is appearing in a sample from a crime scene and a suspect's profile. Comparison across multiple loci reduces the chance of coincidence that individuals have the same sequence.³⁴⁴

Process

The process of forensic DNA analysis typically involves five steps: extraction, quantification, amplification, separation/detection, and analysis. The first step, extraction, separates the DNA from the sample matrix, which can be blood, saliva, semen, or epithelial cells. Next, quantification determines the amount of DNA present in the sample. The amplification step creates multiple copies of specific areas that differ in size between individuals. During the amplification phase, these locations are fluorescently tagged. These fluorescent markers allow for the specific locations to be separated based on size and color. The final step uses software to visual the genetic profile in a pictorial

format.³⁴⁵ If a match exists between samples, a statistical probability is applied to provide a numerical weight to the likelihood of the match.³⁴⁶

There are an estimated 37.2 trillion cells in the body, with the majority of these cells containing a nucleus. Within each nucleus there are 23 sets of paired chromosomes. A chromosome is inherited from each biological parent. The information, DNA, contained in these chromosomes comprise the human genome.³⁴⁷ The human genome is a sequence of approximately 3 billion base pairs. The overwhelming majority of these base pairs are identical across individuals. Only 0.1% or 3 million bases differ between individuals. It is in these variations that DNA profiles can be used to identify individuals. In forensic DNA typing the analysis focuses on short tandem repeats (STRs). STRs are known sequences in the DNA strand that repeat a varying number of times in different people. Typically, STRs at 13-23 different locations are analyzed during the process. The regions where the STRs repeat are non-coding regions, meaning the genetic information gathered cannot be used to predict disease or personal traits.³⁴⁸ At each location, there are two different alleles or copies, one from each parent. The length of these alleles can be the same or different at a single location. Once the sizes of the repeats are collected at all the locations, a genetic profile specific to a single individual is produced.³⁴⁹ Currently, the FBI CODIS database requires data from a minimum of 13 locations. On January 1, 2017, seven additional locations will be added to CODIS. The addition of these locations will provide more information to differentiate individuals.³⁵⁰ Information collected from STR testing is the primary source of genetic data stored in forensic databases.

While traditional STR testing is most commonly used for forensic DNA analysis, two additional analyses can be conducted to provide additional genetic information. Y-STR

testing and mitochondrial DNA (mtDNA) testing provides information about familial relationships. Y-STR testing shows paternal linkage by examining specific areas on the Y-chromosome. Y-STR testing has less discriminatory power than traditional STR markers since all males in a family will have an identical Y-STR profile.³⁵¹ Y-STR analysis follows the same method as traditional STR testing, but only locations on the Y chromosome are analyzed. Often Y-STR testing is used in cases where a useable STR profile cannot be produced due to the overwhelming presence of female DNA.³⁵² The Y-STR profile can aid investigations by narrowing possible suspects to one particular family.

An additional lineage test uses mtDNA to confirm a relationship between a mother and child. A mother passes her mtDNA to all of her children. This analysis sequences the hypervariable portion of the non-coding region of DNA found in the mitochondria of a cell. Compared to traditional STR typing that relies on two copies of the DNA per nucleated cell, hundreds to thousands of copies of mtDNA exists per cell.³⁵³ Therefore, this type of analysis can be conducted on samples that are severely degraded and traditional STR typing is not possible.³⁵⁴ The analysis of mtDNA is a more labor-intensive process than nuclear DNA analysis using STR testing. Very few laboratories are equipped to process mitochondrial DNA due to the resources and the risk of contamination given the large quantity of DNA present. Mitochondrial DNA testing is most commonly performed in cases involving the identification of human remains.³⁵⁵ The use of Y-STRs and mtDNA will be further explored as it relates to the process of familial DNA searching.

The process of forensic DNA typing creates an extensive amount of data that needs to be stored in a manner that protects privacy while allowing a searching mechanism to aid in solving additional crimes. In the United States, the primary software system used to store DNA data is the Combined DNA Index System (CODIS). The United States FBI developed CODIS in 1990 to aid investigations by linking possible cases and providing matches to potential suspects. The benefits of a DNA database include the quick identification of suspected offenders, ability to eliminate innocent suspects, and increased confidence in the judicial system.³⁵⁶ Although CODIS is utilized throughout the United States and internationally, it is not the only DNA storage mechanism. Other databases, such as those controlled at the local level or by a police agency can also store DNA data. Potential privacy issues related to both types of databases are examined.

CODIS is the leading DNA database system in the world and is currently used by over 50 countries. Within the United States, all 50 states, the federal government, Puerto Rico, the District of Columbia, and the United States Army Criminal Investigation Laboratory are connected to the National DNA Index System (NDIS) or national CODIS system. CODIS has several indices where DNA data is stored: forensic, convicted offender, arrestee, missing person, biological relatives of missing persons, unidentified human remains and pedigree tree indices. The forensic index contains data from crime scene samples that are attributed to a suspect. It is important to note that victim and other reference profiles should never be uploaded to NDIS in order to protect their privacy. Two of the other major indices most commonly used in forensic investigations collect samples from convicted offenders and arrestee samples. The laws governing the collection of these samples are discussed in the next section.

Any laboratory submitting data to NDIS must follow a number of regulations. First, the DNA section must be accredited to ensure proper analysis procedures are followed. Accreditation requires laboratories to meet certain technical and quality assurance standards. This process provides oversight from an outside organization that confirms the technical competence of the laboratory.³⁵⁷ Additionally, only a limited number of trained analysts are allowed access to the dedicated computers, which are only used to connect to the CODIS system. Access to the national database can be withdrawn if a laboratory does not uphold quality control and privacy requirements.³⁵⁸ In 2010, the Department of Justice began publishing standardized audit reports for laboratories participating in the national database system. There is a wide range of variability when reviewing these audit documents. A particularly troubling statistic is that an average 6% error rate in sample uploads was identified across the twenty-two labs audited between 2010-2015. This means that a significant number of samples were improperly uploaded to the database, which could have been victim or elimination profiles. Only one lab was in full compliance. This error rate is only a glimpse of the larger picture, because it merely accounts for 22 out of 190 laboratories across the United States connected to NDIS.³⁵⁹

While CODIS is the standard database used by accredited forensic science laboratories, other databases can exist. Databases at the local level or private databases maintained outside of a forensic laboratory lack regulation.³⁶⁰ Companies such as Cybergenetics and SmallPond have created software for laboratories or police agencies to store DNA data outside of the traditional CODIS structure. There is no external oversight or governance related to these databases. These types of databases may be referred to as rogue databases.³⁶¹ For example, the DNA Profile Matching System created by

SmallPond, LLC allows users to create a private database to store STR DNA profiles. As of April 2016, the company statistics indicate 14 sites utilizing the software with over 2 million profiles being stored. According to the SmallPond website, the company advertises the benefits for criminal investigations by lowering crime rates and creating safer communities. SmallPond markets to those who are frustrated with all the privacy restrictions and regulations established by the FBI, by offering a legal database that can be controlled internally. The primary target customer is the police. Given the acceptance of new rapid DNA technology in conjunction with software such as SmallPond, police now have the capability to collect, analyze, and store genetic profiles.³⁶² Given the lack of oversight for rogue databases, serious privacy issues may be violated.

Collection of DNA

The information stored in a DNA database must first be recovered from a biological sample. DNA can be extracted from a multitude of samples including blood, saliva, sweat, and other biological fluids. Samples can be collected at a crime scene or from individuals related to the crime. In a case investigation where DNA is present, reference samples are commonly collected from victims, suspects, and other individuals who can be eliminated as the perpetrator. Elimination standards are collected from any individuals who were not involved in the crime, but may be identified in the sample. A boyfriend, girlfriend, or roommate are examples of elimination standards. Additionally, there are mandatory collection laws requiring the collection of DNA samples from convicted offenders and arrestees. The most common DNA collection method for obtaining reference profiles uses a cotton-swab to gather epithelial cells from the inside of a person's mouth. This minimally invasive procedure has the power to harness a person's entire genetic code.

Historically, DNA was collected and stored from sex offenders or violent felons based on the assumption that they are likely to engage in repeated criminal activity. Studies have shown that 60% of violent criminals are repeat offenders within three years of being released from prison.³⁶³ Given their conviction, the courts have upheld that these individuals forfeit certain privacy rights.³⁶⁴ As the use of DNA evidence became more prevalent, states began passing additional laws requiring the collection of DNA samples upon arrest.

As stated earlier the fourth amendment is meant to protect individuals from illegal searches or seizures. Given the broad text of the fourth amendment, it is unclear if the collection of biological samples is included. Thus far, case law and the courts have upheld the right of states to collect a DNA sample from convicted offenders.³⁶⁵ All states and the federal government require that DNA be collected from individuals convicted of certain crimes. Forty-eight states require the collection of DNA for all felony convictions, while forty-two states additionally require collection for some misdemeanor convictions. New York and Wisconsin require collection from all felony and misdemeanor convictions.³⁶⁶ Over half the states also require samples be collected from juveniles. In 2015, close to 12 million convicted offender samples were stored in CODIS at the national level.³⁶⁷ There is widespread agreement that collecting samples from convicted offenders is an ethical and legally accepted practice. By committing a crime, these individuals forfeit some of their right to privacy.³⁶⁸ At the NDIS level, laboratories must expunge profiles if the laboratory receives a certified court order documenting that the conviction has been overturned.³⁶⁹

While the collection of DNA samples from convicted offenders is a widely accepted practice, legislation requiring arrestee DNA collection has been met with mixed reception. In 1997, Louisiana passed the first state DNA collection law. Four other states had created similar laws before the U.S. Congress passed the DNA Fingerprint Act of 2005. As of January 1, 2009, an adult arrested for a federal crime must submit a DNA sample. Since that time, thirty states and the federal government require the collection of DNA samples from persons arrested for certain crimes. The laws vary among states as to what charges apply, if a probable cause hearing is required, the expungement procedures, and if juveniles are included.³⁷⁰ A major concern associated with arrestee samples relates to the privacy rights of the individual. Many people are arrested yet never formally charged with a crime or are charged with a lesser offense. If a sample is collected immediately upon arrest, a number of individuals are included in the DNA databases who do not belong.³⁷¹ Within the United States, the expungement process varies between states. Thirteen states have an automatic expungement process, while seventeen states require an individual to request an expungement.³⁷² This burden of requesting an expungement is especially significant for impoverished individuals due to the cost of expungement procedures. According to a report in 2012, expungement procedures cost \$450-\$2,000 plus additional fees based on the number of charges or arrests.³⁷³ At the NDIS level, the laboratory must expunge arrestee samples after they receive a final court order documenting the dismissal of charges, acquittal, or no charges file within the appropriate timeframe.³⁷⁴

An important Supreme Court decision related to the collection of arrestee samples is the Maryland v. King Case.³⁷⁵ In 2009, Alonzo King was arrested and charged with first-

and second-degree assault. Based on Maryland law, police collected a DNA sample. King later pled no contest to the second-degree assault charge while the first-degree charge was dropped. Based on the Maryland law, if King were only charged with second-degree assault at the time of the arrest a DNA sample would not have been collected. When King's DNA sample was analyzed and submitted to the state DNA database, the profile matched a profile from a 2003 sexual assault case. King was charged with the sexual assault and tried to have the DNA match excluded from evidence stating that his fourth amendment was violated. The majority decision equated the collection of the DNA sample to fingerprints, which are routinely collected during an arrest.³⁷⁶ As of 2015, approximately 2 million arrestee samples are stored at the national level of CODIS.³⁷⁷

The collection of DNA samples from individuals can occur outside the jurisdiction of convicted offender or arrestee laws. Police may employ voluntary sampling techniques or the collection of discarded items. This type of forced or non-consensual sampling violates individual privacy rights.³⁷⁸ DNA dragnets occur when the police ask individuals in a specific area to provide a DNA sample in order to be eliminated from a criminal investigation.³⁷⁹ In addition, discarded items or abandoned DNA may be collected from an individual suspected of committing a crime. The police may employ this tactic in order to force the individual to provide a biological sample when they do not have enough evidence to obtain a search warrant.³⁸⁰

Occasionally the police employ DNA dragnets to collect voluntary samples from individuals in an area where a serial criminal is committing heinous acts.³⁸¹ A DNA dragnet or DNA sweep is a practice employed by police to collect "voluntary" DNA samples from individuals in a particular location with the goal of identifying the

perpetrator. In 1987, the first DNA dragnet was conducted in Leicestershire Township in the United Kingdom. Approximately 4,000 samples were collected from males between the ages of 17-34 in the village where the double rape and murder occurred as well as from two close villages. No match was made between the evidence and the collected samples. The perpetrator was eventually identified after a woman heard a man describe how his coworker, Colin Pitchfork, paid him to submit a DNA sample using his name.³⁸² In 2004, a study in the United States revealed that only one out of eighteen reported dragnets assisted in the capture of a suspect.³⁸³

Ethical concerns with DNA dragnets include the fact that no warrant, probable cause or individual suspicion is required. In addition, DNA dragnets claim to be voluntary, but the process of consent is unclear and the practice seems to be coercive. When police request a DNA sample, the phrasing resembles a demand and individuals do not understand their right to deny the request.³⁸⁴ Often by not submitting a voluntary sample, there is a presumption of guilt. Police will then acquire a search warrant requiring the individual provide a sample, which can result in public humiliation. Additionally, since samples are collected voluntarily no standards exist for handling the sample or data after comparison to the case at hand. The information garnered from the sample can be stored in rogue databases and used for future cases.³⁸⁵ The use of DNA dragnets implies that people are guilty until proven innocent, which is in direct contradiction to the current legal standard.³⁸⁶

Police can also obtain a person's DNA without directly interacting with the individual. Humans are constantly leaving traces of DNA everywhere through shed skin cells, saliva, and hair. The police can take advantage of this abandoned genetic material.

Abandoned DNA is defined as any material capable of producing a genetic profile that was inadvertently left behind by an individual.³⁸⁷ The collection and analysis of abandoned DNA is a useful investigative tool for police, but since no regulations exist to govern its use, potential privacy issues arise. These sorts of samples are easy for police to collect because it does not require a court order. For example, police can pick up a discarded cigarette or a used coffee cup from a potential suspect who they do not have enough evidence against to get a warrant. If the DNA sample matches the crime scene sample, police now have the necessary evidence to move forward and obtain the required court orders.³⁸⁸

Abandoned DNA is often compared to trash and therefore not protected by the fourth amendment or any other constitutional law. Criminal procedure law does not place any restrictions on this kind of collection nor does it fall under the exclusionary rule, where evidence would be rejected if obtained through an unreasonable search and seizure.³⁸⁹ The Court has established that when suspects knowingly expose items to the public view, such as leaving trash bags at the curb, there is no longer a reasonable expectation of privacy. Abandoned DNA has been assessed in this same manner since it is separated from the body in a non-invasive manner and is often left in a public place. There is no penetration of the body, as is the case when collecting a blood or saliva sample directly from an individual.³⁹⁰ It seems that the fourth amendment is not well suited to protect an individual's genetic information. Since DNA shedding is a natural occurrence it cannot be avoided, but that does not mean an individual forgoes their expectation of privacy.³⁹¹ While abandoned DNA is most often used as an investigative tool, it has the potential to be used to collect DNA from anyone and everyone. Once collected and analyzed it can

then be stored in a local database. This entire process has limited to no oversight.

Although the fourth amendment may not provide the necessary privacy protections governments can establish legislation requiring police to acquire a warrant prior to the collection of abandoned DNA.³⁹²

C.iii.(b). Data Use: Searching Protocols; Advanced Familial Searches; Oversight & Protocols; Familial DNA Protections

As explained, multiple methods are used to obtain DNA samples for inclusion in a forensic DNA database. Next, it is important to understand how the data is used once it is in the database. The current searching protocols employed at the national level of CODIS will be defined since this is the most common and regulated mechanism. Additionally, familial DNA searching will be highlighted due to its increasing use for aiding investigations.

Searching Protocols

At the NDIS level, when an evidence sample from the suspected perpetrator is developed it is uploaded to the Forensic Index of the database. The evidence sample is searched against other samples in the forensic index and compared to the convicted offender and arrestee indices. Comparisons within the forensic index indicate associations between unsolved cases and may indicate a serial offender.³⁹³ If a potential match is identified between any of the indices, it is referred to as a hit. The DNA laboratories that submitted the potential matching samples must confirm all hits. Since no identifying information is stored in the CODIS system, DNA analysts across laboratories must work together to confirm potential matches. If a match is confirmed, the necessary police jurisdictions will be contacted.³⁹⁴ Users of NDIS must follow the Privacy Act Notice, which mandates that no personal identifying information is stored on NDIS. Profiles are only marked with a specimen identification number. Additionally, the

Federal DNA Identification Act limits the disclosure and use of the DNA samples and records. The majority of states also have similar statutes that limit access and disclosure in order to maintain confidentiality and protect privacy.³⁹⁵ The laboratories share information and the law enforcement agency obtains a court order authorizing the collection of a known reference sample from the suspect. The laboratory that submitted the crime scene sample will process the newly collected reference sample to reconfirm the match and use the match information in court. Assuming all samples in the database are allowable based on the CODIS regulations and collection laws, the benefit to society is great. The databank allows for the identification of suspects in otherwise unsolvable cases. Additionally, connecting multiple cases across the county aids investigators in closing cases and protecting society.³⁹⁶ As discussed earlier, when problems arise during the collection or data storage phase individual privacy violations can occur.

Advanced Familial Searches

Familial DNA searching is the process of trying to search a database to find profiles with enough similarities or overlapping regions that may indicate related individuals. According to a report by the Bureau of Justice Statistics in 2002, 46% of inmates had a family member who had been incarcerated.³⁹⁷ This information promotes the concept of trying to identify a related individual in the database. Currently only Maryland and the District of Columbia have enacted laws that ban the use of familial DNA searching. While nine other states; California, Colorado, Florida, Michigan, Texas, Utah, Virginia, Wisconsin, and Wyoming, have developed policies which establish the procedure for performing familial searches as a last resort.³⁹⁸

In the United States, familial DNA searching is a two-step process. The first step searches a state database based on autosomal STR data. This process is conducted using

special software, not CODIS, to identify and prioritize possible relatives using a likelihood ratio and/or allele counting method. It is important to note that familial searching is different from partial matching. Partial matching is conducted by using low to moderate-stringency searching and has a low-probability of success.³⁹⁹ Once a number of possible candidates are identified further lineage marker testing using Y-STRs is conducted to reduce the candidate list to none, one or two potentially related individuals. Information regarding geographical location, age, gender, and population group may also be used to evaluate possible candidates.⁴⁰⁰ One of the problems with the two-step process is that related females are automatically excluded from possible testing since the second step relies on Y-STR testing.⁴⁰¹ The analysis of mtDNA could alleviate this issue, but very few laboratories perform mtDNA testing.

The use of familial searching must balance the protection of individual privacy and public safety. Arguments are made that familial searching violates the fourth amendment, which pertains to unreasonable search and seizures. Proponents of the practice argue that the purpose is to identify criminals and familial searching is the means.⁴⁰² As of April 8, 2016, the Denver District Attorney documents 53 successful uses of familial DNA searching within the UK and US. Some of the most notable success stories involve the identification of prolific serial killers. In 2005, Dennis Rader, the “BTK Killer” was identified after killing 10 people from 1974-1991. In 2010, “The Grim Sleeper” who had killed 10 victims between 1985-2010 was identified as Lonnie David Franklin Jr. Another serial killer, the “Roaming Rapist of Sacramento” who had murdered 10 victims, was identified as Dereck Sanders in 2012.⁴⁰³ However, as was stated earlier, while convicted offenders forfeit some of their privacy rights by the act of committing a crime,

being related to a convicted offender should not be cause to forfeit privacy. One of the strongest arguments against familial searching is the fact that a universal database has not been established. In general, people do not want to have their DNA stored in a database unless they have committed a criminal act. By performing a familial search all individuals related to an offender are at risk of being falsely identified.⁴⁰⁴ As the size of a database grows, the number of false positives generated through a familial search also increases.⁴⁰⁵ Within CODIS, data regarding geographical location, age, gender, and population group are not collected. In addition, given the millions of records stored at the national level, establishing a threshold for evaluating individuals identified on ranked lists would only have a 25-50% success rate. Once the additional core loci or genetic information for more locations is increased, the feasibility of a successful search at the NDIS level will need to be re-evaluated.⁴⁰⁶

Oversight and Protocols

In order to improve protocols surrounding forensic DNA databases more transparency is required along with greater public debate. External individuals who do not have a vested interest in the use of the DNA databases should be contributing to discussions regarding what entails good science and proper governance of DNA databases.⁴⁰⁷ The Nuffield Council on Bioethics calls for improved transparency and accountability, ethical oversight, and quality assurance when dealing with genetic information collected for forensic purposes. Transparency can be increased by requiring agencies to report annually.⁴⁰⁸ For example, there should be better recording and reporting regarding how the police utilize DNA match information.⁴⁰⁹ Ethical oversight can be improved by learning from medical research. In the UK an Ethics and Governance Framework (EGF) handles how the UK Biobank operates. One task the EGF performs is creating standard

operating procedures that address consent, confidentiality, rights of withdrawal and more.⁴¹⁰ Additionally, the UK established a Forensic Science Regulator (FSR). The FSR monitors compliance, investigates errors, and provides guidance. Some states have formed similar organizations, such as the New York Office of Forensic Services.⁴¹¹

Internationally the Grand Chamber of the European Court of Human Rights ruled on a case in December 2008 regarding the retention of DNA profiles. The ruling in the case of *S. and Marper v. the UK* declared that the indefinite retention of DNA profiles, fingerprints, and samples breached Article 8 of the European Convention on Human Rights. Article 8 relates to the right to privacy. The ruling stated that the retention is disproportionate to the individual's right to a private life.⁴¹² Based on this ruling, the Protection of Freedoms Act 2012 resulted in the removal of over 1.7 million profiles from the UK database. Now DNA profiles from innocent people arrested for minor offenses must be automatically expunged upon acquittal or if charges are dropped. Profiles may be maintained for up to 3 years for more serious allegations.⁴¹³ There is a growing global consensus to provide legislation regarding the destruction of biological samples and the removal of innocent people's DNA profiles from databases. The legislation should adhere to the Marper decision.⁴¹⁴ In the United States, the American Bar Association (ABA) echoes the Marper decision by urging for the destruction of DNA samples and the expungement of DNA profiles from the database as soon as a conviction is overturned. The ABA DNA standard encourages the creation of a routine expungement method.⁴¹⁵ The Nuffield council also recommends that mandatory arrestee samples should only be collected for recordable offenses or those where the sentence could be jail

time. All minor, non-imprisonable offenses should be excluded from mandatory collection.⁴¹⁶

Familial DNA Protections

Since there is widespread disagreement regarding the use of familial DNA searching as evidenced by the lack of legal statutes mandating the use or ban of such methods, a deeper analysis of the arguments is necessary. First, data that is more detailed needs to be collected for familial searching. For example, metrics regarding the number of familial search investigations along with the outcome is needed to assess the efficacy of the practice in order to properly weigh individual privacy concerns and benefits to the common good.⁴¹⁷ As of January 2015, Denver had a 26% success rate (23/90) of identifying a true biological relative of the evidence sample using familial searching. California's success rate is approximately 39% and the United Kingdom is at a 21% success rate. These success rates are comparable to the direct matching in CODIS.⁴¹⁸

The Nuffield Council on Bioethics provided recommendations related to familial DNA searching in their report "The Forensic Use of Bioinformation: Ethical Issues." They recommend that given the particularly sensitive nature of a familial DNA search due to lack of consent it should only be used when necessary and the potential benefits must be balanced with any potential harm. The use of familial searching should only be used in certain cases where it is justified and proportionate. Necessary safeguards must be implemented to protect privacy rights and explicit guidelines should be established.⁴¹⁹ This will increase transparency and address potential privacy issues prior to a familial search.⁴²⁰ Safeguards include special training for investigators to ensure the initial investigation post-familial searching is done in a way to protect possible relatives from public scrutiny until more information is gathered.⁴²¹ An analysis of proportionality

between the potential benefits and harms must be conducted on a case-by-case basis. The establishment of committees or groups can aid in reviewing and recommending DNA practices to ensure ethical conformity. The United Kingdom established the National DNA Database Ethics Group and California has the Familial Search Committee. The California committee review search requests and tracks the progress of cases by establishing legal and ethical checkpoints throughout the investigation process.⁴²²

Forensic DNA databases allow for the swift identification of suspects and the ability to link serial crimes. These benefits contribute to the common good by protecting individuals so that they can flourish in a safe society. While the utility and benefits of forensic DNA databases are evident, individual privacy rights must remain intact. An ethical balance between protecting individuals while promoting the common good must be established throughout the process of collecting the DNA samples, storing the genetic information, and searching the data. The establishment of external oversight committees can aid the forensic community by increasing transparency and establishing protocols that reflect the ethical balance of these two principles. Additionally, better reporting and legislation related to the process of collecting, storing, and searching DNA data is necessary to uphold personal privacy while promoting the common good.

This chapter examined the prevailing ethical principles and reasoning in bioethics with particular examination of the UNESCO “Universal Declaration of Bioethics and Human Rights” and Principlism. Examples from healthcare demonstrated the application of the principles and provided a more detailed understanding particularly of the respect for autonomy principle and application of informed consent. Different models for decision-making examined the practical reasoning in bioethics based founded on the

normative principles. The application of this analysis of principles and reasoning in bioethics to Forensic Science highlights the need to balance privacy and the common good particularly as it relates to the criminal justice system.⁴²³ Definitions of privacy and the common good were explored to understand the interaction of the principles as they relate to criminal investigations. Multinational research and research ethics illustrated the need to uphold privacy while contributing to the common good. The chapter concluded by analyzing the collection and use of forensic evidence as it relates to forensic DNA databases in order to assess individual privacy rights in relation to the common good. The bioethical principles and reasoning discussed in this chapter establish the foundation for ethical reasoning skills in forensic science.

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⁶ Natalie A. Bennet, "Privacy Review of DNA Databases, A," *ISJLP* 4 (2008): 816-845.

⁷ Nuffield Council on Bioethics, *The Forensic Use of Bioinformation: Ethical issues* (Nuffield, 2007) 31.

⁸ Henk ten Have, "Potter's Notion of Bioethics," *Kennedy Institute of Ethics Journal* 22, no. 1 (2012): 59-82.

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¹¹ Henk A.M.J. ten Have and Michele S. Jean, eds., *The UNESCO Universal Declaration on Bioethics and Human Rights: Background, Principles and Application* (Paris: UNESCO, 2009), 67.

¹² Henk A.M.J. ten Have and Michele S. Jean, eds., *The UNESCO Universal Declaration on Bioethics and Human Rights: Background, Principles and Application* (Paris: UNESCO, 2009), 327-332.

¹³ United Nations Educational, Scientific and Cultural Organization (UNESCO). "Universal Declaration of Bioethics and Human Rights." October 2005.

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¹⁷ Tom L. Beauchamp, "Principlism and Its Alleged Competitors," *Kennedy Institute of Ethics Journal* 5, no. 3 (1995): 181-98.

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- ²¹ Albert R. Jonsen, *The Birth of Bioethics* (New York: Oxford University Press, 1998), 337.
- ²² Albert R. Jonsen, *The Birth of Bioethics* (New York: Oxford University Press, 1998), 65–71; 77–83.
- ²³ Albert R. Jonsen, *The Birth of Bioethics* (New York: Oxford University Press, 1998), 337–338.
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- ²⁹ Tom L. Beauchamp and James F. Childress, *Principles of Biomedical Ethics*, 7th ed. (New York, NY: Oxford University Press, 2013), 102–108.
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Chapter 4: Ethical Culture in Forensic Science

This chapter will explore the ethical culture within forensic science laboratories to explain the contribution of ethical reasoning skills within organizational structures and in codes of conduct. The facets of an ethical culture as defined by Craig E. Johnson provides a framework to assess the current state of forensic science laboratories.¹ Improvements to the current system include transitioning to independent laboratories, setting up mechanisms to reduce bias, and upholding a code of ethics. Analysts must achieve scientific accuracy while maintaining honesty and impartiality.² Serious ethical problems can arise within forensic laboratories when the law enforcement or legal cultures negatively infiltrate the forensic science culture. Forensic laboratories need to remain unbiased therefore; the organization should be independent of other law enforcement entities. Since it is unrealistic to convert hundreds of forensic laboratories into independent organizations, other safe guards need to be implemented in order to allow the forensic scientist to maintain impartiality and limit bias.³ Beyond the organizational structure, numerous codes of conduct exist for forensic scientists across many professional organizations. Implementation of a uniform code of ethics for forensic scientists is a tool to improve the ethical culture within laboratories and among all members of the forensic science community.⁴ The work of the National Committee on Forensic Science, Organization of Scientific Area Committees for Forensic Science, and State Commissions such as the Texas Forensic Science Commission indicate positive improvements for forensic science.⁵

A. Organizational Structure

In 2009, the National Academy of Sciences (NAS) issued a report titled “Strengthening Forensic Science.” Numerous factors were identified that led to the

examination of the validity and reliability of forensic laboratories. The NAS report raised serious concerns about the lack of independence of forensic laboratories. The report identified that insufficient resources and budgetary funding resulted in case backlogs across the majority of forensic science laboratories. The report recommended laboratories “be independent of or autonomous within law enforcement agencies.” Independence would help resolve many of the cultural pressures and allow laboratories more budget control.⁶

A.i. Ethical Culture

Multiple cultures exist within the criminal justice system. There is a law enforcement culture, science culture and legal culture.⁷ It is important to recognize that these organizations interact in a partnership on some level all with the common goal of justice, but the approach is different. Forensic analysts are a crucial member in the justice system. Analysis of the science culture embedded within the law enforcement culture reveals factors that contribute to forensic science failures.⁸ Features within an organization that stimulate ethical conduct define the ethical culture.⁹ Forensic laboratories like any other organization must transform into an ethically centered organization. Both formal and informal elements influence moral actions from employees.¹⁰

Like ethicists, forensic scientists must remain unbiased. While every individual will have personal opinions about the cases he/she is working, this cannot effect the scientific analysis, particularly the explanation of the results. The autonomy of the lab is critical to establishing and maintaining an ethical culture. By moving to an independent lab, a natural barrier is established to reduce the bias forensic scientists face.¹¹ Since it is unrealistic to convert hundreds of forensic laboratories into an independent organization, other safe guards need to be implemented in order to allow the forensic scientist to

maintain independence and limit bias. One example is the use of linear sequential unmasking.¹² Another safeguard would be limiting the interaction between the forensic scientists working on a case and the police or lawyers.

The facets of an ethical culture as defined by Craig E. Johnson provides a framework to assess the current state of forensic science laboratories.¹³ Improvements to the current system include transitioning to independent laboratories, setting up mechanisms to reduce bias, and upholding a code of ethics. Forensic science is first and foremost a science. A scientific analysis becomes forensic when the results are applied to the legal system.¹⁴ Therefore, a forensic scientist's foremost professional duty is to follow proper scientific procedures. The unique position of forensic scientists within the criminal justice system can raise unique challenges not faced by other scientists. The ethical responsibilities of forensic scientists differ from those of police and lawyers.¹⁵ There are three overarching principles forensic scientists must uphold. First, they must be technically competent and use scientifically reliable testing methods. Next, forensic scientists must maintain honesty during interpretation and explanation of results as well as when describing personal qualifications. Finally, forensic scientists are obligated to remain unbiased.¹⁶ Numerous examples exist where forensic scientists and forensic laboratories have failed to uphold these ethical responsibilities.¹⁷ The structure of a forensic laboratory has a great influence on these failures. The primary issues relate to insufficient funding, the misapplication of forensic science, external pressure, and internal cover-up.¹⁸ This analysis will highlight the negative impact of law enforcement agencies operating forensic laboratories.

A.i.(a). Defining an ethical culture

Formal and informal elements within an organization affect the ethical culture.

Craig E. Johnson, emeritus professor of leadership studies, outlines the elements and the influence each element has on the moral activities of the employees. The components he outlines are general features that are applicable to any organization.¹⁹ After establishing an understanding an ethical culture framework, it must be situated within a forensic science context. This section will briefly describe Johnson's elements of an ethical culture and ethical principles of forensic scientists in order to define an ethical culture in forensic science.

Features within an organization that stimulate ethical conduct define the ethical culture.²⁰ Forensic laboratories like any other organization must transform into an ethically centered organization. Too often, a company says ethics is important by implementing policies that adhere to legal requirements without affecting day-to-day operations. An organization must truly transform in order to improve all aspects of the culture. The culture of an organization unites people. Both formal and informal elements influence moral actions from employees. The core values, mission statement, code of ethics, and organizational structure are examples of formal cultural components. The informal components include language, rituals, and stories.²¹

In order to change the culture it is necessary to address all of the elements described above. These factors operate in a complex network and focusing on only one element loses sight of the overall culture. Ethical drivers are needed to truly affect change throughout the organization. These include ethical diagnosis, engaged leadership, targeted socialization processes, ethics training, and continuous ethical improvement. All of these elements must come together to promote ethical behavior thereby creating an

ethical culture.²² This chapter will briefly discuss each of the formal and informal features that define an ethical culture while paying particular attention to the effect of the organizational structure and code of ethics on the culture and ethical conduct of forensic science laboratories. Further analysis is needed to fully diagnose the current forensic culture in order to comment on improvements for the other elements.

Formal Elements

The core ideology of an organization is its identity. The core values and mission statement define a company's core ideology. Core values are the guiding principles of an organization. The values must be clearly identified and continually communicated otherwise they fail. The mission statement is the organization's reason for existing.²³ For example, the mission statement of the Tulsa Police forensic laboratory is "To provide and serve the citizens of Tulsa with ethical, accurate, and unbiased scientific services in order to assist law enforcement and judicial communities."²⁴ Another example is the Georgia Bureau of Investigation Division of Forensic Sciences, "The Division of Forensic Sciences will provide the highest quality forensic services for our customers, achieved through accurate and thorough analyses utilizing state of the art technology. This mission will be accomplished by innovative, highly skilled, unbiased professionals with vision and integrity."²⁵ The mission statement should provide guidance and inspiration to its members.

Another example of a formal cultural component is a code of ethics, which serves as the most common ethics tool. According to the 2014 Census of Publicly Funded Forensic Crime Laboratories, 94% of laboratories have codes of ethics. State crime labs were the most likely to have a code of ethics and the majority of laboratories across all levels adopted existing codes.²⁶ Codes typically address six areas: conflicts of interest,

records, funds and assets, information, outside relationships, employment practices, and other practices. Codes are often criticized for being ineffective and merely a public image ploy that has no effect on ethical behavior. While proponents argue that a code supports ethical behavior. Beyond the creation of a code, organizations should provide training about the code and procedures for enforcing the code.²⁷ Further analysis of codes of ethics or codes of conduct related to forensic science will be explored later in this chapter.

The structure is another formal component of the ethical culture. The structure of the organization influences moral behavior based on the lines of accountability, allocation of decision-making rights, and authority relationships.²⁸ In 2009, the National Academy of Sciences (NAS) issued a report titled “Strengthening Forensic Science.” Numerous factors were identified that led to examination of the validity and reliability of the forensic laboratories. Serious concerns about cultural pressure and budgets arose since the majority of forensic science laboratories are controlled by law enforcement agencies.²⁹ Exploring the structure of forensic laboratories under the management of police departments will highlight the negative impact this structure can have on the moral behavior of the forensic analysts. A component related to the structure of the organization that affects the ethical culture is the reward and performance evaluation system. This system can have a huge impact on the ethical or unethical behavior of employees. Based on how members are measured and rewarded, the evaluation can either positively or negatively affect their actions.³⁰

An organization also needs a reporting and communication system. Some companies employ a hotline to report misconduct or field questions related to ethical

conduct. Additionally, there needs to be constant communication to employees about corporate values, the provisions of ethics codes, and disciplinary actions. Employing an ethics expert within the organization can help organizations comply with legal requirements and act ethically. Previously referred to as general counsel or human resource director. A shift is occurring within many large corporations where a chief ethics officer focuses strictly on ethics and compliance.³¹

Informal Elements

Beyond the formal elements, informal elements greatly influence the ethical culture. Individuals experience informal features daily and it is these elements that define the day-to-day work environment. An example of an informal element is the language used on a daily basis. Many employees avoid ethical terminology.³² Another element is the accepted standards of practice within an organization or the norms. These norms have an immense influence over behavior compared to formal rules and policies.³³ A third informal element is rituals. These can be broken down into six types according to Harrison Trice and Janice Beyer: rites of passage, rites of degradation, rites of enhancement, rites of renewal, rites of conflict reduction, and rites of integration. It is important to determine how each ritual impacts ethical behavior either directly or indirectly.³⁴ The final informal element is the narratives of an organization. The stories reveal the ethical stance an organization has taken in different situations.³⁵ In order to assess a forensic science laboratory according to these features of an ethical culture it is imperative to first define the ethical principles guiding forensic science.

A.i.(b). Justice in Forensic Science

The principle of justice was previously discussed in chapter 3, but given its relevance to the topic of an ethical culture in forensic science a brief refresher of the

leading philosophical theory is discussed before describing the role of forensic scientists to uphold justice. Numerous philosophical theories surround the concept of justice.

Utilitarianism outlined by philosopher Jeremy Bentham and further supported by John Stuart Mill promotes the greatest good for the greatest number of people. Mill added to the theory by addressing the role of individual rights within utilitarianism through the utility principle.³⁶ Opponents argue that utilitarianism supports the concept that the end justifies the means. By placing the greater good of the whole above individual worth, this type of reasoning can lead to the violation of individual rights.³⁷ While the libertarianism view holds individual rights, particularly the right to liberty, above all else. Libertarians argue that individuals can do what they want with their possessions as long as it does not violate other people's right to do the same thing. Essentially individuals have the right to decide what to do with their bodies, money, and possessions.³⁸ A third theory of justice by Philosopher John Rawls acknowledges individual freedoms, but also recognizes the equitable distribution of good. His justice as fairness approach follows two principles of justice, principle of equal liberty and equal opportunity. The principle of equal liberty takes precedence. This principle establishes certain rights as protected and must be equally applied to everyone. These rights include freedom of speech and freedom from unlawful arrest. While the equal opportunity principle asserts that job discrimination is forbidden.³⁹

Forensic scientists uphold justice through the scientific pursuit of valuable information related to cases of wrongdoing. There are some overarching principles that must be upheld in forensic science. Scientists must be technically competent and use reliable testing method. Second forensic scientists need to maintain honesty in terms of

personal qualifications as well as interpretation of test results. Finally, a scientist must remain impartial during analysis, reporting, and testifying.⁴⁰ Forensic science offers a service to the rest of the criminal justice community by scientifically evaluating evidence and reporting the findings of that analysis. The public expects that forensic scientists will perform this duty.⁴¹ By following these principles, forensic science pursues justice by protecting individual rights and benefitting society. Through independent scientifically founded analysis and reporting, the results ensure defendants receive fair treatment and contribute to the common good of society. The independence, objectivity, and scientific validity of forensic analysis contributes to the pursuit of justice by providing meaningful information to police investigations and judicial proceedings.⁴²

A.i.(c). Current Culture Issues

Multiple cultures exist within the criminal justice system. There is a law enforcement culture, science culture and legal culture.⁴³ It is important to recognize that these organizations interact in a partnership on some level all with the common goal of justice. While there are different cultures, these entities need to dismiss the misconceptions that promulgate animosity between scientists and lawyers.⁴⁴ Forensic analysts are a crucial member in the justice system. Serious ethical problems can arise within forensic laboratories when the law enforcement or legal cultures negatively infiltrate the forensic science culture. Analysis of the science culture embedded within the law enforcement culture reveals factors that contributed to forensic science failures. The primary issues are related to funding, the misapplication of forensic science, external pressure, and internal cover-up.⁴⁵

The structural issues identified by the National Academy Sciences report may be attributed to the genesis of forensic laboratories. Individual practitioners usually working

in a university dominated forensic science analysis until the nineteenth century. The Los Angeles Police Department Laboratory established in 1923 is considered the first forensic science laboratory in the United States. The progressive police chief recognized the need for blood alcohol testing. In 1930, another early laboratory formed within the Law School of Northwestern University in Chicago, Illinois. The largest and most recognized laboratory, the FBI laboratory, was established in 1932 under law enforcement control. By the 1960s and 1970s, many laboratories formed through government funding in order to fight the war on drugs.⁴⁶ In 2005, Saks and Koehler described a paradigm shift in forensic science. Traditional individualization sciences based on law enforcement practices learned on the job, like fingerprints and tool marks, must transition to practices empirically grounded in science.⁴⁷ As the forensic community continues to transition from traditional practices to scientifically founded practices, numerous examples illustrate problems within the forensic science culture.

Many factors contribute to the failures in forensic science, which breaks the ethical obligation of the criminal justice system to protect the innocent and convict the guilty. These factors include funding, misapplication of forensic science, external pressure, and internal cover-ups.⁴⁸ Funding issues threaten the operation of forensic laboratories across the United States. The misapplication of forensic science whether during analysis, reporting, or testifying leads grave instances of injustice through wrongful convictions. Often the misapplication of forensic science is a direct result of undue pressure that influence forensic scientists to misrepresent results. Another major factor is the cover-up mentality within the forensic laboratory. Management does not properly conduct a root-cause analysis to determine the fundamental issues and instead

tries to cover-up or downplay any wrongdoing.⁴⁹ Examples of the failures within forensic laboratories will highlight how the unethical actions of the analysts and management led to injustices where individuals were wrongfully convicted and the true criminals remained free to threaten public safety.

Funding

Particularly in police controlled laboratories, underfunding poses a huge threat and has led to the errors seen nationwide. The lack of funding inhibits the laboratory from attracting well-qualified analysts and managers. Furthermore, the lack of funding affects the integrity of the evidence due to insufficient quality control procedures, limited computer support and security, and inadequate security measures to protect the evidence.⁵⁰ The largest effect of underfunding is the inability to handle the number of examination requests resulting in significant backlogs. Case backlogs lead to further delays in the criminal justice process.⁵¹ Lack of funding in forensic laboratories was reported as early as 1974 in a report from President Nixon's Crime Commission.⁵² A survey in 2002, by the Bureau of Justice Statistics still cited funding issues and the American Bar Association in 2006 credited underfunding as contributing cause for wrongful convictions.⁵³

Misapplication of Forensic Science

The Innocence Project, an organization founded in 1992, uses DNA testing to exonerate those wrongfully convicted and advocates for criminal justice reform to prevent future injustice. By examining over 300 exonerations, the Innocence Project has identified the "misapplication of forensic science" as a contributing factor in 46% of the cases. The term "misapplication of forensic science" represents numerous issues: unreliable or invalid forensic discipline, insufficient validation of a method, misleading

testimony, mistakes, and misconduct.⁵⁴ Bite-mark analysis is an example of an unreliable or invalid forensic discipline. Hair comparison back to a unique person or a shoe impression match to a unique source are examples of methods insufficiently validated.⁵⁵ A report published in the Virginia Law Review from 2009 found that 60% of the 137 cases examined found the forensic examiner provided invalid testimony. It was also revealed that the invalid testimony came from seventy-two analysts across fifty-two laboratories.⁵⁶ The numbers highlight that this is not strictly an issue with a few rogue examiners, but a cultural issue within the forensic science community.

The FBI laboratory has undergone extreme scrutiny related to examiner misconduct. In 2004, an FBI DNA analyst pleaded guilty to making false statements and failure to follow protocols in approximately 100 analyses. For two years, the DNA analyst failed to conduct quality control checks. The misconduct was not detected for over two years. Also in 2004, the FBI declared a definitive fingerprint match to Brandon Mayfield for the Madrid terrorist bombing, only to retract the conclusion after Mayfield spent two weeks in jail.⁵⁷ As recently as April 2015, the FBI admitted to flawed testimony related to microscopic hair analysis. For over 20 years, analysts incorrectly applied statistics to hair comparisons. The statistics were unfounded due to the lack of a database with the frequencies of class characteristics. In at least 35 of the nearly 3000 cases, defendants received the death penalty. Errors were identified in 33 of those cases. Nine of the defendants were already executed and another five died while on death row.⁵⁸

External Pressure

A major external pressure applied on forensic laboratories is the time constraints demanded by police or judges. Forensic laboratories are faced with expanding caseloads and pressure to report cases quicker. This expediency can lead to analysts' cutting-

corners, making hasty mistakes, or failing to following protocols in order to produce a quicker result. An additional pressure is the desire of clients for favorable results.⁵⁹

Forensic scientists must share all results with their client whether it be the police or lawyers regardless if it does not agree with their current theory. This directly relates to the unbiased nature forensic scientists must have when performing their duties. Their job is not to report what the client wants, but rather report the truth that is obtained through the scientific testing of the evidence in a case.⁶⁰

Internal Cover-ups

Some problems within forensic laboratories arise from “rogue” analysts. These analysts may commit fraud, steal drugs, cheat on proficiency tests, lie about education and training credentials, or pure incompetence. Such analysts have committed fraud by sending reports based on analyses that were never performed, also referred to as dry-labbing.⁶¹ There are extensive examples to cite for misconduct example, but larger issues exist at the organizational level. In too many of these cases, it took management an extensive amount of time to identify the misconduct. Additionally, the wrongdoings were often covered-up. The scandals are hidden in the hopes of avoiding negative consequences like the shutting down of a lab, firing of analysts, and prosecution of those responsible for the misconduct. The misconduct also requires the review of hundreds to thousands of cases, which may result in overturned convictions.⁶² While it is a natural tendency to avoid criticism, it is completely unethical at all levels. In many cases, the unethical action began with one analyst, but ballooned to an organization filled with unethical behavior.⁶³

Structure of Laboratory Organization

Numerous misconduct was outlined that ranged from individual errors to management cover-ups. Funding issues, misapplication of forensic science, external pressure, and internal cover-ups are all factors directly influenced by the structure of the forensic science organization.⁶⁴ The examples listed above represent laboratories that operate within a law enforcement structure. This organizational structure of the laboratory sets the ethical culture or tone for the ethical behavior of the employees.

According to 2014 census reports, 409 forensic laboratories are publicly funded. The laboratories are at the federal, state, county, and municipal level.⁶⁵ Of these laboratories, 88% of them are accredited. Estimates predict that 50-90% of the accredited laboratories are within a law enforcement agency or prosecution agency.⁶⁶ A 2013 publication breaks down the forensic science laboratory structural landscape. “In the United States, almost all laboratories are government funded (there are 25 private forensic laboratories accredited by ASCLD/LAB). Government-funded laboratories include state and local police departments (55%), state departments of justice/public safety departments (10%), sheriff’s offices (7%), federal agencies (6%), regional agencies of various types (4%), coroner/medical examiner offices (3%), separate state forensic science departments (3%), district attorney offices (2%), and university, state fire marshal and state health departments (each about 1%).”⁶⁷ This research will not draw attention to forensic services and testing provided by private laboratories or completed outside of a laboratory such as fingerprint analysis that is conducted by police officers.

In 2009, the National Academy of Sciences (NAS) issued a report title “Strengthening Forensic Science.” Numerous factors were identified that led to examination of the validity and reliability of the forensic laboratories. The NAS report

raised serious concerns about the independence of forensic laboratories. The report identified insufficient resources and budgetary funding resulted in case backlog across the majority of forensic science laboratories. The report recommended laboratories “be independent of or autonomous within law enforcement agencies.” Independence would help resolve many of the cultural pressures and allow laboratories more budget control.⁶⁸

In terms of funding, laboratories operated by law enforcement agencies struggle to receive appropriate funding. Priority is often given to hiring new police officers, buying new patrol cars or providing training for officers since these items are viewed as having an immediate impact on public safety. The laboratory’s needs to hire personnel, purchase new equipment and other needed resources lack political influence within the larger police department to adequately received proper funding. In June 2013, the Kansas City police crime laboratory’s budget was cut from \$40 million to \$19 million.⁶⁹

Within a forensic laboratory that is operated by a police agency, the analysts, while not usually sworn officers, are considered police colleagues. The analysts expected to conform to the interests of the police department.⁷⁰ Law enforcement has a duty to protect and serve the public by obtaining criminals. Forensic scientists are tasked with analyzing evidence and reporting the results while maintaining impartiality. The police are not required to remain impartial.⁷¹ Additionally, due to the relationship between police and prosecutors the analysts are viewed as pro-prosecution and do not perform any analyses for the defense.⁷² Findings from forensic examiners must be based on scientific testing not on investigative information.⁷³ Lawyers have an obligation to serve the interest of their client in an adversarial system. All communication is privileged and the ultimate goal is to produce a better argument than opposing counsel. Science does not

serve the interests of any individual and communication should remain open. Scientists act in an unbiased and systematic manner to provide information.⁷⁴

Bias

Bias is a huge issue within the forensic science community. The structure of the laboratory has a direct impact on some forms of bias that are introduced in forensic science.⁷⁵ Like ethicists, forensic scientists must remain unbiased. While every individual will have personal opinions about the cases he/she is working, this cannot effect the scientific analysis, particularly the explanation of the results. Many different types of bias can exist in a forensic organization operated by law enforcement. The types of bias that will be explored are not specific to forensic analysts, but will be described in the context of a forensic laboratory.⁷⁶ One type is motivation bias, which stems directly from an analyst being a member of a police department. In order to please upper management and advance in a career, analysts feel pressured to provide testimony that is favorable to the prosecution or the theory developed by the police investigators.⁷⁷ Another type of bias is role effect bias. This is a more subconscious bias compared to motivational bias. Every person wants to be accepted and gain support of peers, which can lead to individuals leaning towards the attitudes and behaviors of the group. In a forensic laboratory, this can lead analysts to tilt conclusions toward the prosecution.⁷⁸ A third type of bias is confirmation bias. This is a natural and unconscious tendency where individuals want to verify pre-existing beliefs.⁷⁹ The incorrect identification of Brandon Mayfield by the FBI reveals the impact of unconscious cognitive bias. This was a high-profile case of international terrorism that ended in a massive error where an innocent man was wrongfully arrested and imprisoned, while the true terrorist remained free.⁸⁰

Types of Bias

Dr. Itiel E. Dror a leading expert in cognition and human decision-making is actively exploring these elements as it relates to forensic science. Cognitive Forensics is a new area recognized by the forensic community. Dr. Dror identifies the hierarchy of seven types of bias forensic scientists encounter (see figure 1).⁸¹

Figure 1: A figure from the paper "Human Expert Performance in Decision-Making"



Figure 1. A taxonomy of different sources of bias that may cognitively contaminate forensic observations and conclusions.

The first three levels in the taxonomy relate to case specific information. Starting at the top of the hierarchy the case evidence introduces bias. In most forensic disciplines, evidence from the crime scene is compared to reference material. At this stage of the analysis, it is important that the analysis and comparison be based on the actual evidence and not driven by the suspect. An examiner trying to find the suspect in the evidence results in a biased examination. Associated with the case evidence is the reference material.⁸² In order to reduce bias procedures should be implemented to ensure the examination is from the evidence to the suspect and never the reverse. One common technique is Linear Sequential Unmasking, where analysts examine and characterize case evidence before making any comparisons to reference material.⁸³ Another level of bias as the case level is irrelevant case information. Often the police provide contextual

information when submitting evidence that may bias the examination.⁸⁴ Again, it is important that the evidence alone be analyzed with scientific techniques in order to draw conclusions.⁸⁵

In 2005, Dr. Dror studied the effect of contextual information on fingerprint analysts. Fingerprint examiners were given a pair of fingerprints that they previously reported as a definitive match. They were also falsely informed that the fingerprints were those from the Madrid bombing case that erroneously identified Mayfield. Only one out of the five participants reported the fingerprints as a match. Three of the examiners declared a non-match and the other examiner stated insufficient information to make a conclusion. This study was performed in the analysts normal work environment and they were unaware that they were being tested. This study revealed the effect of contextual information on the objective analysis.⁸⁶ Extraneous information about things like past convictions, police theories, suspect confessions, or eyewitness testimony are irrelevant to the forensic analysis.⁸⁷

The next levels of bias are not related to the specific case but rather the environment, culture, and experiences of the analyst. The first level is base rate expectations, which are based on past experiences leading to an expectation regarding the current case. The next level is organizational factors. Examiners experience numerous biases based on their work environment.⁸⁸ One study demonstrated that forensic examiners experience adversarial allegiance. In analyzing the same evidence, they reached different conclusions depending on whether they believed they were an expert for the prosecution or defense.⁸⁹

Further down the hierarchy is the human nature factors of bias. First is the training the examiner receives and the motivation of the examiner. The very bottom of the hierarchy is the cognitive architecture and the brain. The very essence of us as humans introduces biases. The organizational structure under which a forensic laboratory operates can influence and introduce bias at all the levels outlined except the base level.⁹⁰

Impact of Bias

Forensic laboratories need to remain unbiased therefore; the organization should be independent of other law enforcement entities. The autonomy of the lab is critical to establishing and maintaining an ethical culture. By moving to an independent lab, a natural barrier is established to reduce the bias forensic scientists face.⁹¹ Since it is unrealistic to convert hundreds of forensic laboratories into an independent organization, other safe guards need to be implemented in order to allow the forensic scientist to maintain independence. One example is the use of linear sequential un-masking.⁹² Another safeguard would be limiting the interaction between the forensic scientists working on a case and the police or lawyers. A different individual, potentially a former analyst, could serve as a case manager who is a liaison between the scientist and the rest of the law enforcement community.⁹³ When the forensic analyst is called to court there would be a level of interaction, but any pre-trial preparation should be done with the manager. Ideally, there would be a case manager in each section who was a former analyst. Therefore, this individual is well versed in the scientific analysis being conducted and can appropriately communicate with both the police officers and the legal personnel.

A.ii. Independent Laboratory Examples

A forensic laboratory in Houston, TX provides an example of laboratory that transitioned from law enforcement control to an independent structure. The Houston

Police Department crime laboratory highlights issues related to a laboratory performing within a law enforcement structure including improper testing leading to wrongful convictions, lack of resources, and ineffective management. The laboratory underwent an arduous process to achieve independence from the police department in an effort to rectify prior issues.⁹⁴ While the Houston Police Department crime laboratory's transition to the independent Houston Forensic Science Center illustrates the positive impact of an independent structure, it is important not to equate independence with perfection. Another laboratory that opened under an independent structure continues to face scrutiny. Investigations at the Consolidated Forensic Laboratory in Washington D.C. revealed improper DNA and firearms testing.⁹⁵ The bigger issue underlying the problems at the DC laboratory may be caused by political influence and interference.⁹⁶ The laboratory's independent structure threatens the ability of law enforcement and prosecution to bias testing and results.

A.ii.(a). Houston

The Houston Police Department (HPD) crime laboratory perfectly exemplifies the failures that stem from an unethical culture and provide a model for breaking the culture, gaining independence, and positively moving forward. Scandals in Houston became known in 2002, when the DNA section was scrutinized by the news. Coverage highlighted improper analysis in numerous cases including the Josiah Sutton case.⁹⁷ Re-testing the evidence revealed that Josiah Sutton was wrongfully convicted of rape due to eyewitness misidentification and improper forensic science testing performed by the Houston police laboratory.⁹⁸ Based on the updated DNA results, the laboratory requested an independent audit of the DNA section, which led to the shutdown of the section. The results of the audit indicated that analysts were not properly trained, insufficient

documentation of testing, and improper evidence storage sometimes resulting in contamination.⁹⁹ Over 400 DNA cases were sent to other laboratories for re-testing. Multiple supervisors resigned prior to termination and other disciplinary actions ranged from a written reprimand to 28 days of suspension.¹⁰⁰

The HPD laboratory again received negative publicity in 2004 surrounding which agency would review prior convictions based on incorrect serology analysis. The errors in the serology division led Innocence Project founder Barry Scheck and State Senator Rodney Ellis to request an audit of 5,000-10,000 serology cases. Scheck wanted the extensive review to investigate other sections including toxicology, firearms, fingerprint, and trace.¹⁰¹ Between 2005-2007, former Inspector General Michael Bromwich along with a team of lawyers and forensic scientists reviewed and reanalyzed over 3,500 cases involving DNA, serology, toxicology, firearms, controlled substances, trace evidence, and questioned documents. Bromwich's final report identified serious problems with 40% of DNA evidence and 23% of blood analysis. Additionally, 147 controlled substance cases showed errors. The audit identified numerous causes including inadequate quality control and quality assurance procedures, lack of support/resources, ineffective management, isolation of the DNA/serology section, and failure of supervisors to recognize issues. By the time the audit was released, the laboratory had greatly improved and the DNA section received accreditation in 2007. Only four months after achieving accreditation, the laboratory was shaken by a cheating scandal. An analyst was accused of cheating on an open-book proficiency test. An investigation of the DNA section again revealed major problems. In 2008, additional wrongful convictions were identified due to improper analysis years earlier. Review of these convictions found statistical errors,

misleading testimony, and pro-prosecution reporting unfounded by the evidence.

Professor and forensic expert William C. Thompson described it as team spirit. An audit conducted in 2009 revealed problems in the fingerprint unit. Then in 2011, a former laboratory supervisor testified that she quit due to the lack of quality control in the field breath alcohol testing. In addition, in 2011 the backlog of sexual assaults was being reported as high as 7,000 kits. After ten years, leaders at HPD and city hall decided to make a major change.¹⁰²

The laboratory needed a complete overall. Officials proposed a regional laboratory or joining with the Harris County Medical Examiner's Office, but neither idea panned out. Ultimately, the decision was made to remove the laboratory from the Police Department. The Houston Forensic Science Center, Inc. was created in 2012 to serve as the governing body of the independent laboratory. Next, the Mayor appointed a Board of Directors. The initial board was made up of four academicians with varying backgrounds including a law, science, and journalism background, an entrepreneur, a retired judge, retired law enforcement member and a former state legislator. The diverse backgrounds of the nine board members proved to be immensely valuable since the transition of the laboratory required expertise in business, law, and laboratory management. The Board then defined the Technical Advisory Group in order to include a mix of university professors and forensic practitioners. This mix would infuse the research culture into the technical application. The Board hired Michael Bromwich again in 2013 to conduct another audit, which resulted in no major problem areas. Through the transition, the board had to make tough decisions. Challenges arose when determining which sections would remain in the police department versus moving to the laboratory. Early

recommendations by the HPD wanted the identification unit, crime scene unit, polygraph unit, and digital and video laboratories to move to the laboratory. The crime scene unit was reluctant to move because the members of this unit were police officers. It was eventually decided that the Crime Scene Unit would become part of the Houston Forensic Science Center (HFSC). While the officers would report to the civilian laboratory director, all disciplinary actions would be handled by the Houston Police Department. The HFSC Board was reluctant to include the polygraph unit due to unreliability. The HPD maintained the polygraph unit as strictly a screening tool for new employees. The Houston Forensic Science Center officially opened on April 3, 2014. While the transition involved extensive planning and important decisions, the laboratory maintained its location, but the police department no longer could access the laboratory.¹⁰³

A.ii.(b). Washington DC

The Consolidated Forensic Laboratory in Washington D.C. opened in 2012 as a truly independent forensic science laboratory with state of the art facilities. By 2015, the lab faced serious criticism and the DNA section was forced to shut down.¹⁰⁴ An audit ordered by the U.S. Attorney's Office identified flaws in the DNA procedures. The DNA section shut down for over nine months, during which time a complete overhaul of the administration occurred and DNA analysts underwent extensive training. The newly hired laboratory director attributed these issues to mismanagement stating that the previous management overlooked problems and were out of touch with prosecutors and investigators.¹⁰⁵ A former member of the DC Division of Forensic Science Advisory Board viewed the DNA discrepancies as differences of opinions within the DNA community since standards for DNA mixture interpretation is non-existent. This individual, a well-respected forensic science practitioner and educator, viewed the

scandal as political interference in a city with a reputation for this type of intrusion. The Board was unable to review the issues raised by the audit team thereby undermining the role of the Board, which is to advise the laboratory, DC mayor's office, and city council.¹⁰⁶ In this case, the independence of the laboratory should have shielded them from political control and interference, but law enforcement, the judiciary, and other levels of government can still have a major effect on laboratory operations.¹⁰⁷

Issues facing the DC laboratory did not end after the DNA scandal. In early 2017, the laboratory disclosed errors and retesting of firearms evidence in over 150 cases due to errors by three analysts. The errors were identified by the laboratory's internal quality control checks, signifying positive reform since the DNA errors were identified. One of the veteran analysts, Daniel Barrett, failed a proficiency test in August 2016 leading to a re-examination of all cases since August 2015, when he last passed a proficiency test. It was revealed that the analysts made wrong conclusions in two cases. A different examiner confirmed each of these cases leading to three analysts currently under investigation. Barrett was a former civilian analyst with the D.C. police and joined the laboratory in 2012. The other two analysts, Luciano Morales and Kevin Webster, were D.C. police officers for over 20 years and firearms examiners who also moved to the laboratory in 2012.¹⁰⁸ While this issue raises questions about the success of the DC laboratory in conducting proper analyses it contributes to the larger conversation regarding scientific concerns with firearms tests. The recent President's Council of Advisors on Science and Technology Report cited error rates in firearms analysis between 1 in 20 to 1 in 46.¹⁰⁹

The transition of the Houston Police Department to the Houston Forensic Science Center was a long and arduous process confronted with many political and practical challenges.¹¹⁰ The Consolidated Forensic Laboratory opened as a state of the art facility touting its independence, but quickly faced criticism for analytical mistakes.¹¹¹ The examples in Houston and Washington DC demonstrate that independence does not automatically fix all the problems. Further steps must be taken to create an ethical culture within forensic science laboratories. The independent structure is one key feature that provides many benefits, but is not a panacea.

B. Codes of Ethics

Forty years ago, Law and Forensic Science Professor, James Starrs implored forensic scientists to abide by ethical and professional guidelines.¹¹² A code of ethics is a formal element that enhances the ethical culture of an organization and indicates both internally and externally the importance of ethical behavior within an organization.¹¹³ Forensic scientists are members of the criminal justice system charged with upholding justice through science. Ethical misconduct within forensic science leads the public to lose trust in forensic science laboratories.¹¹⁴ Implementation of a uniform code of ethics for forensic scientists is a tool to improve the ethical culture within laboratories and among all members of the forensic science community.¹¹⁵ One of the foremost problems is enforcing a code of ethics. Currently, forensic science professional societies and laboratories have different codes of ethics. Although the forensic science community has not universally accepted a unified code of ethics, federal and state recommendations continue to move in that direction.¹¹⁶ Adherence to universal code of ethics will not prevent every instance of misconduct by forensic scientists. Rather implementation of a universal code of ethics with proper enforcement mechanisms will improve the

identification of misconduct and promote corrective action.¹¹⁷ Upholding a unified forensic science code of ethics improves the culture of forensic science at all levels, from the individual practitioners to the laboratory organization.

As discussed earlier in the chapter, a code of ethics is a formal element for establishing an ethical culture. A code of ethics is the most commonly used ethics tool.¹¹⁸ Critics argue that practitioners rarely look at their professional code of ethics making them ineffective and merely a public image ploy. While proponents emphasize that ethics codes directly promote ethical behavior. The adoption of a code of ethics is critical to an organization. It professionalizes a group and indicates both internally and externally that the profession upholds a higher obligation to society beyond its own self-interest.¹¹⁹

Craig E. Johnson states the following content that is typically contained in a code of ethics: conflicts of interest, records, funds and assets, information, outside relationships, employment practices, and other practices. Examining these areas in terms of relevance to a forensic science code of ethics, it is evident that not all categories are necessary. The information about records, funds, and assets are not included in forensic science codes.

This category most commonly applies to publicly traded financial companies who follow the Securities and Exchange Commission (SEC) guidelines or tax-exempt organizations.

¹²⁰ Disclosure of financial information is not a primary responsibility of forensic scientists. While tracking of financial records is important to the business operation of a forensic laboratory it is not criteria that needs to be explicitly contained in the codes of ethics. Furthermore, for codes that apply directly to forensics science practitioners, a statement regarding employment practices is not applicable. A code for a forensic laboratory should include a statement addressing such practices. Additionally, the code of

ethics among different professional societies and organizations may address each typical content area to different extents.¹²¹

Ethical conduct is a universal issue that affects every field. Overarching principles and regulation exist at multiple levels to inform the general public all the way down to specific practitioners of ethical conduct. For example, the Declaration of Helsinki is an international document addressing the ethical principles surrounding human experimentation. The Common Rule captures these ethical principles as regulations at a national level in the United States. Various licensing boards are commonly state regulations and an Institutional Review Board regulates at the institution level.¹²² Professional societies or a field can accentuate these layers and promote ethical behavior through a code of ethics and educational initiatives.¹²³ A review of codes of ethics across numerous scientific societies of different disciplines revealed three common themes. Honesty and fairness, competence, and benign action define good conduct. While these three components apply universally across all fields, the incorporation of these elements within a code of ethics varies among disciplines and organizations.¹²⁴

B.i. Current Codes of Ethics

Forensic science, law enforcement, and law are distinct professions with different duties and ethical standards.¹²⁵ An investigation of the Federal Bureau of Investigation (FBI) laboratory in 1996-1997 revealed differences in the duties and ethics between forensic scientists and law enforcement. For the first 50 to 60 years, all examiners at the FBI laboratory were sworn special agents. Before working at the laboratory, each individual spent several years as a field agent. While this experience can provide useful information and help examiners understand the needs and challenges of investigators, their role as an investigator must end as soon as they transition to the laboratory. The

investigation of the FBI laboratory found that some agents were unable to differentiate between the two roles. In one example, an examiner testified that an explosive material in a terrorism case was pentaerythritol tetranitrate (PETN). The examiner came to this conclusion without conducting a confirmatory test. Instead, he confirmed his preliminary identification with information obtained from the field agent who stated it was PETN based on other evidence found at the scene. The judge dismissed the charges against the accused terrorist due to the lack of scientific data. While it is acceptable for law enforcement to share information and act upon such information, it is unethical for a scientist. A scientist must base conclusions on proper scientific testing.¹²⁶

Forensic scientists are members of the criminal justice system, but their ethical responsibilities differ from those of law enforcement and lawyers. Additionally, forensic scientists encounter unique challenges not faced by other scientists.¹²⁷ While all scientists have a responsibility to conduct scientific analyses according to proper procedures, forensic scientists must present results in court. Forensic scientists' duty to uphold justice through science greatly benefits the public. There are some overarching principles that apply to forensic science. Scientists must be technically competent and use reliable testing method. Second forensic scientists need to maintain honesty in terms of personal qualifications as well as interpretation of test results. Finally, a scientist must remain impartial during analysis, reporting, and testifying.¹²⁸ These forensic principles line up with the general theme areas identified in the earlier study. The themes of honesty and fairness, competence, and benign action clearly apply to forensic scientists.¹²⁹ Forensic science offers a service to the rest of the criminal justice community by scientifically evaluating evidence and reporting the findings of that analysis. The public expects that

forensic scientists will perform this duty.¹³⁰ By following these principles, forensic science pursues justice by protecting individual rights and benefitting society. Through independent scientifically founded analysis and reporting, the results ensure defendants receive fair treatment and contribute to the common good of society. The independence, objectivity, and scientific validity of forensic analysis contributes to the pursuit of justice by providing meaningful information to police investigations and judicial proceedings.¹³¹

Codes of ethics within the forensic community formed in professional organizations.¹³² It was not until 2008 that accreditation requirements mandated a code of ethics within a laboratory.¹³³ The need for all forensic scientists to uphold a professional code of ethics is evident in the negative headlines that capture public attention. Ethical misconduct is highly publicized. These transgressions cause the public to lose faith in the abilities of forensic scientists and laboratories.¹³⁴ While unethical behavior taints a limited number of cases, the conduct of one examiner can cast doubt over thousands of cases.¹³⁵ Public recognition of an enforceable and adequate code of ethics enhances a profession's credibility. Additionally, ethical performance is key to excellent performance. Former laboratory manager, Douglas Lucas, emphasizes the importance of doing the right thing while never forgetting to do things right.¹³⁶

B.i.(a). Individual Ethical Misconduct

Earlier in the chapter, the effect of ethical misconduct across the organization of a forensic science laboratory was analyzed. The laboratories in Houston and Washington D.C. emphasize the need for laboratory reform and an independent system. This section highlights individual wrongdoings and the larger impact on the community. The story of Fred Zain is a primary example of extreme individual ethical misconduct. Fred Zain is the most notorious forensic scientist regarding ethical misconduct. Zain was a drug

chemist in West Virginia and Texas for over sixteen years. He testified as an expert witness in hundreds of criminal cases including multiple capital murder convictions. Zain appeared to be a qualified expert who provided strong evidence against defendants. His lies and wrongdoings were finally revealed in 1992 when Glen Woodall's conviction was overturned. In 1987, Zain testified that the blood type from the evidence was identical to Woodall. With the advancements in DNA testing, it was definitively determined that the evidence did match Woodall. This led the West Virginia Supreme Court to review all of Fred Zain's cases. The investigation revealed 134 cases where the actual guilt of the individuals was in doubt. Ultimately, nine men were released, due to Fred Zain's testimony that solely caused the wrongful convictions.¹³⁷

Had anyone bothered to look into Zain's history, his academic transcript would have been a clear indication that he was not qualified to perform the duties of a forensic scientist. Zain had an English degree, not a Chemistry degree as he claimed. Furthermore, he failed organic chemistry.¹³⁸ Zain was hired as a chemist in 1977 and eventually promoted to Director of the Serology Department. Zain gained notoriety among the West Virginia prosecutors who continually requested him as an expert witness. In 1985, the FBI laboratory directory informed the West Virginia state police that Zain had previously failed FBI courses in basic serology and testing bloodstains. Also, in 1985 two fellow co-workers informed superiors of Zain reporting results without performing any tests, dry-labbing. The laboratory dismissed these allegations since they received no complaints from lawyers or investigators. In 1989, Zain began working at the Bexar County Medical Examiner's Office in Texas as the Chief of Physical Evidence. After the investigations in West Virginia, Bexar County fired Zain in 1993.¹³⁹ Further investigation into the Texas

cases revealed as many as 180 additional wrongful convictions. Zain was formally charged with fraud. His first trial ended in deadlocked jury and he died from liver cancer in 2002 before a new fraud trial began.¹⁴⁰

The misconduct of Fred Zain is merely one example in a long list of analysts who have committed ethical violations. Other cases include dry-labbing, stealing evidence, manipulation of evidence to support the prosecution, false report conclusion, and overstated testimony.¹⁴¹ As of April 2017 the misconduct of former Massachusetts drug chemist, Annie Dookhan, drastically impacted over 21,500 criminal drug cases. Annie Dookhan began working at the Massachusetts state lab in 2004 and did not resign until March 2012. Her productivity appeared to triple her colleagues because she was not truly performing the analyses. She pled guilty in 2013 to 27 counts of misleading investigators, tampering with evidence, and filing false reports. In November 2013, Dookhan was sentenced to three to five years in prison plus probation. She was released in April 2016. The district attorneys from the seven Massachusetts counties affected by her work reviewed 24,000 convictions where she analyzed the evidence. They needed to determine which ones should be thrown out due to the misconduct. On April 20, 2017, the Massachusetts Supreme Judicial Court dismissed 21,587 drug cases.¹⁴² While Annie Dookhan did spend time in jail for her wrongdoings and will likely never be employed in a forensic laboratory again, for less severe misconduct cases there are no formal barriers in place that prohibit analysts from testifying in future cases.

B.i.(b). Current Codes of Ethics

For decades, many forensic scientists were not held to enforceable ethical standards. Until recently, only professional forensic science societies and certification organizations provided ethical guidelines for forensic practitioners.¹⁴³ The only exception

with the forensic science disciplines is forensic pathologists. Forensic pathologists are licensed physicians and must comply with state medical ethics codes. The National Association of Medical Examiners adopts the American Medical Association, “authoritative ethics guide for practicing physicians” as its unified code. Within this chapter, further analysis of codes of ethics within forensic science will not refer to the code for forensic pathologists.¹⁴⁴ The code of ethics or codes of professional conduct address honesty, integrity, and objectivity. Furthermore, the codes stress the importance of professional competence, clear and objective presentation in reports and testimony.¹⁴⁵

Professional Societies

The very first North American forensic science organization to establish a code of ethics was the California Association of Criminalists (CAC) in 1957. This code remains the most comprehensive and detailed code within the forensic science community.¹⁴⁶

Since 1976, the Association of Firearms and Tool Mark Examiners (AFTE) has enforced a code of ethics. The largest organization, the American Academy of Forensic Sciences (AAFS) approved a code of ethics and conduct in 1977. The American Society of Crime Laboratory Directors (ASCLD) created a code in 1987. The American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB) developed one of the more recent codes of ethics. In 2008, the accrediting organization ASCLD/LAB adopted a code of ethics. This code essentially serves as a national code since all laboratories accredited by ASCLD/LAB acknowledge this code. This impacts almost 400 laboratories and thereby the majority of forensic scientists in the United States.¹⁴⁷

Given the number of disciplines encompassed within the AAFS, an exploration of the AAFS code of ethics reveals basic ethical principles for forensic science. A multidisciplinary organization, the AAFS was founded in 1948. The founding members

recognized the importance of ethical conduct for forensic scientists, but a committee tasked with creating a code of ethics was not established until 1960. Fifteen general rules were proposed. These Rules of Ethics were never accepted and the 1963 executive committee declared that the Academy's Constitution was sufficient. Again, in the mid-1970s, another committee was formed and the proposed code was accepted in 1977.¹⁴⁸

Below is the Code of Ethics and Conduct for the AAFS. Members and affiliates reaffirm their acceptance of the Code annually during dues renewal. Even though the AAFS code only lists four provisions, it highlights key ethical principles for forensic scientists. The code emphasizes honesty, integrity, competency, and professionalism. The AAFS code does not include the requirement for using sound scientific methods.¹⁴⁹

“AAFS Article II. CODE OF ETHICS AND CONDUCT¹⁵⁰

SECTION 1 - THE CODE OF ETHICS AND CONDUCT: As a means to promote the highest quality of professional and personal conduct of its members and affiliates, the following constitutes the Code of Ethics and Conduct which is endorsed by all members and affiliates of the American Academy of Forensic Sciences:

- a. Every member and affiliate of the Academy shall refrain from exercising professional or personal conduct adverse to the best interests and objectives of the Academy. The objectives stated in the Preamble to these bylaws shall be to promote professionalism, integrity, and competency in the membership's actions and associated activities; to promote education for and research in the forensic sciences; to encourage the study, improve the practice, elevate the standards and advance the cause of the forensic sciences; to promote interdisciplinary communications; and to plan, organize and administer meetings, reports and other projects for the stimulation and advancement of these and related purposes.
- b. No member or affiliate of the Academy shall materially misrepresent his or her education, training, experience, area of expertise, or membership status within the Academy.
- c. No member or affiliate of the Academy shall materially misrepresent data or scientific principles upon which his or her conclusion or professional opinion is based.
- d. No member or affiliate of the Academy shall issue public statements that appear to represent the position of the Academy without first obtaining specific authority from the Board of Directors.”

The AAFS enforces this code of ethics and conduct according to the rules and procedures outlined in section 6.4 of the AAFS Policy and Procedure Manual.¹⁵¹ Seven members at the Fellow level representing the diverse disciplines of the Academy

compose the Ethics Committee. The Board of Directors appoints each member for a three-year term. The members of the Ethics Committee elect the Chair of the committee annually.¹⁵² Investigations may be initiated by the committee based on a written complaint from an AAFS member or affiliate or by a motion from an Ethics Committee member. No investigative action is taken for alleged misconduct that occurred five years prior to the complaint or motion. All allegations are treated as confidential until the Board of Directors reaches a final decision. If a member or affiliate accused of violating the Code of Ethics and Conduct ceases to be a member or affiliate, the Academy ceases to have jurisdiction and a notation is made in the membership file. The Committee makes an initial determination regarding whether a formal investigation is necessary. The committee also holds hearings and provides recommendations to the Board of Directors.¹⁵³ At the conclusion of cases, the files are sealed and destroyed after five years unless the Board issued a public sanction, requiring the records be maintained for fifteen years. A brief report regarding activity by the Ethics Committee is announced at the AAFS Annual Meeting. Violations in a case and a non-confidential sanction are published in the *Academy News*.¹⁵⁴ The most common sanctions imposed against members are a reprimand letter, suspension, or expulsion from the Academy.¹⁵⁵

Laboratory

According to the 2014 Census of Publicly Funded Forensic Crime Laboratories, 94% of laboratories have codes of ethics. At 98%, State crime labs were the most likely to have a code of ethics and the majority (67%) of laboratories across all levels adopted existing codes. These ethical codes guide ethical behavior. They outline the following principles: analyst work is confined to their expertise, analysts provide objective findings

and testimony, avoid conflicts of interest, and avoid susceptibility to outside influences.

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Although diverse analyses are conducted within a forensic laboratory given the numerous forensic science disciplines, there are foundational principles that apply to all forensic scientists. Additionally, the fact that each case contains unique evidence specific to that case the analyses conducted must adhere to scientifically approved methods. Upholding ethical standards and following standard methods ensure that scientific results for each case are accurate and reliable.¹⁵⁷

The American Society of Crime Laboratory Directors/Laboratory Accreditation Board developed one of the newest, but widely accepted codes. The Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists, originally adopted on December 6, 2008, was most recently updated on November 13, 2016 and is now called the Guiding Principles of Professional Responsibility for Forensic Service Providers and Forensic Personnel.¹⁵⁸ In order to obtain ASCLD/LAB accreditation, laboratory management must incorporate or directly reference these Principles of Professional Responsibility or establish an equivalent document.¹⁵⁹ As of April 24, 2017, 373 forensic science laboratories are accredited by ASCLD/LAB. This includes 172 state laboratories, 133 local laboratories, 24 federal laboratories, 18 international laboratories, and 26 private laboratories.¹⁶⁰ According to the 2014 census, there were 409 publicly funded forensic laboratories.¹⁶¹ Since 329 of the publicly funded forensic laboratories (state, local, and federal) are accredited by ASCLD/LAB approximately 80% of laboratories uphold ASCLD/LAB principles.

B.ii. Universal Code of Ethics

Earlier in the chapter, the recommendation, from the 2009 NAS report “Strengthening Forensic Science”, to make forensic laboratories independent from law enforcement was explored. The NAS report also made a recommendation regarding a unified code of ethics within forensic science. Recommendation nine states that a national code of ethics should be established that applies to all forensic disciplines and could be incorporated in professional societies’ codes of ethics. Additionally, enforcement mechanisms are needed for those who violate the ethical code. One possible mechanism is through certification. This recommendation was made since the content between the codes of ethics among professional societies varies. Furthermore, no consistent enforcement mechanism exists. Unlike lawyers or doctors, who are licensed and face serious sanctions for ethical violations, the punishment for forensic scientists varies. As outlined earlier, although the majority of forensic scientists uphold their ethical obligations, occasionally practitioners act unethically. There is no official sanction imposed for scientists who have committed a grave ethical violation.¹⁶² The enforcement of a code of ethics will be further explored later in the chapter.

B.ii.(a). Need for a Universal Code

Although numerous codes exist for forensic science practitioners, these codes do not apply to all forensic experts who testify in court. Many forensic professionals are members of multiple organizations with different codes. While some forensic scientists, such as independent experts do not necessarily belong to a professional society or a laboratory and do not follow an ethical code.¹⁶³ A thorough comparison of the major codes of ethics in forensic science conducted by Kenneth E. Melson, former acting director of the Bureau of Alcohol, Tobacco, Firearms and Explosives, reveals the

differences among codes. Extensive tables from Professor Saks article “Prevalence and impact of ethical problems in forensic science” were updated to illustrate provisions within each code. Most of the codes outline that forensic scientists should remain unbiased and impartial as well as use proper testing methods. While there is overlap and similar conduct between codes, differences still exist. For example, many codes require testing be performed using only generally accepted methods. However, some organizations allow for the use of new or experimental techniques to provide additional information.¹⁶⁴

Another varying factor is the length of different codes. Explored earlier, the AAFS code only has four provisions while the CAC code contains five different sections with 41 provisions.¹⁶⁵ Further differences exist in the enforcement of the code of ethics. The structure of the enforcement process varies among organizations. Ethics committees may make the initial determination regarding whether to open a case or not. Typically, these Ethics Committees also perform an investigation and hold hearings. Recommendations regarding the finding and potential sanctions are then forwarded to the governing body for a final decision.¹⁶⁶ In some societies, the Board of Directors or Executive Committee makes that decision to open a case and the Ethics Committee acts as an investigative body. Recommendations from the Committee proceed to the Board and it is the Board or Executive Committee that holds the hearing. The voting pattern of the organizations at different steps in the process also differs. Finally, information released to the general membership can vary drastically between organizations.¹⁶⁷ Adherence to universal code of ethics will not prevent every instance of misconduct by forensic scientists. Rather implementation of a universal code of ethics with proper

enforcement mechanisms will allow the misconduct to be identified and corrected.¹⁶⁸ A unified code can also remove differences between organizations to eliminate confusion. Additionally, members of multiple organizations would not need to undergo multiple investigations all with different enforcement procedures.

In 2002, John Mario, forensic scientist from Suffolk County Crime Laboratory, published an extensive review of the professional codes of ethics. One of his observations notes that the codes do not distinguish between ideals, principles, rules, and prudence. Ideals are desirable goals or a vision of what should be achieved. Ideals in forensic science codes indicate that a forensic scientist should strive to be objective. Given the broad nature of ideals, failure to uphold ideals does not warrant punishment. Principles refer to fundamental practices. For example, forensic scientists will not conduct secret analyses. Rules of conduct are more specific and violations directly warrant punishment. For forensic scientists, a general rule is that training and education must not be misrepresented. Finally, some provisions within a code are only prudently obligatory. For instance, scientists will make and keep notes should be followed, but failure to do so can be explained.¹⁶⁹

B.ii.(b). Uniform Code for Forensic Scientists

In 2010, in response to the NAS report, the Education, Ethics, and Terminology Inter-Agency Working Group (EETIWG) of the National Science and Technology Council's Subcommittee on Forensic Science developed and recommended a single code for forensic science practitioners. The EETIWG extensively reviewed codes of ethics among the number forensic science organizations and found four major categories addressed by every code. They are "working within professional competence, providing clear and objective testimony, avoiding conflicts of interest, and avoiding bias and

influence, real or perceived.” This group identified the code of ethics from the ASCLD/LAB *International* Supplemental document as the best document to serve as the National code. Unfortunately, nothing happened with this recommendation and as of 2016 no National code of Ethics and Professional Responsibility for Forensic Sciences (NCEPRFS) existed.¹⁷⁰

The National Commission on Forensic Science (NCFS), which will be described in detail later in the chapter, was a Federal Advisory Committee that operated from April 2013 to April 2017.¹⁷¹ This group also recognized the benefits of a uniform code. The Interim Solutions Subcommittee of the NCFS started with the EETIWG’s recommendations. The NCFS subcommittee renamed the updated code as the National Code of Professional Responsibility for Forensic Science and Forensic Medical Service Providers. The term professional responsibility replaced ethics because the committee felt the term ethics is too broad. The NCFS recommended all forensic science providers, certification and accreditation bodies, and professional societies adopt the code. Annual review and verification of the Code is also recommended. Additionally, enforcement of ethical violations must be established by management systems.¹⁷² On March 22, 2016, the NCFS adopted the National Code of Professional Responsibility as a recommendation to the Attorney General. On September 6, 2016, Attorney General Loretta Lynn announced the implementation of the new code of professional responsibility for all Department of Justice (DOJ) laboratories.¹⁷³ The DOJ laboratories are the Federal Bureau of Investigation (FBI) Laboratory, the Drug Enforcement Administration (DEA) Laboratory, and the Alcohol, Tobacco, Firearms, and Explosives (ATF) Laboratory.¹⁷⁴ The full text of the Code of Professional Responsibility for the Practice of Forensic

Science endorsed by the NCFS and mandated by the Department of Justice can be found in the appendix labeled Figure A2.

The unified professional code contains 16 provisions that highlight the importance of honesty, competency, impartiality, and use of scientifically validated methods. The code identifies two standards related to honesty in terms of representing education, training and experience as well as truthful portrayal in all professional activities. Revisiting the six content areas Craig E. Johnson outlined, this unified code for forensic scientists encompasses the majority of the areas. Johnson stated the following areas: conflicts of interest, records, funds and assets, information, outside relationships, employment practices, and other practices.¹⁷⁵ One of the provisions clearly addresses conflicts of interest by indicating they should be avoided also forensic scientists should minimize influence or bias caused by outside relationships with investigators or lawyers. Furthermore, information regarding the results of analyses are provided through reports and testimony.¹⁷⁶ The records, funds and assets, and employment practices are not specifically addressed in this code. As addressed earlier this information is not required to be in a code that applies directly to a forensic practitioner. Were this a code at the forensic laboratory level a statement regarding employment practices should be included.

B.ii.(c). Oversight

As discussed earlier, the NAS report recommended a unified code of ethics with possible enforcement through certification. The NAS report also recommended certification separate from the code of ethics. Specifically, recommendation 7 endorses mandatory accreditation for laboratories and individual certification for practitioners. The recommendation further states that no individual should be allowed to work or testify as a forensic scientist without certification. At a minimum certification should include:

“written examinations, supervised practice, proficiency testing, continuing education, recertification procedures, adherence to a code of ethics, and effective disciplinary procedures.”¹⁷⁷

Enforcing a code of ethics is often the most difficult task when upholding professional standards within a profession. In forensic science there does not exist one overarching regulatory agency.¹⁷⁸ As described previously the AAFS covers the most diverse areas of forensic science and has the largest membership, but it is not a requirement of all practicing forensic sciences to join the organization. Therefore, enforcement is handled differently by each organization and laboratory. Beyond the separate organizations and physical laboratories, a few states have a Forensic Science Commission.¹⁷⁹ If a universal code of ethics were to be adopted, universal oversight would be necessary. This entity could coordinate research, standards, accreditation, certification, ethics, and funding. A singular agency responsible for overseeing forensic science would help the community unite by providing leadership and improving the system.¹⁸⁰

The Association of Firearm and Toolmark Examiners (AFTE) clearly outlines the purposes of enforcing a code of ethics. It is not punitive, but rather the enforcement educates, advises, and protects. First is educates the accused and the membership about the ethics of forensic science and importance of ethical behavior. Next, the criminal justice system is advised of individuals who engage in unethical behavior. Finally, the reputation of the organization is protected from unethical members.¹⁸¹ Overall, the existence of a code of ethics will not defray all ethical misconduct, but proper enforcement mechanisms will allow the misconduct to be identified and corrected.¹⁸²

Exploration of the role of federal and state oversight indicates potential enforcement mechanisms. Additionally, the National Commission on Forensic Science, the Organization of Scientific Area Committees, and State Forensic Science Commissions focus on scientific and quality improvements to forensic science.

Federal Oversight

In response to the 2009 NAS report, the US Federal Government established The National Commission on Forensic Science (NCFS) and the creation of the Organization of Scientific Area Committees for Forensic Science (OSAC) in 2013. The development of both entities indicate an interagency initiative to improve forensic science. The NCFS focused on developing policies that express the views of the Commission or make recommendations directly to the Attorney General for potential action. While OSAC efforts are aimed at strengthening forensic science by developing discipline specific standards focused on scientific measurements, analyses, results, and interpretation.¹⁸³

National Commission on Forensic Science

The NCFS was a Federal advisory committee for the US Department of Justice (DOJ) and co-chaired with the National Institute of Standards and Technology (NIST). NIST is an organization independent from law enforcement as it is within the US Department of Commerce. As a federal advisory committee, the organization operated on two-year renewable terms. The NCFS operated for two terms, from April 2013 to April 2017.¹⁸⁴ The NCFS consisted of 40 commissioners representing a diverse set of stakeholders. Commissioners included forensic science practitioners and managers, researchers, jurists, law enforcement, and criminal justice advocates. The NCFS developed two types of work products. One is a document regarding the Views of the Commission. The other form is Recommendations to the Attorney General. At the

conclusion of the NCFS tenure, twenty-three views documents were created along with twenty recommendation documents.¹⁸⁵ The full-list of work products can be found at www.justice.gov/ncfs.

While the NCFS has made progress in advancing the field of forensic science, the field again has to overcome a huge hurdle created by Attorney General Sessions failure to renew the Commission.¹⁸⁶ Co-chair of the NCFS's Scientific Inquiry Subcommittee and Professor at West Virginia University, Dr. Suzanne Bell, commented that while progress may slow it will not end. In her comments, she also emphasized a need for an independent science agency, not the DOJ, to continue reforming forensic science. The persistence of the OSAC committees within NIST promotes continued reform even with the end of the NCFS.¹⁸⁷

Dr. John Butler, Vice-Chair of the NCFS and SAC Biology/DNA Member shared four lessons he learned from his experience with the NCFS. First, time and patience is critical for a new group to come together. Second, only by listening and trying to understand different perspectives can respect and trust develop. Next, although feedback can be uncomfortable it usually improves the outcome. Finally, a dedicated group openly sharing work products benefits the community.¹⁸⁸ This same level of transparency should transfer to ethics proceedings. Increasing the transparency of the practices of ethics committee by publishing proceedings and decisions will allow all forensic scientists to gain knowledge related to upholding ethical practices.

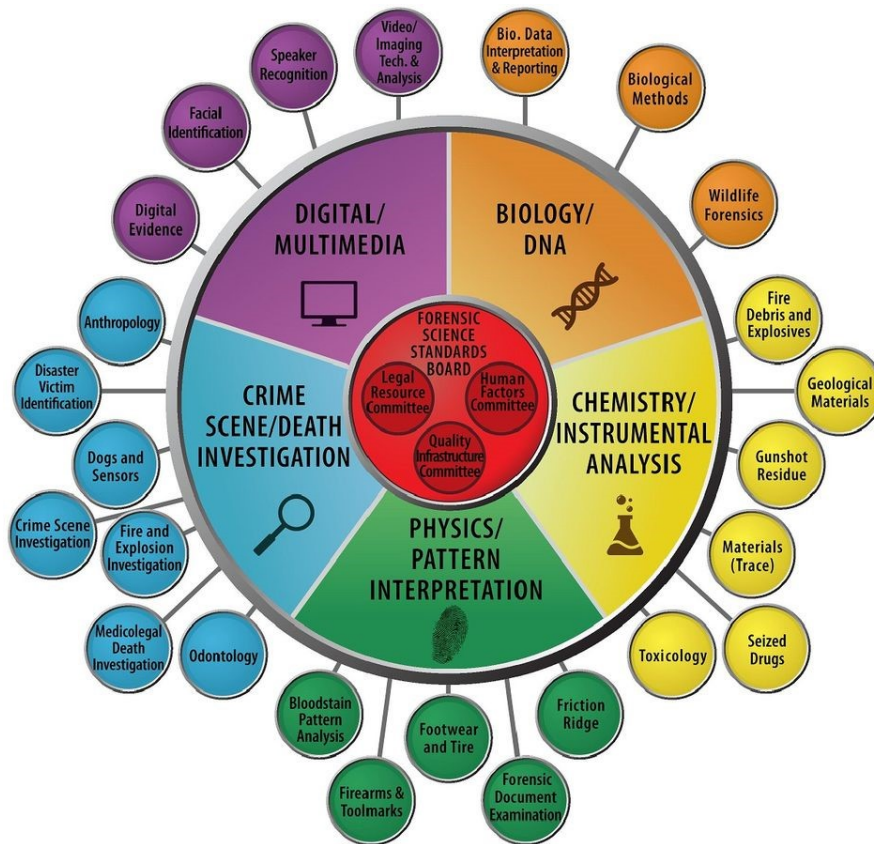
At the September 2016 meeting, the NCFS adopted the "Views Document on Certification of Forensic Science Practitioners". The document outlines the benefits of certification for all forensic science practitioners. Certification is a tool for the public and

legal community to identify practitioners compliant with standard requirements in forensic science.¹⁸⁹ Certification ensures practitioners maintain technical competency and adhere to ethical standards in order to perform the duties necessary.¹⁹⁰ The NCFS notes that certification can include the following elements: “written and/or practical testing; an evaluation of education, training, and practical experience; requirements for continuing education; and adherence to a code of ethics.” Since numerous disciplines exist within forensic science, certification would be obtained for practitioner’s relevant domain. This document identifies ten disciplines and subdisciplines that are not currently covered by a certification body.¹⁹¹

Organization of Scientific Area Committees (OSAC)

Prior to the formation of OSAC, 21 Scientific Working Groups (SWGs) composed of subject-matter experts determined best practices and developed standards for forensic disciplines. In 2013, along with the NCFS, the OSAC was developed by NIST to develop standards and guidelines to improve forensic science. OSAC is made up of five Scientific Area Committees (SACs) that report to a Forensic Science Standards Board (FSSB). The SACs oversee twenty-five discipline specific subcommittees and over 200 task groups. Additionally, three resource committees provide input to the various levels. Figure 2 displays the overall layout of the OSAC.¹⁹²

Figure 2: Structure of OSAC



With the formation of OSAC, some of the SWGs have transferred all activity to the disciplines Scientific Area Committee like the Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST).¹⁹³ While other SWGs such as the Scientific Working Group for DNA Analysis Methods (SWGDM) continue to have regular meetings and publish recommendations for the forensic DNA community.¹⁹⁴ The OSAC now acts as a unifying body with all the forensic disciplines housed within one structure. Each SAC is incorporating a lot of material from the SWG's. Having all the disciplines within the same structure promotes intermingling to strengthen the entire forensic science field.¹⁹⁵ SWGFAST chose to transfer all documents to the OSAC

Friction Ridge Section based on the value of having a single entity developing standards to improve the friction ridge discipline.¹⁹⁶

The FSSB is the governing body of the OSAC, which oversees the operation of all the committees, approves standards for the OSAC Registry, and facilitates internal and external communication within and between OSAC and the forensic science community. The approved standards listed in the OSAC Registry will be used by accrediting bodies when auditing forensic laboratories.¹⁹⁷ Although the OSAC is primarily concerned with developing standards and guidelines for discipline specific analyses, it is important to understand its larger role within the forensic science community.

State Forensic Science Commission

The federal government has failed at regulating forensic science thus some states have undertaken the regulation task. Texas, Virginia, and New York have successfully implemented forensic science commissions that provide oversight and policy development. While Arizona's attempt to regulate forensic science failed.¹⁹⁸ The role of State regulation for forensic science is often overlooked. While the federal government provides grant money for laboratory operations and can influence state laboratories based on standard practices at the federal laboratories, the operation of state and local laboratories is controlled at the state level. Given the ever-changing political climate at the federal level, as demonstrated by the termination of the NCFS, state oversight may be better positioned to implement reform. States have the ability to experiment with different reform and oversight methods since they operate on a smaller scale and can act quicker than the federal government.¹⁹⁹

These regulatory agencies focus on the credibility, transparency, and standardization of forensic science within the state. The Texas Forensic Science

Commission will be explored as an example of regulation at the state level. The Texas Forensic Science Commission was created in May 2005.²⁰⁰ The creation of the Commission correlates with the increased scrutiny of the Houston Police Department Laboratory that was described earlier in the chapter. Examination of the Texas regulation commission found three primary reasons contributing to the success of the commission. The first and biggest factor was participation and buy-in from all stakeholders. Representatives from the laboratory, judiciary, and law enforcement were working toward a common goal of promoting justice and not trying to advance personal agendas. Texas hired full-time staff members who could be present at community events, which increased visibility of the commission and led to increased trust. This structure also allowed stakeholder representatives to maintain their full-time positions. The full time staff were a key factor in the success of the commission. The staff is able to receive the complaints and allow the commissioners to focus on the investigation. The final factor was funding provided to the commission.²⁰¹ Lack of funding has led to failed regulation in other jurisdictions. The Texas commission originally had no budget, but now receives \$500,000 annually.²⁰² The budget covers the salaries for the full-time positions and the cost of investigations and meetings.²⁰³ Political influence almost ended the Commission in the early years.²⁰⁴

The Texas Forensic Science Commission oversees the investigation of professional negligence and misconduct allegations. The Commission receives public complaints and performs investigations on a case-by-case basis. The full time staff are able to collect complaints and send the information to investigate panels made up of three commissioners. The Commission serves as a permanent institution focused on the

oversight of forensic science. The permanence of the Commission ensures forensic science investigations are not discarded or delayed.²⁰⁵

Recent legislation in Texas requires the Commission to establish licensing programs. By January 1, 2019, all forensic analysts in Texas are required to be licensed. The mandatory licensing is required for all accredited disciplines and the Commission can create voluntary licensing programs for disciplines not currently accredited by Texas law.²⁰⁶ Texas legislation requires all forensic analysts working in an accredited forensic laboratory obtain a license if they perform Controlled Substance, Toxicology, Biology/DNA, Firearm/Tool Mark, Questioned Documents, and/or Trace Evidence analysis. According to the fifth Annual Report from the Commission, the licensing advisory committee has met over ten times since its creation in December 2015. The Commission is responsible for establishing the licensing qualifications in four areas: education requirements; specific coursework and experience; completion of an examination; completion of proficiency testing in line with the laboratory's accreditation. Additionally, the Commission must determine the fees for issuance and renewal along with the term length for the forensic analyst license. A draft proposal regarding the requirements for licensing were to be reviewed at the February 2017 quarterly meeting of the licensing advisory committee.²⁰⁷ The Texas Code of Criminal Procedure Article 38.01 describes the forensic analyst licensing. For license holders who commit professional misconduct, the Commission can revoke or suspend the license, refuse to renew the license, or reprimand the analyst. At this time, no formal reports have been released regarding the status of the Commission's Forensic Analyst Licensure Program.²⁰⁸

The formal and informal elements of an organization defined by Craig E. Johnson outlines how each element influences the ethical culture of an organization.²⁰⁹ The culture within forensic science laboratories must uphold and promote three primary ethical responsibilities for forensic scientists. Analysts must achieve scientific accuracy while maintaining honesty and impartiality.²¹⁰ The forensic culture can be improved by establishing independent organizational structures, reducing bias, and adhering to a code of ethics. This paper particularly emphasized the role of the laboratory structure on the ethical culture of the laboratory. The examples in Houston and Washington DC demonstrate that independence does not automatically fix all the problems.²¹¹

The 2009 NAS report recommended a unified code of ethics for forensic science. A code of ethics enhances the ethical culture of an organization and indicates the importance of ethical behavior within an organization. As members of the criminal justice system, forensic scientists are charged with upholding justice through science. Ethical misconduct within forensic science leads the public to lose trust in forensic science. Implementation of a uniform code of ethics for forensic scientists is a tool improve the ethical culture within laboratories and among all members of the forensic science community. The work of the National Committee on Forensic Science, Organization of Scientific Area Committees for Forensic Science, and State Commissions such as the Texas Forensic Science Commission indicate positive improvements for forensic science. Adherence to a universal code of ethics will not eliminate ethical misconduct by forensic scientists, but can improve the identification and correction of such wrongdoing.²¹²

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Chapter 5: Reasoning Models

The earlier chapters have established ethical issues within forensic science. This chapter transitions to the broader topic of reasoning in order to highlight the contribution of ethical reasoning skills for forensic science. This chapter will examine the work of American philosopher Charles Sanders Peirce that focuses on solving problems or resolving doubt using three types of reasoning methods. Peirce's development of three reasoning types stem from his view of semiotics. The core of semiotics revolves around the ideas of sign. Background information of Peircean semiotics lays the foundation for how an individual interacts with the world through signs. This leads into an individual's belief structure. For it is not until a person is in genuine doubt, where their current belief structure does not align, that inquiry can begin. The three types of reasoning proposed by Peirce are abduction, deduction, and induction. A summary of Peirce's expansive explanations regarding abduction highlight the complexity and importance of this type of reasoning in scientific inquiry. Further breakdown of the modes within each type of reasoning along with examples provide necessary information to understand how the reasoning processes can be applied in the world. This chapter concludes by highlighting forensic case study comparisons that explore how the reasoning method utilized can influence an investigation.

A. Semiosis Background and Relation to Ethical Practices

Semiotics describes how individuals interact with the world through signs. Further investigation of Peircean semiotics leads to the understanding of an individual's belief structure. When an individual is confronted with a situation that does not make sense given their current belief structure they experience genuine doubt. In order to solve this doubt and update their beliefs an individual must use inquiry. The methods of inquiry are

the three reasoning methods Peirce explains. Abductive, inductive, and deductive reasoning are methods to form new ideas, test them, and reason between ideas. The forms of reasoning can be described as the way individuals interact with the world through signs. The case examples discussed at the end of the chapter demonstrate the importance of abduction to maintain ethical practices and the limitations of deduction.

The most basic definition of semiotics is the study of signs, but that definition provides no information about the meaning of a sign.¹ Italian philosopher and semiotician Umberto Eco provides the broadest definition of signs, which states, “Semiotics is concerned with everything that can be taken as a sign.”² Semiotics is a complex field of study. It represents studies across multiple disciplines such as art, literature, and anthropology rather than being an academic discipline itself. Given the diverse fields of study, professionals from many fields serve as semioticians including linguists, psychologists, philosophers, and educationalists. Within semiotics, two divergent traditions exist based on the teachings of the founding fathers.³

In an effort to establish a basic understanding, it is important to highlight the key figures involved in the early development of semiotics. Swiss linguist Ferdinand de Saussure is a founder of linguistics and semiotics. Saussure was educated in Geneva, Paris, and Leipzig. His early contribution to comparative linguistics as a student displayed his brilliance. His influence on linguists stemmed from his teaching at the University of Geneva, which reached a larger audience after his teaching notes were published posthumously.⁴ Another founding member of semiotics is philosopher Charles S. Peirce. Peirce is best known as the founder of Pragmatism, but his philosophical exploration included nearly every dimension of philosophy. Peirce benefitted from a

privileged education and frequently interacted with leading scholars. He was unable to disseminate his work beyond a small circle due to financial restrictions and other life events that marginalized his work. One of Peirce's papers originally published in 1877 documents his views on learning and cognition through reasoning which will be explored later.⁵

A.i. Sign Interpretation

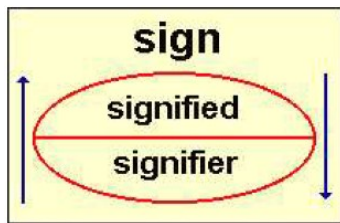
An individual's beliefs are the sign structures one has created over time. If one undergoes a sign structure change then a belief structure change occurs. The only way for a change to occur is when someone is open to doubt. Peirce proposed that we create or accept new beliefs when we are in a condition of inadequacy that he called "genuine doubt".⁶ This state of genuine doubt arises from experience; hence, it is naturally imbedded in a relevant context or situation. Being in a state of genuine doubt can be uncomfortable, painful, and irritating and therefore can compel individuals to create new beliefs or alter existing beliefs to move to or establish some new state of belief.⁷ Peirce proposed four methods through which we can fix beliefs/resolve doubt: tenacity, authority, a priori, and experiment.⁸ When doubt occurs, individuals must go through a reasoning process, which allows the belief, and thus sign structure to change or be confirmed. In argument formation or logic, deductive and inductive reasoning are common modes of reasoning. Peirce proposed a third method of reasoning termed abduction.⁹ Abduction proposes or creates hypotheses. Deduction explains hypotheses, moving from necessary consequences that may be tested. Induction is the testing of hypotheses, which evaluates the value of the hypotheses.¹⁰

A.i.(a). Sign Models

Ferdinand de Saussure and Charles S. Peirce first proposed the science of semiotics in the late 1800s, early 1900s. Each individual established a model to define a sign.

Saussure's approach is very language centered and dyadic. His two-part model has a signifier, the word, and the signified, a concept. Figure 3 displays the Saussure sign model. Essentially, the signifier and signified unite in the human brain as a sign.¹¹ For example, when an individual hears the word apple, the brain equates the word to the image of an apple. The signifier is the word apple and the signified is the image of an apple. Semiotics has shifted away from the Saussurean classification of sign systems toward the exploration of the production of signs and meanings.¹²

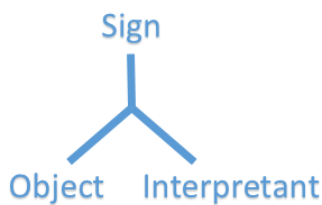
Figure 3: Representation of the Sign model created by Ferdinand de Saussure



While Saussure was developing his model for semiotics, in the United States, Charles Peirce independently developed a triadic or three-part model. He defined the relationship between sign, object and interpretant.¹³ The sign is the intermediary between an object and interpretant where the sign signifies the object and links to the interpretant, which is an additional sign that stands for some aspect of the object. Compared to Saussure's model, the sign or representamen is similar to Saussure's signifier while the interpretant is similar to the signified. However, the interpretant in Peirce's model has a unique quality because it is itself a sign in the mind of the interpreter.¹⁴ Anything can be a sign, object or interpretant, therefore the context in which they occur is critical to

understanding the role of each. The sign or representamen is the form that the sign takes, such as a written word. The actual sign is the entire ensemble of the object, representamen, and interpretant. It is important to understand that our experiences are mediated through signs and since signs represent objects, but are not the object, our understanding is incomplete. Our reality is our current understanding based on what our own sign process reveals.¹⁵

Figure 4: Basic sign process created by Charles S. Peirce



The diagram in figure 4 highlights the three elements that are necessary for the sign process to occur. This figure merely illustrates a basic sign process. Multiple interpretants can exist for any object or sign, which Umberto Eco calls “unlimited semiosis”.¹⁶ Additionally, an initial interpretation can be re-interpreted.¹⁷

In discussing the sign process, it is important to highlight Peirce’s classification regarding ways in which a sign can stand for an object. An icon, index, or symbol represent potential aspects of the sign process.¹⁸ A sign that resembles or imitates an object can be an icon. Examples include maps, images, and algebraic expressions. The similarity between an object and icon can be visual or by some other resemblance.¹⁹ An index refers to a link between the sign and object. The link between an index and object is a casual link rather than only a similar relationship like the icon. The actual relationship that exists between an index and the object means the object affects the sign. For example, the height of mercury in a thermometer is an index of temperature or the

sign of smoke is an index of fire.²⁰ Finally, when signs refer to objects through law, rule, or convention it is classified as a symbol. The most common example is language, where words, sentences, paragraphs represent an object because of a defined system. For example, the word dog is understood to mean a domesticated four-legged animal. Symbols can be arbitrary in that they have no similarity or casual relation to the objects they represent.²¹ Since symbols do not need to have a link to the object, the sign can be interpreted in unlimited ways.²² Regardless of the classification of a sign, it is crucial to remember that a sign represents an object in some fashion, but it is incomplete. The sign and object are not equivalent otherwise; the sign would be the object. Since signs are incomplete equivalencies that represent other things, a system of signs act as codes for some system of objects.²³ Again, it is important to note that a sign can have multiple interpretants. The interpretation is based on an individual's belief system.²⁴

A.i.(b). Belief Process

Educator and semiotician, Donald J. Cunningham defines semiotics “as a way of thinking about the mind, and how we come to know and communicate that knowledge.”²⁵ By focusing on semiosis, Cunningham states, “the idea of building up sign structures to represent experience raises the metaphor of the mind as a laboratory or perhaps a construction engineer. The focus now is not on what is constructed but on the construction process itself; not knowledge, but the process whereby something can become known; not *what* we know, but *how* we know it.” Consider how individuals react to political stories in the news. After the 2016 presidential election, Facebook was heavily criticized for the fake news stories the company allowed to be freely shared and promoted across the platform. Many people complained the information was false, yet readers believed the information. This example exemplifies the process of how someone

comes to believe something. The fact that the information was false turned out to be irrelevant. The fake news outlets were able to use a medium, Facebook, which readers believed and trusted. The false news outlets could control the story by manipulating the process of how readers receive the information. Based on the individual's beliefs, if the story aligned with their current belief system it was accepted as true and the individual never went through a process of genuine doubt to determine the authenticity of the information. Although the stories were fake, they aligned with the previous beliefs and allowed the person to confirm their belief based on falsehoods. For a different individual the same story was believed to be false and the content was ignored. In this example, the same story or same sign was interpreted differently based on the individual's belief system. An individual's belief system is personal and complex allowing signs to be interpreted in multiple ways.²⁶

Rhizome

Within our conception of cognition as semiosis, there is the acknowledgement of the incredible variety of signs. Semiosis spreads and is perpetual through a network of interpretants that Eco described as unlimited semiosis.²⁷ In addition, this complexity or unlimitedness of the network of signs, objects, and interpretants has been described as a rhizome.²⁸ A metaphor used to describe an individual's overall beliefs, our sign structures, is that of the mind as rhizome. A rhizome commonly describe plants with root structures that include buds, nodes, and scale-like leaves.²⁹ Seven characteristics describe a rhizome: dynamic, heterogeneous features, infinite connections among features, does not need to be hierarchically organized, cannot be ruptured, no inside or outside, and multiple entrances.³⁰ When thinking of the mind as rhizome, it is dynamic in that it is continuously growing, changing, modifying, and increasing connections. Heterogeneous

features refers to the dimensions to knowledge. When someone is learning something, he/she does not merely learn that specific thing, but rather learning includes attitudes, emotions, and so on. The third characteristic of the rhizome is that it has infinite dynamic connections that are able to constantly change. The rhizome is a structure that can never be broken because should a connection break, it begins anew or creates a new connection. While the rhizome is a branched structure there does not need to be a hierarchy, but artificial hierarchies may exist. The characteristic that there is no outside to the rhizome exists because each of person is within the dynamic system. Additionally, multiple entrances refers to the Umwelt described by von Uexkull in 1957 where the rhizome is described by an individual's view and each individual has a personal view.³¹

Lebenswelt

As mentioned previously, the Umwelt is an organism's particular rhizome or "real" world. German ethnologist, Jacob von Uexkull, described the Umwelt. The Umwelt describes an organism's behavior based on the organism and the experience of the organism in a given environment. The Umwelt of an organism represents the joint relation of the organism and the environment. In an example by von Uexkull, he describes the numerous Umwelten created by a tree. It is a rough terrain for a bug, a set of limbs for a nesting bird, and playful form for a young child. This example shows that the environment of the tree remained the same, but each organism had their own uniquely different experience.³² For a human, the Umwelt is referred to as the Lebenswelt. This includes biological, physical, cultural, and semeiotic factors. The Lebenswelt is different from the Umwelt because humans have the ability to manipulate signs and create an infinite number of meanings or unlimited semiosis. It has been argued that the construction of beliefs in a rhizome structure allows individuals to more easily navigate

the world.³³ Through reasoning and making inferences, humans are able to shift their Lebenswelt or set of beliefs in order to successfully negotiate daily living.³⁴

Beliefs

Individuals reason as to how their world works, how it fails to work, and how they should or should not act based upon the successful and unsuccessful negotiations of daily life. These reasoned inferences are rooted in the individuals' interconnected beliefs about the world, which in turn comprise a rhizome-like knowledge structure.³⁵ Since our beliefs, sign structures, are part of an interconnected rhizome, they are not separated from other beliefs, ideas, attitudes, or emotions. Our base state of cognition is a set of beliefs through which we make sense of the world.³⁶ In the 1877 article, *The Fixation of Belief*, Charles Peirce stated, "Our beliefs guide our desires and shape our actions".³⁷ Beliefs are at the core of reflexive and customary decisions of practice that are often set in motion with the best of intentions. Belief invokes a calm feeling.³⁸ An individual's beliefs are the sign structures one has created over time. If one undergoes a sign structure change then a belief structure change occurs. The only way for a change to occur is when someone is open to doubt.

Doubt

Peirce proposed that we create or accept new beliefs when we are in a condition of inadequacy that he called "genuine doubt".³⁹ This state of genuine doubt arises from experience; hence, it is naturally imbedded in a relevant context or situation. Being in a state of genuine doubt can be uncomfortable, painful, and irritating and therefore can compel individuals to create new beliefs or alter existing beliefs to move to or establish some new state of belief.⁴⁰ Genuine doubt is different from Descartes' notion of skepticism or Cartesian doubt, which Peirce viewed as "pretend" doubt or paper doubt.⁴¹

Peirce believed that Descartes never truly doubted anything that he did not plan to restore. An example is Descartes' skepticism about the existence of God. He never stopped using his method of skepticism until he could claim the necessity of the existence of God. Peirce defined the struggle and process to attain a state of belief as inquiry.⁴² It has been argued that Descartes was never truly doubting or inquiring.⁴³ According to Peirce doubt must be felt. It is not merely writing down on paper the opposite of what a person believes, which is merely self-deception. Additionally, genuine doubt is not a decision as Descartes describes in the *First Meditations*. Pretend doubt is a voluntary act whereby an individual decides/pretends prior judgments or beliefs are false. Peirce argues this is a backward state of inquiry because all efforts are focused on demolishing prior beliefs, which hinders the ability to truly resolve doubt. Genuine or true doubt comes when a person experiences discomfort because an experience does not align with their initial beliefs. Inquiry is aimed at re-fixing belief.⁴⁴

Doubt Fixation

Peirce proposed four methods through which we can fix beliefs/resolve doubt: tenacity, authority, a priori, and experiment.⁴⁵ Tenacity is a method of holding on to original beliefs even in the face of doubt. This method does not resolve the doubt, but is the process of holding on to the belief and believing all others are wrong. The second method of authority resolves doubt by accepting the opinions of others who have 'authority' over the subject. For example, professors, priests, and parents are considered authority figures, but books, movies, peers, and so on can also act as an authority to resolve doubt. The method of authority is used in the educational model where teachers provide information to students. The a priori method aims to resolve doubt by trying to find a connection between a person's current understanding and the new information that

raises doubt. Therefore, the doubt is influenced by the individual's beliefs. The fourth method, known as experimentation, is the one Peirce preferred. In Peirce's experimentation, one seeks to remove doubt by collecting more and more observations, generating potential hypotheses to account for experience and, finally, reaching a conclusion based upon an inferential process. Experimentation entails skepticism, openness to alternatives, discernment, negotiation, cooperation, and compromise to fix or stabilize beliefs.⁴⁶ Experimentation involves searching for contributing factors to a concern. It is a systematic and intentional inquiry to determine the nature of the concern and underlying issues. Instead of merely reacting through a quick correction, experimentation is a process to reflect and learn.⁴⁷

The earlier example about Facebook and false news articles exemplifies the use of authority to resolve doubt instead of experimentation. For an individual who may have begun to enter genuine doubt regarding the news stories, the doubt was resolved according to what Peirce classifies as authority. Facebook was considered an authority, thus individuals never used experimentation to resolve doubt. Had experimentation been implemented the validity of the information could have been confirmed or refuted which would have differently affected the individuals' belief structure. After the election, numerous questions arose about whether Facebook had an ethical responsibility to remove the links to the fake news articles. While arguments can be made for either side of the Facebook argument, a more important aspect should place the responsibility on the reader. This example demonstrates the importance of using the method of experimentation to resolve doubt.

A.i.(c). Reasoning Types

Genuine doubt arises when a functioning habit is interrupted. Nothing can undergo

scientific investigation until a belief-habit (stable sign structure) is interrupted. Once an interruption occurs, the goal is to arrive at a new stable belief-habit. This process of resolving genuine doubt is inquiry. Peirce went on to describe three types of reasoning as three stages of inquiry.⁴⁸ When doubt occurs individuals must go through a reasoning process, which allows the belief, and thus sign structure to change or be confirmed. In argument formation or logic, deductive and inductive reasoning are common modes of reasoning. Peirce proposed a third method of reasoning termed abduction.⁴⁹

Peirce stated,

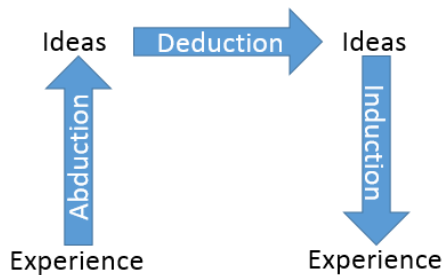
“Deduction is the only necessary reasoning. It is the reasoning of mathematics. It starts from a hypothesis, the truth or falsity of which has nothing to do with the reasoning; and of course its conclusions are equally ideal. The ordinary use of the doctrine of chances is necessary reasoning, although it is reasoning concerning probabilities. Induction is the experimental testing of a theory. The justification of it is that, although the conclusion at any stage of the investigation may be more or less erroneous, yet the further application of the same method must correct the error. The only thing that induction accomplishes is to determine the value of a quantity. It sets out with a theory and measures the degree of concordance of that theory with fact. It can never originate any idea whatsoever. No more can deduction. All the ideas of science come to it by way of Abduction. Abduction consists in studying facts and devising a theory to explain them. Its only justification is that if we are ever to understand things at all, it must be in that way.”⁵⁰

Abduction proposes or creates hypotheses. Deduction explains hypotheses, moving from necessary consequences that may be tested. Induction is the testing of hypotheses, which evaluates the value of the hypotheses.⁵¹ Semiotician Douglas Anderson states,

“Deduction adds nothing new to thought. It merely works out the limits of a closed

system. Both abduction and induction add something new by providing possible or probable knowledge about an undetermined future.”⁵² Deduction is an explicative type of reasoning while the other two are ampliative.⁵³ As Peirce noted in the above statement, scientific creativity must begin in abduction. Therefore, he proposed that abduction serve as the foundation of scientific inquiry.⁵⁴ These reasoning methods can be embedded within the definition of semiosis. Each type of reasoning describes how an individual puts all the pieces together. Cunningham stated, “Semiosis is a process of applying signs to understand some phenomenon (induction), reasoning from sign to sign (deduction), and/or inventing signs to make sense of some new experience (abduction).”⁵⁵ Figure 5 provides a visual display of the interactions between ideas and experiences according to the reasoning type.

Figure 5: Interaction of Experience and Ideas according to the Reasoning Models



A.ii. Abduction

Abductive reasoning is unfamiliar to many, yet it is a common reasoning process in practice. When a person encounters an experience that cannot be sufficiently explained by existing knowledge, sign structures, abduction arises because there is doubt.

Abductive reasoning refers to the creation of new ideas and deals with potential or possibility. Signs are used to make sense of a new experience that cannot be explained by the current belief structure.⁵⁶ The method of discovering hypotheses is abduction according to Peirce.⁵⁷ Six modes of abductive reasoning have been identified and refined

from Peirce. The six abductive reasoning modes are Omen/Hunch, Symptom, Metaphor/Analogy, Clue, Diagnosis/Scenario, and Explanation.

In forensic science and healthcare when the best forensic investigators or medical doctors start cases, they are in genuine doubt and are compelled to use the skill of experimentation through abductive reasoning. Resolving doubt through experimentation allows a forensic scientist or healthcare practitioner to examine their personal belief system. Trying to understand one's personal beliefs is hard because resolving doubt is uncomfortable and energy intensive. Yet belief maintenance is critical so that these professionals can be lifelong learners and practitioners.⁵⁸ As an investigative case is developing, the inferences made, and abductive scenarios created all reside in a context that has ethical implications (e.g., common good, justice) to it. Another way to discuss this is the individual's *Lebenswelt*⁵⁹ and how the inference making process in that *Lebenswelt* is ethical. A brief example of this complex rhizomatic context is a murder case in Wisconsin where the forensic examiner clearly interpreted the results correctly (identified a contaminated DNA sample), but then stated this was not a problem related to interpreting the piece of evidence (ethical inference making issue).⁶⁰

A.ii.(a). Peirce's Abductive Reasoning

To understand the pivotal role of abductive reasoning, it is important to understand Peirce's broad remarks on the topic. His interpretation of abduction developed over 50 years.⁶¹ Peirce viewed Aristotle's *apagogue*, as the source of his view of abduction. He claimed that abduction is a method, but also has a logical form. By working through Aristotle's discussion of *apagogue*, Peirce establishes abduction as a type of reasoning with a logical form that is also a lived process of thought.⁶²

The formal logical abduction schema was presented in 1903 in Peirce's Harvard Lectures:

The surprising fact, C, is observed:

But if A were true, C would be a matter of course,

Hence, there is reason to suspect that A is true.⁶³

In another example, Peirce compares the form of deduction to abduction. In deduction, an argument takes the following form:

Rule – All the beans from this bag are white.

Case – These beans are from this bag.

∴ Result – These beans are white.

The corresponding abduction form is:

Rule – All the beans from this bag are white.

Result – These beans are white.

∴ Case – These beans are from this bag.⁶⁴

In abduction, the hypothesis or guess is made that the handful of beans were possibly taken from that bag. It is important to note that although it is not specifically stated in the example, it is implicit that the statement refers to the potentiality of the beans possibly coming from the bag. Therefore, the example should state, "These beans are potentially from this bag."

When examining Peirce's writings on abductive reasoning they may appear fragmented and lacking a unified thought, but this point is often over exaggerated. It is important to recognize that Peirce's logic is the foundation for the rest of his philosophy. Additionally, in his scientific nature he pursued different hypotheses, which resulted in

varied terminology between papers. Finally, his thoughts on abduction should be examined according to their evolution.⁶⁵ Like the three broad categories of reasoning, his interpretation of abduction also follows three categories. First Peirce describes abduction as a way to generate new theoretical discoveries. A second interpretation views abduction as a method to justify beliefs regarding the probable truth of theories. Finally, a third examination of abductive reasoning relates the pursuitworthiness of theories independent from the truth-value assessment of the theory.⁶⁶

The first category, Generative Interpretation, is founded on explanations Peirce wrote in his “Lectures of Pragmatism” in 1903. Peirce wrote, “abduction consists in studying facts and devising a theory to explain them”⁶⁷ and “abduction is the process of forming an explanatory hypothesis.”⁶⁸ According to this interpretation, an explanatory hypothesis is one that an individual guesses, yet requires future testing. However, it is not merely an unfounded guess; rather the individual first examines some data then develops hypotheses. Peirce expounded on this by writing that although trillions of possible hypotheses might be developed, usually a scientist develops a correct hypothesis after less than a dozen guesses.⁶⁹ The second category is the Justificatory Interpretation, which establishes abduction as a type of inference that leads one to think that the hypothesis is more likely to be true than other alternatives. It can be argued that the interpretation confuses abduction with induction, which Peirce states as the concluding step while abduction is the preparatory step.⁷⁰ Peirce recognized the problem of confusing abduction and induction, but never feared confusion between deduction and abduction.⁷¹ The third category and least analyzed is the Pursuitworthiness Interpretation. Here abductive reasoning occurs between the initial proposal of hypotheses and the later experimental

confirmation. No longer is the correctness of the hypothesis considered, instead judgments must be made regarding whether the hypothesis is worth further investigation and development.⁷² Peirce's reflection on abduction spanned fifty years and likely explains the span of his ideas. It can be argued that the three interpretations present an overall picture of scientific methodology instead of inconsistencies.⁷³

A.ii.(b). Modes of Reasoning

Further understanding of abduction requires an elaboration of Peirce's reasoning types. Shank and Cunningham have elaborated Peirce's types of reasoning by identifying six modes of abduction, one mode of deduction, and three modes of induction.⁷⁴ Each of the modes described refers to a type of sign. All the reasoning types will be discussed while providing general examples.

Abductive Reasoning

Abduction is unfamiliar to many, yet it is a common reasoning process in practice. When a person encounters an experience that cannot be sufficiently explained by existing knowledge, sign structures, abduction arises because there is doubt. Abduction refers to the creation of new ideas and deals with potential or possibility. Signs are used to make sense of a new experience that cannot be explained by the current belief structure.⁷⁵ The method of discovering hypotheses is abduction according to Peirce.⁷⁶ Six modes of abductive reasoning have been identified and refined from Peirce. The six abductive reasoning modes are Omen/Hunch, Symptom, Metaphor/Analogy, Clue, Diagnosis/Scenario, and Explanation. An example using an archeologist will be used to explain each of the abductive reasoning modes.⁷⁷

1. Omen/hunch (Rhematic Iconic Qualisign). An omen is an abductive inference that allows for the possibility of a possible resemblance where initial observations may serve as future evidence. Here an archeologist might guess that examining the banks

of an ancient river bend might lead her to an artifact.

2. Symptom (Rhematic Iconic Sinsign). A symptom actually deals with possible resemblances where prior experience is often involved. For example, the archeologist finds a smooth stone. Not knowing whether the stone is natural or man-made, the archeologist must make an inference.
3. Metaphor/Analogy (Rhematic Iconic Legisign). This type of inference manipulates the resemblance to create or discover a possible rule. Here the archaeologist may be struggling to explain the collected artifacts with the social structure of the culture being examined. A method to help resolve the conflict can be considering how this discrepancy would be solved in a contemporary culture.
4. Clue (Rhematic Indexical Sinsign). A clue involves possible evidence that our observations do or do not support some more general phenomenon. It indicates some past state of affairs or circumstances. Suppose the archaeologist finds a mound on pottery shards next to numerous smooth stones. Is there a connection or merely coincidence? The archaeologist looks for some physical connection between the two. She may hypothesize that the stones were used to break the pots for a reason not yet known.
5. Diagnosis/Scenario (Rhematic Indexical Legisign). This type of inference creates a plausible scenario from the body of clues. Individual observations are assembled as potential scenarios. As the archaeologist further examines the shattered pots, she notes they are placed in a shallow pit with smooth stones organized around the edges of the pit. She uses these individual observations to build up to a potential scenario. Maybe the pots were broken during a burial ritual.
6. Explanation (Rhematic Symbolic Legisign). Reasoning to the best possible explanation in order to explain many individual pieces of evidence and a number of alternative scenarios into a single coherent explanation. Explanation becomes the

basis of inductive testing and deductive explanations. Now the archaeologist wants more than a single scenario. She wants a rule to summarize multiple pieces of evidence and alternative scenarios into a single coherent explanation.

Inductive Reasoning

Peirce defines inductive reasoning as the method of testing hypotheses.⁷⁸ Induction is the method of applying signs to understand some phenomena.⁷⁹ In forensic science, induction is the common reasoning mode. For example, a DNA sample is submitted to the laboratory and it tested to determine if it matches the suspect in the case. Three modes of induction have been elucidated from Peirce's work. Induction deals with testing to determine the actuality.⁸⁰

1. Identification (Dicent Indexical Sinsign). In scientific work, this is termed construct validation to test if an observation is an instance of X, where X is already assumed. Here the archeologist might test whether the multiple sites examined have characteristics to confirm her abduction about the breaking of pots as a burial ritual.
2. Prediction (Dicent Indexical Legisign). This can be thought of as hypothesis testing. This type of induction reasons from actual evidence of a probable rule. When evidence is linked in some type of relationship, observations can test the veracity of the relationship. The archeologist may predict that another culture with similar social structures has a similar ritual.
3. Model Building (Dicent Symbolic Legisign). If a probable conclusion based upon rules or set of rules develop from inductive test then models are formed. In a scientific framework, this is referred to as convergent validity. The archeologist can build explanatory models across a variety of cultures.

Deductive Reasoning

Deduction is a type of reasoning by which conclusions are reached based on formal rules. This is referred to as formal reasoning or argument symbolic legisign. Deduction

focuses on rules and regulations. Deduction is the method of reasoning from one sign to another sign.⁸¹ Continuing with the archeologist example, she may connect prior hypotheses for further inductive and abductive reasoning. Might human remains be found at the same site or are burial rituals performed at a different location than the actual remains?

In summary, the ten modes of reasoning are based on the trichotomies of signs. They are based on different signs and quality of signs.⁸² When viewing the world through a semiotic lens the interaction of all these parts can be understood. It starts with identifying a sign. Next an individual's current belief structure interacts with the belief structure. Should the interpretant of the sign leave an individual in genuine doubt the individual must resolve that doubt. For example, using tenacity or experimentation. Through experimentation, a person can employ the three different types of reasoning methods or inquiry in order to propose, deduce, and test new theories and their practical consequences.⁸³

B. Examples Related to Investigations

This chapter also highlights case study comparisons that explore how the reasoning method utilized can influence an investigation. Sexual assault and homicide investigations were investigated from a reasoning perspective to determine if investigators tend to follow an abductive model of reasoning. A content analysis was performed to identify the reasoning processes that occur in a criminal investigation. The analysis revealed that a reliance on deductive reasoning led to errors and ultimately a wrongful conviction. Employing abductive reasoning and Peircean experimentation explained the reasoning process employed by good investigators who worked through

doubt and tested their explanations. The findings of this study identify the contribution of ethical reasoning skills in forensic science.

The purpose of this research was to examine investigations from a reasoning perspective to improve forensic investigation education. Peircean semiotics, specifically, abductive reasoning provides a unique and powerful way to educate forensic students in the area of reasoning and decision points. The research aimed to determine if investigators tend to follow an abductive model of reasoning.

B.i. Case studies

This research examined investigations from a reasoning perspective to identify ethical reasoning skills forensic investigations. Peircean semiotics, specifically, abductive reasoning provides a unique and powerful way to educate forensic students in the area of reasoning and decision points. Do investigators tend to follow an abductive model of reasoning? The method for this research is a case study approach.⁸⁴ Three criminal investigations are used in this study. The first one, the murder of Jeffrey Farkas, is a well-known homicide case and has been featured on the show *Ice Cold Killers*. The second, the Dutch Case of the Ball Point Pen Murder is also well known because of the strange series of events as the case moved through the legal system in the Netherlands. The third is a more recent case of serial robberies and sexual assaults that occurred around Pittsburgh, PA.

The purpose of this research was to examine the reasoning processes that occur in criminal investigations in comparison to a model of abductive reasoning in an effort to identify the contribution of ethical reasoning skills in forensic science. In addition, the abductive modes create a concrete framework that students do not normally receive during their training. With the interviews and document research, the modes do not fall in

a linear fashion. In the Dr. Farkas case, the explanation of who the murder was fell apart twice during the investigation as more information was gathered and new scenarios had to be built. As demonstrated briefly in the results, there is an interaction or reciprocal nature to abduction during the scenario development process leading to explanation.

The data for the Dr. Jeffrey Farkas case involved an interview with the Commander of Homicide who was in charge of the case. In addition, publicly available Court documents, transcripts of a lecture discussing the murder, and a television show transcript of the case were used in the analysis.⁸⁵ Court Documents for the Dr. Farkas Case can be found at <https://ujportal.pacourts.us/DocketSheets/CP.aspx> using docket numbers CP-02-CR-0000080-1990 and CP-02-CR-0000106-1990. Newspaper articles related to the case were found on the Pittsburgh Post-Gazette archive site by searching for the articles “Jury Deciding Fate of Doctor’s Killer” and “Intern’s Killer Gets Life in Jail.” For the Ball Point Pen case, publically available documents along with several research articles related to the case were used for the analysis.⁸⁶ The serial robbery and sexual assault case involved an interview with the lead detective, court documents, and newspaper accounts. The analysis is a matching of content, i.e., content analysis, to a priori categories of the six modes of abductive reasoning. The narratives of each case indicate the modes of reasoning described by the Shank-Cunningham model.⁸⁷ Additionally, results are placed in chronological order to reveal how a case unfolds from the investigation perspective. This research received Duquesne University Institutional Review Board approval before interviews were conducted with the detectives of the Farkas and serial robbery case.

Case 1: Farkas Case Overview

Dr. Jeffrey Farkas was a 26 year-old pediatric intern at Children’s Hospital in Pittsburgh when he died on December 6, 1989. A roommate returning from a hospital

rotation at approximately 4:16 a.m. found Dr. Farkas and by 5:00 a.m. the homicide team, 4 crime scene investigators, and the Homicide Commander were on scene. Initial clues at the scene were a wallet with its contents scattered on the living floor as well as additional items scattered in the living room. The victim was found in the upstairs bathtub with a cord tied around his neck using a non-traditional knot and his eyes were stabbed out. A wood mask with its eyes stabbed out was also in the bathtub and the toilet tank was broken and out of place.

Based on these clues the police began creating analogies based on strong resemblances to other cases. First by the look of the victim, his neck was probably broken. The damaged toilet tank indicates it was used as a weapon. Additionally, the presence of a hand iron indicates it was used as a weapon. At this point, the investigators have a hunch that the person of interest has committed previous crimes. The stabbed eyes symbolize “I will not be identified.”

Just after 5 a.m. and the entire homicide group was called in along with Mobile Crime Unit. The Allegheny County Medical Examiner lab sends technicians (as described by Homicide Commander, “real scientists helping with the process”). Additional clues were identified. The victim’s car is missing and two size 13 shoe impressions were found in the yard in the snow. The impressions measured size thirteen shoes and a cast of the shoe-print was made. At this point in the investigation, the Homicide Commander remembers there is an alternative light source (ALS), a tool that might help them identify evidence. The ALS is in New Jersey. The Commander calls NJ at 5:19 a.m. and at 5:22 a.m., PA state police head out to get the NJ officer with the ALS tool.

The process proceeds with interviews of the housemates and officers begin to review every report at the local police precinct for past year looking for any clue or similarity in previous cases. A command post is setup at the house next door and canvassing the neighborhood begins. When talking to neighbors, another clue is revealed. Two witnesses remember seeing a large African American male asking for Cindy the night before and the individual tried to open their door. The witnesses state that the man is 6'7" or 6'8". Investigators form an analogy based on previous cases. Police believe the man is not that tall because people tend to exaggerate height especially when stressed. At one of witnesses' house an identical footprint impression was found which is another clue.

At 7:44 a.m., the victim's car was found in nearby Homestead. CSI processes vehicle and finds a clue of matching footprints near the car. By 8:57 a.m., the NJ Trooper and ALS machine arrive at the Command Post and by 9:16 a.m., further processing of the house begins. At 9:23 a.m., FBI behavioral unit is called and FBI profiler agrees with "Hunch" from the stabbed eyes and says to get the person, the person will do this again. By 11:20 a.m., 21K dollars for a reward had been collected and the media is briefed. Investigators continue to process and collect evidence in the house. A new clue is found in the bathroom. A fresh fingerprint is found which didn't match the victim. It is a "half print" which leads to a hunch that the half-print is due to someone wearing a band-aid. Although the print did not match the victim, 112 people had been in or had access to the house and need to be eliminated or not.

The police started receiving tips from other police departments and the public. The first tip came from Homestead Police stating it may be an individual with a long criminal history. The investigators tested his alibi and confirmed the fingerprint didn't match.

Another clue from public identified another individual who matched the physical description and had a girlfriend named Cindy. Again investigators tested the clue by confirming his alibi and determining that the shoe size did not match. Three days after the initial crime scene was processed, the scene was re-evaluated. At this point a new clue is discovered using the alternate light source (ALS); a shoeprint with details is on the toilet lid. The investigative team obtains the same style of shoe from the manufacturer.

Eyewitnesses from earlier are re-questioned to confirm height. This is a testing of the hypothesis that height is exaggerated, which is moving into the inductive reasoning stage for Peirce. An African American police officer was brought to the witnesses' doors in a simulation of what happened and they stacked phone books. The eyewitnesses all said at 6'8" the officer is the correct height. The scenario at this point is a tall individual with a criminal history.

On day 7 of the investigation, the fingerprint is loaded into the "new" AFIS (Automated Fingerprint Identification System) after being driven to Washington, D.C. from Pittsburgh. A match is found. Then an Allegheny County parole officer is called about William Yarborough whose print is matched to the half-print found. He is 6'8". The suspect was arrested while working at a fast food restaurant. His shoes were collected as evidence. The shoes matched the prints left at the scene and had some blood on them. Yarborough confessed to the murder of Jeffrey Farkas. As the history of the case demonstrates, it was solved quickly and 364 days later, the convicted murderer, William Yarbough, was sentenced to life in prison.

Case 2: Ball Point Case Overview

On May 26, 1991 at 14:10 police in Leiden, The Netherlands, received an emergency call from a man saying he just found his mother dead. Arriving on the scene, they found a 53 year-old woman face down and a few drops of blood on the rug and on her clothes. Because of the nature of her death, an autopsy was performed. The autopsy uncovered a fully intact Bic ball point pen in her head that had entered through her right eye.⁸⁸ Police investigated the case as a homicide and believed the son committed the murder.

After the pen was found in the mother's head, police started a homicide investigation. Thus, they began with an explanation and worked backwards in a Peircean reasoning sense. There was one clue used to support this explanation. The pen was a black ink ballpoint pen and the woman preferred using felt tip pens and never used a ball point pen. Subsequent interviews with family, friends, neighbors, and related aspects, such as alibis were complete and nothing was found to support a murder. Two experts, one in clinical forensics and an ophthalmologist both said it was an accident, rare but classic. Police still considered it a murder, but in August 1992 the case was suspended.

Four years later, a Hall Porter from the son's secondary school read about the "Ball Point Murder" and said he remembered some students talking about the perfect murder using a cross bow and a ball point pen. The son was one of the students. Then a second informant, the son's therapist said he confessed to the murder during a therapy session and she was worried he would kill again. The police considered this information to be clues that supported their explanation that the mother was murdered. The son was arrested and in October 1995 the District Judge sentenced the son to 12 years in prison based primarily on a closed-door discussion between the judge and the therapist.

An appeal occurred. Experiments were conducted with cross bows and pens. These experiments showed the pen breaking apart, which did not align with the victim's wound. The therapist was re-questioned this time with the defense attorneys present. Given the new clues, the explanation of the son being the murderer was no longer supported and the son was exonerated.

Case 3: Robberies and Sexual Assaults Case Overview

In January 2012, a series of robberies and sexual assaults began on January 7th. The first victim was a female in her early fifties who was returning home after a night with friends at the local casino. The assailant entered her home shortly after she arrived and followed her upstairs where he robbed her of her valuables and raped her. After he left, she drove straight to the police. Based on the clues from the victim, the inference or basic scenario police developed was this incident is a single assault case. Some of the first clues in the case are the theft and the statement that the assailant was not going to rape the individual, yet still did.

On the same morning, a second robbery and rape occurred where a female in her twenties had been out walking her dog and her dog jumped on the assailant. After she apologized, she went to her apartment and as she entered the apartment, the door was pushed opened. He had her disconnect her modem, took her credit cards and debit cards, and asked for passwords. She asked if he was going to rape her, he said no. Then he tied her up with duct tape and raped her twice in the living room. Based on the timing of the incidents the police do not believe it is a serial rapist at this point, rather this is a new scenario.

A third rape occurred on January 9th. A woman was out walking her dog and came back home to hear her alarm clock going off. She was mad because she has a baby and wondered why her fiancé had not turned it off. As she went upstairs, she found the assailant in her bedroom and her fiancé tied up. The fiancé had woken up when he heard someone in the room and thought it was the female back from the walk. He was tied up with packing tape, which was not working so the assailant found duct tape in the residence and used that. As he was telling the woman to hand over money and to turn the television up full blast, she took off her engagement ring and threw it under the bed. He took her into the baby's bedroom and told her he would not rape her because he also had a kid, and then proceeded to rape her in front of the baby. After the assault he noticed the ring was gone, and made her retrieve it. A woman in the apartment complex saw the assailant in the parking lot running to a dark blue Ford Expedition. When she got to work, she saw the news about the assault and called 9-1-1.

At this point, multiple police agencies from multiple townships are involved and investigators start to consider a single assailant is the perpetrator in all the cases. This thought is classified as a symptom based on the resemblance of the cases. At the apartment complex where the 3rd assault occurred a police officer set up an information gathering road-block and started asking everyone entering and exiting questions about a blue ford expedition. During this roadblock, an officer asked a male and a female in a Blue Ford SUV to wait because other officers might want to talk with them. The male in the vehicle said he had already talked to officers and was just leaving. The officer let them go. This is a case where simple inferences, that are not checked, can create

problems later. The officer did write down the individual's name and the license plate of the car, which provided a clue.

Another clue came from an anonymous phone call from a former resident of the apartment complex of the last rape and said he recognized the car description. Police responded to the apartment complex and found the vehicle.

At about the same time, a different township called because they had a strong-armed robbery case. A man returning from the casino was assaulted and robbed. The person who was robbed realized he knew the assailant as a fellow poker player and gave the police his name and poker name. A potential individual was considered a suspect because he was part of a gang and was known by the poker name that was given to police.

Given those pieces, they decided to get the surveillance videos and saw a dark blue ford expedition at the building of the robbery, from a road by the apartment complex of the first victim, and the casino parking lot. Now there is an explanation with evidence in enough detail to get a search warrant. The suspect was convicted and sentenced to 122 years in prison.

B.ii. Analysis of Cases

The purpose of this research was to examine the reasoning processes that occur in crime scene investigation in comparison to a model of abductive reasoning in an effort to improve forensic science education. In addition, the reasoning modes create a concrete framework that students do not normally receive during their training.

Comparing the reasoning across cases based on the interviews and document research, the modes do not fall in a linear fashion. In the Dr. Farkas case, the explanation of who the murder was fell apart twice during the investigation as more information was gathered and new scenarios had to be built. As demonstrated briefly in the results, there is

an interaction or reciprocal nature to abduction during the scenario development process leading to explanation. In these cases, early explanations that do not go back and focus on the evidence at hand appear to be the most problematic. If the focus is on just the explanation and going back to see how the data fit, much more deductive in nature, errors seem to occur. This is highlighted best in the Ball point pen case. The key part is to focus on the evidence you have and build from there. In the long run, reasoning errors build up over time propagating through the system over time and creating situations where the case cannot be brought to trial, creates a mistrial, or false negative-acquittal.

Alternatively, people may be wrongly imprisoned due to focus on the explanation. This is more than basic pattern searching, which can lead to incorrect inferences.⁸⁹ The key is the development of the pattern and then the testing of that pattern with new data (evidence). This type of Peircean experimentation is the skill set that needs to be developed and understood to be used to its fullest capacity during investigations.

In addition, good investigators, let doubt exist and work through it. Doubt is not a negative component of investigation. It can be harnessed and used to develop the explanation to test over time. To us, it is quite healthy during the process to let doubt exist and use it. Subsequently, good investigators also realize when they must test some piece current scheme or scenario they have as doubt builds. It is important to note these cases are post-hoc analyses on available documentation and interviews. They are not the in-situ or ecological moment of the investigators.

Semiotics describes how individuals interact with the world through signs. Further investigation of Peircean semiotics leads to the understanding of an individual's belief structure. When an individual is confronted with a situation that does not make sense

given their current belief structure they experience genuine doubt. In order to solve this doubt and update their beliefs an individual must use inquiry. The methods of inquiry are the three reasoning methods Peirce explains. Abductive, inductive, and deductive reasoning are methods to form new ideas, test them, and reason between ideas. The forms of reasoning can be described as the way individuals interact with the world through signs. The investigation examples demonstrate the importance of abduction to maintain ethical practices and the limitations of deduction.

In forensic science and healthcare when the best forensic investigators or medical doctors start cases, they are in genuine doubt and are compelled to use the skill of experimentation through abductive reasoning. Resolving doubt through experimentation allows a forensic scientist or healthcare practitioner to examine their personal belief system. Trying to understand one's personal beliefs is hard because resolving doubt is uncomfortable and energy intensive. Yet belief maintenance is critical so that these professionals can be lifelong learners and practitioners.⁹⁰ As an investigative case is developing, the inferences made, abductive scenarios created all reside in a context that has ethical implications (e.g., common good, justice) to it. Another way to discuss this is the individual's *Lebenswelt*⁹¹ and how the inference making process in that *Lebenswelt* is ethical. A brief example of this complex rhizomatic context is the murder case in Wisconsin where the forensic examiner clearly interpreted the results correctly (identified a contaminated DNA sample), but then stated this was not a problem related to interpreting the piece of evidence (ethical inference making issue).⁹²

The content analysis research demonstrates the reasoning processes that occur in criminal investigations and the importance of using abductive reasoning as a primary

investigative tool. This is more than basic pattern searching, which can lead to incorrect inferences. The key is the development of the pattern and then the testing of that pattern with new data (evidence). This type of Peircean experimentation is the skill set that needs to be developed and understood to be used to its fullest capacity during investigations. The next chapter explores the related work ongoing in forensic education with reasoning and decision points and the ethical consequences associated with them.

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Chapter 6: Educational Tools for Ethical Reasoning

This chapter applies the insights of the previous chapters to discuss the development of education tools created to foster ethical reasoning skills. This chapter emphasizes the importance of educating students on the use of improved reasoning skills in order to promote ethical behavior by describing how and why educational tools for fostering ethical reasoning skills in forensic science was created. Although the tools were developed with a forensic focus, a brief discussion of ethics consultations provides foundational bioethical content related to ethical reasoning. The skills required by ethics consultants are largely applicable to forensic scientists. Furthermore, ways in which the educational content can be adopted for individuals performing healthcare ethics consultations will be noted. This chapter will describe the development of the online modules and the in-class activity contained in the ethical reasoning curriculum. Additionally, preliminary results regarding the effectiveness of the modules to teach students about reasoning patterns and the connection between forensic science and ethical conduct will be discussed.

A. Creation of Education Tools Focused on Ethical Reasoning

Generally, ethics education is delivered in two fashions. One as “doctrinaire” or “imperative” where the goal of learning and teaching is to deliver the tradition of ethics content. The other form is “neutral” or “informative” which presents the information of all theories without placing any value judgment on the theories. Both teaching methods are devoid of reasoning or discussion opportunities. When teaching bioethics the focus of the teaching should be on deliberation.¹ Resolving ethical issues requires critical thinking skills. Improved ethics education is process oriented where students are able to justify decisions rather than thinking in terms of right and wrong answers.² A 2016 literature

review aimed to assess the feasibility of understanding the quality of current ethics education programs. The programs were evaluated according to the performance and effectiveness, as viewed by the students and educators. Each program's teaching scope, teaching method, and classroom model were analyzed. Only scholarly articles published between 2010-2015 were included in the review, which resulted in a total of 34 articles from all around the world.³ Overall findings indicated that students and educators support the necessity of ethics education, but the quality of current programs indicates a need for improvement. Quality could not be formally defined by the studies examined, but student and educator perceptions related to the performance, benefits, and shortcomings of current programs provided a broad framework for assessing quality. The author proposed three recommendations for improving ethics education. First, educators with a foundation in ethics education and experience should teach ethics courses. Next, a formal curriculum that integrates theory and case-based learning is recommended. Finally, in addition to teaching foundational ethics principles and codes, the education should enhance cultural competence.⁴

A.i. Goals/objectives

Reasoning skills are critical for effective and ethical decision-making.⁵ During ethics consultations proper reasoning skills are a core requirement.⁶ Educational tools utilizing problem-based learning were created to foster ethical reasoning skills in forensic science. Ethical reasoning is a diverse skill that applies to numerous disciplines.⁷ Successful resolution of ethical dilemmas requires proper reasoning skills. The first goal is to create online modules that improve ethical reasoning skills. The second goal is to ensure the content is accessible to an expansive audience rather than creating educational content strictly for a single classroom setting. The information is presented in various online

modules that can be shared across universities and organizations using the Open Learning Initiative (OLI) platform created by Carnegie Mellon University.⁸ Additionally, an in-class activity was developed to supplement the online content.

A.i.(a). Improved Ethical Reasoning Skills

The first goal is to develop improved material that uses problem-based learning where students can fully engage and cultivate enriched ethical reasoning skills. Within each module, specific learning objectives outline what the students will be able to do upon completing the module. Initially, the objectives are basic to ensure students fully comprehend the foundational content surrounding reasoning types and ethical principles. These learning objectives relate to declarative knowledge that students will gain. As the modules progress, the learning objectives focus on procedural knowledge. These advanced objectives focus on the student understanding how and when to apply different reasoning methods. Ethical reasoning is a critical skill desired by employers across diverse fields. Ethical reasoning skills are imperative for successful navigation of career challenges.⁹ Ethics education is beyond right and wrong. Ethics education can be categorized in three groups; predominantly theoretical, achieving ‘right’ answers, and understanding an ethical process. The first two categories are often recall based where students study theories and professional codes, but skill development is missing.¹⁰ Students need to be equipped with the skills to make ethical decisions.¹¹ An education tool focused on developing an individual’s ethical reasoning skills can be adapted to healthcare, forensic science or other disciplines. Creating the tool in an online module format increases accessibility. Additionally, following a problem-based learning pedagogy increases critical thinking and the development of ethical reasoning skills that focus teaching students an ethical process.

As Robert Sternberg outlines in a 2010 article, ethical reasoning can and should be taught.¹² Ethical reasoning differs from teaching ethics. Ethics refers to the principles that generally define right and wrong behavior. Ethical reasoning focuses on the way to think about issues related to right and wrong. He emphasizes the need to present students with ethical dilemmas that they must reason through. Sternberg identifies eight steps that encompass the skills necessary to reason with ethical principles through an ethical dilemma.¹³ Sternberg identifies the following steps: “Recognize that there is an event to which to react. Define the event as having an ethical dimension. Decide that the ethical dimension is significant. Take personal responsibility for generating an ethical solution to the problem. Figure out what abstract ethical rule(s) might apply to the problem. Decide how these abstract ethical rules actually apply to the problem so as to suggest a concrete solution. Prepare to counteract contextual forces that might lead one not to act in an ethical manner. Act.” Sternberg argues that this model can be applied when judging external situations as well as personal confrontations.¹⁴ This model can be further simplified into four necessary components for ethical decision making: problem-seeing, formulating judgments, motivation, and ethical action.¹⁵ Sternberg emphasizes the importance of teaching ethical reasoning through case studies. Case studies allow students to engage in active learning, by reasoning through different scenarios. The ability to solve ethical dilemmas across various scenarios teaches students how to apply the ethical principles. This is a significant difference from merely teaching a student what to do in certain situations.¹⁶ Ethical reasoning is a foundational skill that transcends all disciplines and is a universal life skill.

A national higher education organization, the Association of American Colleges and

Universities (AAC&U) lists ethical reasoning and action as an essential learning outcome.¹⁷ Ethical reasoning skills are imperative for successful navigation of career challenges. Surveys commissioned by the AAC&U report the learning outcomes most valued by employers. “Of 17 outcome areas tested, **written and oral communication, teamwork skills, ethical decision making, critical thinking,** and the **ability to apply knowledge in real-world settings** are the most highly valued by employers.”¹⁸ Only 30% of employers believe recent college graduates are well prepared in the area of ethical decision making, while 62% of students believe they are well prepared in this area. Given the high priority employers place on ethical decision-making this is a critical area where universities need to focus on improving education. Additionally, the discrepancy between employer and recent graduate’s belief in preparedness related to ethical decision making demonstrates that this skill is not properly learned.¹⁹

At James Madison University (JMU), an initiative is underway to teach ethical reasoning to all the students regardless of major. Citing the AAC&U essential learning outcomes as well as news headlines highlighting ethical dilemmas and misconduct, key University stakeholders identified a need to review and rethink the current ethics education at JMU.²⁰ The Collaborative: Ethical Reasoning in Action (ERA) was formed to define ethical reasoning. The Collaborative, comprised of cross-disciplinary faculty, professionals from student affairs, assessment specialists, and an ethics expert, define ethical reasoning as a “decision-making process catalyzed by viewing a situation through different perspectives.”²¹ The Collaborative developed an ethical reasoning framework consisting of eight key questions or the 8KQ. The 8KQ topics are fairness, outcomes, responsibilities, character, liberty, empathy, authority, and rights. Each topic guides

students to ask questions relating to the differing ethical theories and principles before making a decision.²² The specific educational programming developed by the Collaborative to teach JMU students the 8KQ will be further explored in the problem-based learning section of this chapter.

Ethics Consultation Background

At this time a brief overview of healthcare ethics consultations will be discussed to provide an example of the skills and competencies needed when focusing education efforts on improved ethical reasoning skills. Although ethical issues encountered in healthcare and forensic science differ, the skills foundational to bioethics apply to both. A description of healthcare ethics consultations is used as an example to better understand ethical reasoning and the competencies required.

Ethics consultants confront complex issues and questions, which requires certain knowledge and skills to successfully navigate a consultation. Specifically for healthcare ethics consultation, the American Society for Bioethics and Humanities (ASBH) originally published the “Core Competencies for Health Care Ethics Consultation” in 1998 with a revised edition in 2011. The core competencies outline critical knowledge and skills required by individuals who participate in ethics consultation.²³

In a health care or clinical setting, decisions about treatment are always ongoing. Occasionally, the members involved in the decision making process do not agree. Those members involved in the process can include the healthcare providers such as doctors and nurses as well as the patient and family members.²⁴ When disagreements arise, healthcare ethics consultation is a primary method for aiding patients, physicians, and other relevant parties in the process of resolving ethical dilemmas.²⁵ A hospital ethics committee composed of physicians, nurses, ethicists, and other hospital personnel perform ethics

consultations as individuals, a team, or the entire committee. One key goal for a consultation is to identify and analyze the conflict then provide mediation to the disagreeing parties in order to bring about an ethical resolution.²⁶ While the ASBH recommends certain core competencies that consultants should possess to ensure they are qualified to provide assistance, the ASBH does not elicit a specific process to follow for the consultation.²⁷

Competencies

The ethics committees can serve three primary roles. One as an ethical educator in order to improve ethics based education for the committee as well as the hospital community. The ethics committee can also develop policies. Finally, the committee can review cases and consult on controversial cases.²⁸ Healthcare ethics consultation is a primary method for aiding patients, physicians, and other relevant parties in the process of resolving ethical dilemmas.²⁹ The ASBH established core knowledge and skill competencies necessary for all individuals involved in healthcare ethics consultation (HCEC). The HCEC skills as outlined by the ASBH identify three categories: assessment, process, and interpersonal skills.³⁰

A hospital ethics committee can aid in resolving conflicts through a consultation. When patients or surrogates disagree with physicians, a HCEC may be required. One of the key goals for a consultation is to identify and analyze the conflict then provide mediation to the conflicting parties in order to bring about an ethical resolution.³¹ An individual, team, or committee can perform healthcare ethics consultation. The level of competency and the specific competencies necessary for an individual providing consultation varies based on the structure of the ethics consultation. At this time, no distinction will be made regarding the differences. Rather all the core skills and

knowledge will be explained in order to understand the need for these competencies within a clinical setting.³²

Skills

The core competencies of healthcare ethics consultation are broken into core skills and core knowledge. The necessary skills include ethical assessment and analysis skills, process skills, and interpersonal skills.³³ Ethical assessment ensures the consultant can identify the ethical conflict. This requires collecting data, assessing the social relationships of those involved, and identifying beliefs and values of those involved, which often leads to a clear ethical concern. Analysis skills require the consultant to access key ethics knowledge, clarify ethical concepts, evaluate both sides of the argument, and use knowledge related to healthcare ethics, law, institutional policy, and professional codes. While process skills relate to the abilities of the ethics consultant to successfully conduct a consultation process. These skills include the ability to determine who should be involved, successfully document consultations, and effectively communicate during and after the consultation. Interpersonal skills are critical for a successful consultation. A consultant must be able to listen and communicate with respect, support, and empathy. Additionally the consultant must be able to recognize the views of all involved parties and ensure they are being heard. Furthermore, it is the consultant's job to educate the parties about the ethical facets pertinent to the specific case.³⁴ These skills are applicable to any individual engaging in ethics consultations or solving ethical dilemmas.

Knowledge

As mentioned in the skills section, the consultant must draw on important information in order to provide a consultation. The ASBH denote nine areas that are required for

HCEC. These are provided as general guidance that should apply to the majority of institutions conducting consultations. Instances may occur where specialized knowledge is needed at certain institutions based on recurring ethical dilemmas. The nine general knowledge categories are: moral reasoning and ethical theory, common bioethical issues and concepts, healthcare systems, clinical context, local healthcare institution, local healthcare institution's policies, beliefs and perspectives of local patient and staff population, relevant codes of ethics and professional conduct and guidelines of accrediting organizations, relevant health law. The necessary level of knowledge in each area (either basic or advanced) can vary depending on the structure of the consultation and whether it is performed by an individual or a team.³⁵ This set of skills and knowledge equip members of HCEC to successfully aid ethical dilemmas encountered in the clinical setting.

In relation to the ASBH core competencies, the ASBH published "Improving Competencies in Clinical Ethics Consultation: An Education Guide" in 2009. A second edition was released in 2015.³⁶ The primary purpose for creating the guide was to address the lack of formal education and training. Many ethics consultants lack education and training focused on ethics consultation primarily due to the lack of formal programs.³⁷ The ASBH "Improving Competencies in Clinical Ethics Education: An Education Guide" outlines learning objectives specific to the core competencies for healthcare ethics consultation.³⁸ The guide provides a self-education framework for any individuals involved in ethics consultation. The guide breaks down three domain areas; knowledge, skills, and responsibilities. Multiple topic areas are incorporated into each domain area. A brief introduction for each topic is provided followed by learning objectives and

strategies then references. This guide provides a road map for individuals to self-educate on the core competencies necessary for clinical ethics consultation. Additionally, the guide provides a foundation from which other educators can develop education and training programs for ethics consultation.³⁹ The current education tool created can be modified and used in conjunction with the ASBH Education Guide in order to further educate healthcare ethics consultants.

Following the release and update to the ASBH Education guide, the ASBH published “Addressing Patient-Centered Ethical Issues in Health Care: A Case-Based Study Guide,” in 2017. This compendium provides 12 clinical ethics cases on various topics commonly encountered during healthcare ethics consultation. Cases are presented in an unfolding approach. Some information is presented followed by questions then additional information and questions. This unfolding approach simulates real-life cases in the clinical setting. Within each case, the reader is directed to the associated learning objectives in the second edition of the “Improving Competencies in Clinical Ethics Consultation.”⁴⁰ As discussed earlier, teaching ethical reasoning through case studies allow students to gain the skills needed for solving ethical dilemmas.⁴¹

A.i.(b). Accessible Resource

The second goal for creating educational content based on ethical reasoning is to create an accessible resource. Ethical reasoning is a diverse skill that applies to numerous disciplines. Successful resolution of ethical dilemmas requires proper reasoning skills. Given the universal importance of ethical reasoning it is vital to create online modules with content that is accessible to an expansive audience rather than creating educational content strictly for a single classroom setting. As discussed earlier ethical reasoning and decision-making are primary skills desired by employers.⁴² Given the universal

application and need for ethical reasoning skills, an educational tool focused on enhancing ethical reasoning should be easily-accessible. The educational content created is presented in five online modules that can be shared across universities and organizations using the Open Learning Initiative (OLI) platform created by Carnegie Mellon University.⁴³

The OLI platform was created in 2002 by a group of researchers and educators at Carnegie Mellon University.⁴⁴ OLI is an autonomous web-based program that delivers educational content through various formats (i.e. text, video, and images) and incorporates assorted low and high stakes assessments that allow students to more fully engage with the content. “The Open Learning Initiative offers online courses to anyone who wants to learn or teach. Our aim is to combine open, high-quality courses, continuous feedback, and research to improve learning and transform higher education.”⁴⁵

The literature review on ethics education notes numerous studies that express the desire for online resources focused on ethics.⁴⁶ Examples of two web-based ethics education resources are *the Values Exchange* and *the SciEthics Interactive*. *The Values Exchange* is an online tool that uses interactive screens to guide students through ethical dilemmas encountered in healthcare. The content is designed as a process oriented approach whereby students make and justify decisions that would be encountered in their profession.⁴⁷ Another online ethics education tool is the *SciEthics Interactive*. The *Interactive* uses simulations to explore ethical issues encountered in science. One particular simulation, the TransGen Island, explores research ethics. Students select one of three role-playing identities (researcher, activist, or government regulations agent) and

explore the virtual world by interacting with other characters and collecting data. At the end of the simulation, students prepare a report to support or oppose the use of genetically modified food for human consumption.⁴⁸ Both tools allow for an interactive experience while working through the decision making process in a case study format. The online format increases access and participation while facilitating interdisciplinary discussions. It allows for self-paced progression, avoids peer-pressure, and teaches critical thinking skills.⁴⁹ The *SciEthics Interactive* uses virtual worlds to explore realistic ethical issues which increases students' ethical understanding.⁵⁰

Like the ASBH Education Guide, which was designed as a self-education tool, creating online modules through the OLI system allows self-paced access by professionals engaging in ethics consultation. Additionally, the OLI modules can be adopted by formal university programs to enhance traditional courses. The modules guide participants through the lessons and provide feedback similar to a traditional instructor led course. The online modules allow students to proceed through material at their own pace which benefits professionals or other non-traditional students whose time commitments restrict their ability to engage in a traditional course.

A.ii. Problem-based Learning

This section will discuss the education tools created to improve ethical reasoning skills. Improved reasoning skills enhance ethics consultations regardless of discipline. The how and why an ethical reasoning curriculum was created will be explored. The explanation emphasizes the importance of educating students on the use of abductive reasoning skills in order to promote ethical behavior. The development of each of the modules contained in the ethical reasoning curriculum will be described. Additionally,

preliminary results regarding the effectiveness of the modules to teach students about reasoning patterns will be discussed.

Reasoning skills are critical for effective and ethical decision-making.⁵¹ During ethics consultations proper reasoning skills are a core requirement.⁵² An online educational tool utilizing problem-based learning was created that is accessible to a broad audience. In order to achieve the first goal of improving ethical reasoning skills it is important to develop material that uses problem-based learning where students can fully engage and cultivate enriched ethical reasoning skills. As the literature review of ethic education programs recommends, an ethics curriculum should integrate theory and case-based learning.⁵³ Within each module, specific learning objectives outline what the students will be able to do upon completing the module. Initially, the objectives are basic to ensure students fully comprehend the foundational content surrounding reasoning types and ethical principles. These learning objectives relate to declarative knowledge that the student will gain. As the modules progress, the learning objectives focus on procedural knowledge. These advanced objectives focus on the student understanding how and when to apply different reasoning methods. The content and activities within each module build to resemble a problem-based learning pedagogy. Students engage with the learning material by solving open-ended problems. Varied assessments throughout each module ensure understanding of key concepts then case vignettes enhance student learning and examine skill development.

The cases in the ASBH “Addressing Patient-Centered Ethical Issues in Health Care: A Case-Based Study Guide” offers twelve (12) unique cases based on the primary ethical issues encountered by healthcare ethicists. The ASBH study guide provides an example

of problem-based learning. A group of bioethicists, primarily clinical ethicists, created the study guide as a supplement to the “Improving Competencies Education Guide.”⁵⁴ The cases are setup using an unfolding approach with intended breaks to mimic how cases unfold in a clinical setting. New information continually enters the case and directs the progression of the consultation. Through a case-based approach, the primary learning objectives focus on enhancing ethical competencies and skills.⁵⁵ Learners must understand how to reason through a case. In ethics consultation, participants cannot follow a defined protocol as each case is unique and must be approached as such.⁵⁶ Having the foundational knowledge and ability to critically think through the ethical dilemma is necessary for anyone who engages in ethics consultations.⁵⁷

A.ii.(a). Module Format

As mentioned earlier, in 2013, James Madison University implemented a program to introduce all first year students to the 8KQ system. Students participated in two educational programs. The first “It’s Complicated” is a 75 minute educational program that introduces students to the 8KQ model. The second program “The Collaborative Interactive” is presented online in an 8-week or 8-episode format.⁵⁸ All first-year students at JMU participate in “It’s Complicated” during orientation. The students are divided into small groups with faculty and staff volunteers who facilitate discussion and analysis of a case scenario using the 8KQ. Through this initial engagement the importance of ethical reasoning is highlighted.⁵⁹ An additional program was created to foster the development of ethical reasoning skills. “The Collaborative Interactive” program is an interactive narrative where students decide the direction of each episode. It is similar to a *Choose Your Own Adventure*® story. Students read each episode about an ethically significant situation and are required to choose between different actions. Beyond simply choosing

an option, students must justify the choice using the 8KQ.⁶⁰ Based on the success of the JMU programming I chose to use a module-based format. This allows for proper pacing.

A curriculum was designed to improve ethical reasoning skills for forensic science students. Examples from pop culture along with real-life cases highlight ethical reasoning in practice. The reasoning process and ethical dilemmas presented in the curriculum simulate real-life work. The curriculum is built as a developmental trajectory from understanding reasoning to activities that simulate decision making in real life cases. This is a problem-based learning focus. Developing a problem-based learning curriculum in a module format engages students in an active learning process. Additionally, creating the modules in an online system allows for more detailed data analysis and expansion to a broader audience beyond a single classroom.

A.ii.(b). Module Development

Module development began by outlining the learning objectives. Informed by the learning objectives instructional activities and assessments were created to ensure all content directly ties to specific learning objectives. Defined learning objectives also aid student learning by directing their focus on the objectives that are outlined.

Multiple modules exist in the current ethical reasoning curriculum. Figure A3 in the appendix displays the overall module layout. First, the student is exposed to a brief philosophical background of semiotics that provides the student with a basic understanding of an individual's belief system and how we create new beliefs when confronted with genuine doubt. The next module explores the different types of reasoning styles. Students identify the three forms of reasoning in a variety of circumstances (i.e. text, video, and case descriptions). The next module further delineates the types of

reasoning into multiple modes and emphasizes abductive reasoning.⁶¹ Definitions for all the modes of reasoning are presented along with a did I get this activity of matching modes of reasoning and a mode identification assessment. Key points for modules 1-3 mirror the content in chapter five of this dissertation. The third module integrates the previous content analysis research discussed in chapter 5 into full case studies that are completed by individuals or groups. These full cases present information at different times in the analysis in order to simulate how information is obtained in a case. The cases in this module can be adapted for HCEC using the ASBH Case-Based Study Guide.⁶²

A fourth module still being developed focuses on ethical principles. In relation to forensic science, the principles of common good and justice will be emphasized.⁶³ The content and activities will allow students to understand the role of various members within the criminal justice field (i.e. investigator, forensic scientist, lawyer, judge).⁶⁴ The connection between proper practices and ethical behavior will be highlighted. The role of these ethical principles as they relate to forensic science are explored.

The modules use pop culture examples, from shows such as Monty Python and Sherlock Holmes, to introduce concepts before real-life examples are incorporated into the modules. The modules progress from simple to complex case examples. The use of real life case examples is imperative for students to understand the impact of the forensic practitioner's actions. The modules integrate the previous materials into full case studies that are completed by individuals or groups. These full cases present information at different times in the analysis in order to simulate how information is obtained in a case. The content outlined in chapter 5 of this dissertation is incorporated into the first three modules and the ethical principles from chapter 3 will be part of module four.

Beyond the online material created, an in-class activity was designed as a think-pair-share activity and is a separate module from the ones created online. The activity promotes the identification and discussion of ethical issues related to reasoning processes. There are three primary learning objectives for this activity, which emphasize the objectives and content learned during the online modules. The first learning objective is to recognize statements that suggest genuine doubt. The second is to identify instances of the three modes of reasoning (inductive, deductive, and abductive). Finally, the third learning objective is to focus on the modes of reasoning and be able to differentiate between hunches, symptoms, clues, metaphors, and scenario building. The activity begins with a review session conducted by the instructor. The concepts of genuine doubt, inductive reasoning, deductive reasoning, and abductive reasoning are discussed with examples related to criminal investigation. Next students watch an episode of forensic files and work together to answer the worksheet questions focused on the identification of the different modes of reasoning. This allows students to understand the decision-making process associated with forensic cases. See figure A4 in the appendix for an example worksheet of the in-class activity. Worksheets have been developed for multiple episodes of Forensic Files. The different iterations allow students to experience different cases while still identifying the important reasoning components and ethical issues. The different episodes can give students multiple opportunities to engage with the material or the episodes can be split among the class and each group can share their findings. Furthermore, within each episode the worksheet can be split between groups and again allow for class discussion. The worksheets were designed this way to allow for flexible deployment based on instructor preferences and the makeup of the class.

B. Testing

At this time, only module two the reasoning styles module has been tested. The results from the first iteration informed improvements to the learning content and additional module design. A detailed overview of the content within the reasoning styles module is presented followed by student results. Figure A5 in the appendix displays the layout of module two. The reasoning styles module provides definitions of abductive, deductive, and inductive reasoning along with examples and some guided practice. The primary learning objectives for this module are to identify the three primary reasoning styles, abduction, induction, and deduction, using everyday examples and explain each style of reasoning. The module begins with a brief pre-test. Students are asked to define and provide an example for deductive, inductive, and abductive reasoning. Next students are provided with a quote by Charles Peirce, which describes the three different reasoning styles. Definitions and examples for the three reasoning methods are provided along with a short you tube video that discusses the fundamentals of Peircean reasoning. The next screen explores the steps of each reasoning type. Students then perform a “Did I get this?” activity where they read a variety of statements and choose one of the three types of reasoning methods (Figure A6 in appendix). There is also a hint function to aid students through the activity.

After the practice, students are presented with a video clip. In the current version, it is a clip from Monty Python’s Holy Grail where they are trying to burn a woman for being a witch (Figure A7 in appendix). The participant is to watch the video clip and then decide if specific statements from the clip are a conclusion, a general rule, or a specific example. Finally, at the end of unit one, a video clip from “Sherlock Holmes” is given and the participant must attempt to answer open-ended questions related to the clip and

the content (Figure A8 in the appendix). This assessment is denoted as a reasoning checkpoint and the two questions are:

1. What did Sherlock Holmes do from a reasoning perspective (explain)?
2. As the viewer, what type of reasoning process were you going through as you watched the scene play out?

The sign action for the participant changes because they are not recognizing a correct answer, which sometimes appears to simply be like an icon. Icons are images that represent something else, e.g., a drawing of a dog. The correct answer in a multiple-choice item can appear to simply be the correct answer, like an icon. But in this open-ended section, participants must reason to a scenario, essentially test that scenario, make a conclusion, and type it out.

The module concludes with a post-test. The test begins by asking short math questions, which attempts to clear students' short term memory in order to better assess student understanding. Next students are asked to define and provide an example for deductive, inductive and abductive reasoning. The final two questions provide statements where students must select the correct reasoning style.

B.i. Testing Procedures

This research received Duquesne University Institutional Review Board approval prior to deployment with students. After module deployment, all the data collected was analyzed in order to assess the effectiveness of the content in relation to students' reasoning skills. Initial results were gathered by comparing answers from the pre- and post-test within a module. Beyond examining the pre- and post-test results, individual results from each of the activities were examined. Within OLI, all student answers from each assessment provided analyzable data. This data explored how many students got

each question right or wrong as well as ranked all questions within an assessment based on difficulty. Additionally, information about the number of questions each student answered was examined to determine if the length of each activity was appropriate. Further analysis, using tools beyond those strictly available in OLI, was conducted to determine if the module was accurately teaching students the intended learning outcomes. The analysis tools in DataShop provided a deeper exploration of the results in order to improve student learning.⁶⁵ This tool uses cognitive modeling to predict human behavior and elucidate areas of improvement. Each assessment question is tied to a learning objective and skill, which can be modeled to assess student learning for each objective or skill.⁶⁶

B.ii. Results/effectiveness

Results regarding the effectiveness of the reasoning styles module to teach students about the types of reasoning will be discussed. Thirty-one students completed the initial iteration of the reasoning styles module. Results from the pre-test showed that only three out of thirty-one students provided a definition for abductive reasoning. By the post-test, all thirty-one students could recognize the three types of reasoning methods and provide definitions.

Further analysis at the question level indicates the effectiveness of each assessment within the module. Participants were asked 10 multiple choice “Did I get this?” questions. For example, one question asked to decide between the three types of reasoning using this prompt: This cat is black, that cat is black, a third cat is black. Therefore, all cats are black. Figure A9 in the appendix displays performance across all the questions. Question number three was the hardest and six the easiest. Figure A10 in the appendix shows the answer breakdown for the first two questions from this activity.

This information is helpful to see specifically where students struggle with each question. Figure A11 in the appendix shows student's overall performance breakdown and answer breakdown for questions related to the Monty Python clip. Figure A12 in the appendix graphs results from DataShop, which display the error rate tied to the skill for identifying abductive reasoning. This indicates that students had five opportunities to identify abductive reasoning during the first "Did I get this?" activity. The error rate is mainly between 20-30% across all questions, which indicates no learning related to this skill. Based on these results it appears that from the outset students had a good understanding of abductive reasoning and were able to identify abductive reasoning statements with little difficulty. Figure A13 in the appendix graphs results from DataShop displaying the error rate tied to the skill for identifying a general rule. Students were only given two opportunities to identify a general rule related to the Monty Python clip. Given the lack of questions for this skill, the results indicate too little data to make a conclusion about student learning. Figure A14 in the appendix graphs results from DataShop displaying the error rate tied to the skill for identifying a specific example. Students answered five questions where they identified a specific example related to the Monty Python clip. The graph demonstrates fewer mistakes over the course of the items. The data also indicate that only 3-4 questions and not five may be needed. Results are categorized as good, which indicates student learning.

In addition to assessment results, students provided anecdotal feedback. In relation to the "Did I get this?" activity students felt it was longer than expected, but did find it helpful to practice identifying the reasoning types.

Results from the module focused on reasoning styles demonstrate students' ability to understand and identify the three reasoning types. Detailed data analysis further illustrates questions where students struggle. Additionally, specific skills tied to each assessment question indicate the level of student learning. The data analysis tools associated with the online system allow for detailed evaluation of student learning and provide constructive feedback for improved iterations of the modules.

Ethical reasoning is a universal skill recognized by the national higher education organization, the Association of American Colleges and Universities (AAC&U) as an essential learning outcome.⁶⁷ This chapter described the educational tools developed to foster ethical reasoning skills specifically for forensic science students. Improving ethical reasoning skills and building easily accessible resources were the primary goals of this work. A brief overview of healthcare ethics consultation provided an example of the skills and competencies required to improve ethical reasoning skills. Additionally, resources created by the ASBH reinforce the importance of problem-based learning using case examples. Informed by other efforts to improve ethical reasoning skills at the college level, the educational content developed employs problem-based learning through a module format and incorporates case studies. Initial results from the reasoning styles module indicates successful learning related to the outlined learning objectives. Based on results from in-depth assessment analysis the module will be updated to improve student learning related to all the skills outlined. Moving forward the entire curriculum will be tested to assess the overall success related to improving ethical reasoning skills.

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Chapter 7: Conclusion

This dissertation discussed the contribution of ethical reasoning skills in forensic science. Forensic science is the application of science to matters related to a court of law. Forensic scientists are members of the criminal justice system charged with upholding justice through science. The staggering number of wrongful convictions and ethical issues involving forensic science indicate a need to examine forensic science from a different perspective. The media continually identifies ethical issues within the forensic science field ranging from misconduct by forensic practitioners to systemic organizational failures that lead to injustice. Cases of individual misconduct have involved dry-labbing, stealing evidence, manipulating evidence to support the prosecution, writing false report conclusions, and overstating results during expert witness testimony. This misconduct and misapplication of forensic science has contributed to almost half of the wrongful convictions examined by the Innocence Project.¹ Beyond individual misconduct, the organization model of numerous laboratories housed within police departments has led to examples of an unethical culture. Scandals in numerous laboratories across the United States raise serious concerns over the ability of forensic scientists within the system to overcome cultural obstacles. Since the majority of forensic laboratories across the United States still operate under law enforcement control, other methods must be implemented to improve the ethical culture and conduct. In addition to mainstream media outlets, federal review and advisory committees have also highlighted the need for reforms in forensic science. In 2009, the National Academy of Sciences (NAS) issued a report titled “Strengthening Forensic Science” and in 2016, the President’s Council of Advisors on Science and Technology (PCAST) published the

report, “Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods.”² These reports identified the need to clarify the validity and reliability of various forensic disciplines and forensic methods as well as evaluate specific methods to determine their scientific validity within the legal system. The forensic science community and federal government entities have responded by creating the Organization of Scientific Area Committees (OSAC) for Forensic Science. The OSACs work to identify and develop high-quality standards for roughly twenty-five specific forensic science disciplines.³ While these are important improvements, there remains a lack of awareness regarding the contribution of ethical reasoning skills in forensic science. This dissertation addressed the gap in the forensic field. Additionally, embedded throughout the dissertation was a discussion regarding how the principles and reasoning in bioethics contribute to ethical reasoning skills in forensic science.

The argument began by exploring the criminal investigation process. The role of law enforcement and forensic science analysis provided general background information necessary to further analyze forensic science and apply bioethical principles. In-depth analysis of a sexual assault investigation explored ways in which bioethics, specifically healthcare ethics, can inform practices in forensic science (chapter 2). Next, the foundational ethical principles and reasoning in bioethics were presented with a focus on respect for autonomy through consent and the balance between privacy and the common good. Examination of the foundational principles in bioethics and their application in healthcare ethics and research ethics provided the ethical groundwork from which ethical reasoning skills develop (chapter 3). The next chapter outlined the ethical culture in forensic science by exploring the organizational structure and codes of conduct to

highlight the contribution of ethical reasoning skills in the field (chapter 4). In addition to a bioethics framework, content focused on different reasoning models highlighted the contribution of ethical reasoning skills in forensic science. The work of American philosopher Charles Sanders Peirce that focuses on solving problems and analyzing situations using three types of reasoning methods is paramount to understanding and applying reasoning skills (chapter 5). Building on the theoretical foundation from the previous chapters, problem-based learning activities were developed to create educational tools designed to foster ethical reasoning skills in forensic science (chapter 6). The dissertation discussed the contribution of ethical reasoning skills in forensic science by explaining the influence of bioethical principles and reasoning.

Chapter two provided background information about forensic science by exploring different facets of the criminal investigation process and introduced bioethics discourse as the context for subsequent analysis. A general overview of a criminal investigation explored the relationship and roles of police officers and forensic analysts.⁴ Next, a detailed analysis of a sexual assault investigation identified ethical quandaries that the forensic science community needs to recognize. The interaction of the various stakeholders including healthcare personnel, police, and forensic analysts illustrated the ethical questions that arise during a criminal investigation. By examining a sexual assault investigation from a healthcare ethics perspective, multiple decision points were identified where upholding survivor autonomy and consent is vital, while promoting justice. It begins with the survivor's initial decision to consent to a sexual assault kit collection following through to reporting as well as tracking the progress of the sexual assault kit (SAK) from collection to storage and testing.⁵ Improved communication using

an ethics trained advocate comparable to an HCE consultant provides one method to enhance the investigation process. The process that a SAK follows is complex. Advocates within each jurisdiction need to be familiar with the decision points and potential testing pathways so that this information can be provided to the survivor at the beginning of the process and reiterated throughout the investigation. Additional recommendations, published in the NIJ report “National Best Practices for Sexual Assault Kits: A Multidisciplinary Approach” and confirmed by an ethical analysis, include the storage of SAKs by law enforcement to preserve evidence integrity and allow for delayed reporting as well as a test-all policy for reported kits.⁶ Applying a healthcare ethics perspective to sexual assault investigations leads to improved communication and recommended practices that uphold autonomy by maintaining informed consent while promoting justice for the survivor and society.

Chapter 3 laid the foundation for further analysis of forensic science according to the prevailing ethical principles and reasoning in bioethics. The chapter began by outlining the internationally recognized fundamental ethical principles in bioethics.⁷ The first section addressed the internationally recognized fundamental principles and explored consent to further enhance understanding of the respect for autonomy principle, which was initially discussed in chapter 2. This chapter examined the prevailing ethical principles and reasoning in bioethics with particular examination of the UNESCO “Universal Declaration of Bioethics and Human Rights” and Principlism.⁸ In this section, a healthcare focused context enriched understanding. Examples from healthcare demonstrated the application of the principles and provided a more detailed

understanding particularly of the respect for autonomy principle and application of informed consent.⁹

The next section of the chapter examined practical approaches to solving ethical dilemmas in clinical medicine. Different models for decision-making examined the practical reasoning in bioethics based on the normative principles. Jonsen's four topics methods as well as Buchanan and Brock's hierarchy approach were explored.¹⁰ The section concluded with case examples that highlight the importance of integrated decision-making.

The final section of the chapter applied the discussion on normative ethical principles (the first section of the chapter) and applied reasoning in bioethics (the second section of the chapter) to pivotal issues in Forensic Science. This part of the chapter began by further exploring the justice principle and discussing the specifics of privacy and the common good using forensic DNA databases and research ethics.¹¹ Since forensic science is a heavily research scientific discipline, it was important to include a discussion of research ethics. To grasp the significance of research ethics in Forensic Science, it is important to understand its history and the role of globalization.¹² Again, a non-forensic example was used in this section to emphasize the application of the ethical principles from the established field of research ethics. The chapter concluded with an analysis of the collection and use of forensic evidence as it relates to forensic DNA databases in order to determine potential violations of individual privacy rights.¹³ The bioethical principles and reasoning discussed in this chapter established the foundation for ethical reasoning skills in forensic science, which were explored in later chapters.

Chapter four explored the ethical culture within forensic science laboratories to explain the contribution of ethical reasoning skills within organizational structures and in codes of conduct. The facets of an ethical culture as defined by Craig E. Johnson provided a framework to assess the current state of forensic science laboratories. The formal and informal elements of an organization outlined how each element influences the ethical culture of an organization.¹⁴ The culture within forensic science laboratories must uphold and promote three primary ethical responsibilities for forensic scientists. Analysts must achieve scientific accuracy while maintaining honesty and impartiality.¹⁵ Improvements to the current system include transitioning to independent organization structures, setting up mechanisms to reduce bias, and upholding a universal code of ethics. The first section of the chapter particularly emphasized the role of the laboratory structure on the ethical culture of the laboratory. Serious ethical problems can arise within forensic laboratories when the law enforcement or legal cultures negatively infiltrate the forensic science culture. Forensic laboratories need to remain unbiased therefore; the organization should be independent of other law enforcement entities. The examples in Houston and Washington DC demonstrated that independence does not automatically fix all the problems.¹⁶ Since it is unrealistic to convert hundreds of forensic laboratories into independent organizations, other safe guards need to be implemented in order to allow the forensic scientist to maintain impartiality.¹⁷ Beyond the organizational structure, the 2009 NAS report recommended a unified code of ethics for forensic science.¹⁸ A code of ethics enhances the ethical culture of an organization and indicates the importance of ethical behavior within an organization. As members of the criminal justice system, forensic scientists are charged with upholding justice through science.

Ethical misconduct within forensic science leads the public to lose trust in forensic science. Implementation of a uniform code of ethics for forensic scientists is a tool to improve the ethical culture within laboratories and among all members of the forensic science community.¹⁹ The work of the National Committee on Forensic Science, Organization of Scientific Area Committees for Forensic Science, and State Commissions such as the Texas Forensic Science Commission indicate positive improvements for forensic science.²⁰ Adherence to a universal code of ethics will not eliminate ethical misconduct by forensic scientists, but can improve the identification and correction of such wrongdoing.²¹

The earlier chapters established ethical issues within forensic science. Chapter five transitioned to the broader topic of reasoning in order to highlight the contribution of ethical reasoning skills in forensic science. This chapter examined the work of American philosopher Charles Sanders Peirce that focuses on solving problems or resolving doubt using three types of reasoning methods.²² Peirce's development of three reasoning types stem from his view of semiotics. Semiotics describes how individuals interact with the world through signs. Further investigation of Peircean semiotics leads to the understanding of an individual's belief structure. When an individual is confronted with a situation that does not make sense given their current belief structure they experience genuine doubt. In order to solve this doubt and update their beliefs an individual must use inquiry. The methods of inquiry are the three reasoning methods Peirce explains. A summary of Peirce's expansive explanations regarding abduction highlight the complexity and importance of this type of reasoning in scientific inquiry. Abductive, inductive, and deductive reasoning are methods to form new ideas, test them, and reason

between ideas. The forms of reasoning can be described as the way individuals interact with the world through signs. Further breakdown of the modes within each type of reasoning along with examples provide necessary information to understand how the reasoning processes can be applied in the world.

This chapter concluded by highlighting forensic case study comparisons that explore how the reasoning method utilized can influence an investigation. The investigation examples demonstrate the importance of abduction to maintain ethical practices and the limitations of deduction. In forensic science, when the best forensic investigators start cases, they are in genuine doubt and are compelled to use the skill of experimentation through abductive reasoning. Resolving doubt through experimentation allows a forensic scientist or investigator to examine their personal belief system. Trying to understand one's personal beliefs is hard because resolving doubt is uncomfortable and energy intensive. Yet belief maintenance is critical so that these professionals can be lifelong learners and practitioners.²³ As an investigative case is developing, the inferences made, abductive scenarios created all reside in a context that has ethical implications (e.g., common good, justice) to it. The content analysis research demonstrates the reasoning processes that occur in criminal investigations and the importance of using abductive reasoning as a primary investigative tool. This is more than basic pattern searching, which can lead to incorrect inferences. The key is the development of the pattern and then the testing of that pattern with new data (evidence). This type of Peircean experimentation is the skill set that needs to be developed and understood to be used to its fullest capacity during investigations.

Chapter 6 applied the insights of the previous chapters to discuss the development of education tools created to foster ethical reasoning skills. Ethical reasoning is a universal skill recognized by the national higher education organization, the Association of American Colleges and Universities (AAC&U) as an essential learning outcome.²⁴ This chapter described the educational tools developed to foster ethical reasoning skills specifically for forensic science students. Improving ethical reasoning skills and building easily accessible resources were the primary goals of this work. A brief overview of healthcare ethics consultation provided an example of the skills and competencies required to improve ethical reasoning skills.²⁵ Additionally, resources created by the ASBH reinforce the importance of problem-based learning using case examples. Informed by other efforts to improve ethical reasoning skills at the college level, the educational content developed employs problem-based learning through a module format and incorporates case studies. Multiple modules exist in the current ethical reasoning curriculum. First, the student is exposed to a brief philosophical background of semiotics that provides a basic understanding of an individual's belief system and how we create new beliefs when confronted with genuine doubt. The next module explores the different types of reasoning styles. Students identify the three forms of reasoning in a variety of circumstances (i.e. text, video, and case descriptions). The next module further delineates the types of reasoning into multiple modes and emphasizes abductive reasoning.²⁶ Key points for modules 1-3 mirror the content in chapter five of this dissertation. The third module integrates the previous content analysis research discussed in chapter 5 into full case studies that are completed by individuals or groups. These full cases present information at different times in the analysis in order to simulate how information is

obtained in a case. The cases in this module can be adapted for HCEC using the ASBH Case-Based Study Guide.²⁷ A fourth module still being developed focuses on ethical principles. In relation to forensic science, the principles of common good and justice will be emphasized. The ethical principles discussed in chapter 3 will be part of module four. The content and activities will allow students to understand the role of various members within the criminal justice field (i.e. investigator, forensic scientist, lawyer, judge).²⁸ The connection between proper practices and ethical behavior will be highlighted. The role of these ethical principles as they relate to forensic science are explored. Initial results from the second module, the reasoning styles module, indicates successful learning related to the outlined learning objectives. Based on results from in-depth assessment analysis the module will be updated to improve student learning related to all the skills outlined. Moving forward the entire curriculum will be tested to assess the overall success related to improving ethical reasoning skills.

Beyond the online material created, an in-class activity was designed as a think-pair-share activity and is a separate module from the ones created online. The activity promotes the identification and discussion of ethical issues related to reasoning processes. The primary learning objectives for this activity emphasize the objectives and content learned during the online modules. The activity begins with a review session conducted by the instructor. The concepts of genuine doubt, inductive reasoning, deductive reasoning, and abductive reasoning are discussed with examples related to criminal investigation. Next students watch an episode of forensic files and work together to answer the worksheet questions focused on the identification of the different modes of reasoning. This allows students to understand the decision-making process associated

with forensic cases.

In conclusion, the dissertation discussed the contribution of ethical reasoning skills in forensic science and explained the influences of ethical principles and reasoning methods in bioethics. Identifying the contribution of ethical reasoning skills is one method to address the misconduct and misapplication of forensic science that lingers in the field. Outlining the criminal investigation process and specifically examining how bioethical principles can alleviate ethical issues encountered during a sexual assault investigation framed the argument. An in depth exploration of the ethical principles and reasoning in bioethics provided a foundation for the educational content focused on ethical reasoning skills, particularly from the perspective of balancing privacy and the common good. The dissertation further explored the ethical culture in forensic science to explain the contribution of ethical reasoning skills within organizational structures and in codes of conduct. A brief philosophical background on the three primary reasoning models along with a content analysis study illustrated the impact of reasoning method on investigative outcomes. The dissertation culminated with the development of educational tools that foster ethical reasoning skills in forensic science. The content is created in an accessible fashion utilizing a problem-based learning. The foundational concepts from bioethics are embedded in the content. Preliminary results from the use of the content in a forensic science program indicates the effectiveness of the created education tools to enhance ethical reasoning skills. In summation, this dissertation discussed the contribution of ethical reasoning skills in forensic science by explaining the influence of bioethical principles and reasoning.

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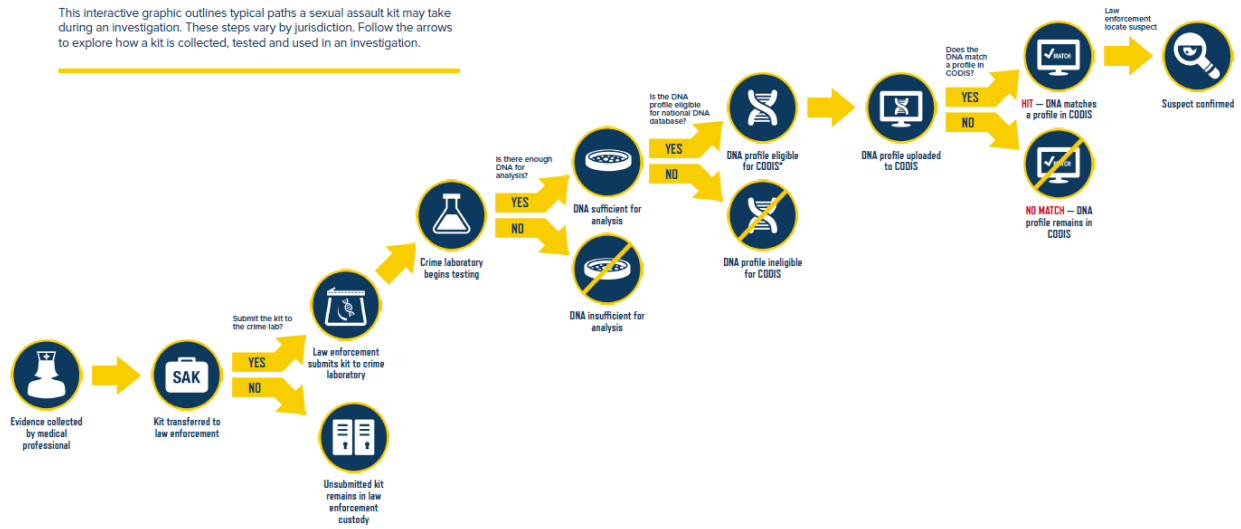
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Appendix

Figure A1: “Analyzing Sexual Assault Kits” Interactive graphic created by NIJ National Institute of Justice, “Sexual Assault Kits: Using Science to Find Solutions,” accessed July 11, 2016, <http://www.nij.gov/unsubmitted-kits/Pages/default.aspx>.

ANALYZING SEXUAL ASSAULT KITS

This interactive graphic outlines typical paths a sexual assault kit may take during an investigation. These steps vary by jurisdiction. Follow the arrows to explore how a kit is collected, tested and used in an investigation.



*The Combined DNA Index System (CODIS) is a national criminal justice DNA database run by the FBI.



Figure A2: Code of Professional Responsibility for the Practice of Forensic Science

1. Accurately represent relevant education, training, experience, and areas of expertise
2. Be honest and truthful in all professional affairs including not representing the work of others as one's own
3. Foster and pursue professional competency through such activities as training, proficiency testing, certification, and presentation and publication of research findings
4. Commit to continuous learning in relevant forensic disciplines and stay abreast of new findings, equipment, and techniques
5. Utilize scientifically validated methods and new technologies, while guarding against the use of unproven methods in casework and the misapplication of generally-accepted standards
6. Handle evidentiary materials to prevent tampering, adulteration, loss, or nonessential consumption of evidentiary materials
7. Participation in any case in which there is a conflict of interest shall be avoided
8. Conduct independent, impartial, and objective examinations that are fair, unbiased, and fit for-purpose
9. Make and retain contemporaneous, clear, complete, and accurate records of all examinations, tests, measurements, and conclusions, in sufficient detail to allow meaningful review and assessment by an independent professional proficient in the discipline
10. Ensure interpretations, opinions, and conclusions are supported by sufficient data and minimize influences and biases for or against any party
11. Render interpretations, opinions, or conclusions only when within the practitioner's proficiency or expertise
12. Prepare reports and testify using clear and straightforward terminology, clearly distinguishing data from interpretations, opinions, and conclusions and disclosing known limitations that are necessary to understand the significance of the findings
13. Reports and other records shall not be altered and information shall not be withheld for strategic or tactical advantage
14. Document and, if appropriate, inform management or quality assurance personnel of nonconformities and breaches of law or professional standards
15. Once a report is issued and the adjudicative process has commenced, communicate fully when requested with the parties through their investigators, attorneys, and experts, except when instructed that a legal privilege, protective order or law prevents disclosure.
16. Appropriately inform affected recipients (either directly or through proper management channels) of all nonconformities or breaches of law or professional standards that adversely affect a previously issued report or testimony and make reasonable efforts to inform all relevant stakeholders, including affected professional and legal parties, victim(s) and defendant(s).

Figure A3: Module Overview Screen Shot

Forensics		
Assignment		Status
Module 1: Semiotics (Gradebook) (Learning Dashboard)		
Module 2: Reasoning Styles (Gradebook) (Learning Dashboard)		
Introduction to the Three Reasoning Styles		
Pre-Test	Quiz	Available Now No due date
Reasoning Checkpoint	Quiz	Available Now No due date
Post-Test	Quiz	Available Now No due date
Module 3: Modes of Reasoning (Gradebook) (Learning Dashboard)		
The Ten Modes of Reasoning		

Figure A4: Example of In-Class Activity

Lesson Plan

Modes of Reasoning in Forensic Investigation

Objectives:

By the end of this lesson the student will:

1. Recognize statements that suggest genuine doubt
2. Identify instances of the three modes of reasoning (Inductive, Deductive, Abductive)
3. Differentiate between hunches, symptoms, clues, metaphors, and scenario building

Preparatory Work

(Class discussion with faculty)

Estimated time: 10 minutes

1. Discuss the concept of genuine doubt and its potential for eliciting creative resolution (its relationship to abductive reasoning)
2. Read the definition of Inductive Reasoning
 - a. Give an example of how someone investigating a crime may use inductive reasoning:
3. Read the definition of Deductive Reasoning
 - a. Give an example of how someone investigating a crime may use deductive reasoning
4. Read the definition of Abductive Reasoning
 - a. Give an example of how someone investigating a crime may use Abductive reasoning
 - b. Discuss how abductive reasoning uses hunches, symptoms, clues, metaphors, and scenario-building to resolve doubt

Activity
(Think-Pair-Share Method)
Estimated time: 35 minutes

Content

Show: Forensic Files

Season: 11

Episode: 31, *Muffled Cries* (Aired on 2/13/2007)

Instructions

1. Read the following:

In the Summer of 2004, there were four hurricanes in Florida within 6 weeks, causing more than a billion dollars' worth of damage. All across the state insurance companies dispatched their adjustors to assess the damage claims. One of them was 25 year old Katie Froeschle. It was her first job after graduating from college. One Friday night after a grueling week of work, Katie was supposed to meet a group of friends at a local restaurant, but she never showed up. None of her family and friends heard from her all weekend.
Katie's father states: "My wife just kept calling Kate periodically and saying she can't get a hold of her and she doesn't understand where she could be."

2. Describe how the situation unfolding with Katie created genuine doubt for those around her. What do you think will need to happen for the doubt to be resolved?
3. Pair up with a classmate and read each of the statements in the chart below. They relate to Katie's case. Complete the columns with the requested information. (There are 94 statements. Depending on the size of the class and amount of time these may be split so each student pair only has to read and analyze a few)
4. After completing the chart, spend some time sharing your conclusions with the class

Situation Description/Time Mark	Does this statement suggest genuine doubt? Explain	What mode(s) of reasoning, if any, is being used? (Inductive, Deductive, Abductive) How do you know? (provide a rationale for your answer)	If abductive reasoning is being used, complete the following:	
			Identify the statement as: 1. Hunch 2. Symptom 3. Clue 4. Metaphor 5. Random fact 6. Relevant floating fact (to possibly be used later) Explain why.	What does the statement contribute to the scenario building happening in your head?
Katie's mother "She had had a four year relationship with a guy and broken up with him and was living independently and for the first time in her life was making her own decisions (10:48)	<i>Yes. I am questioning, along with Katie's mother, whether the breakup has something to do with Katie's disappearance</i>	<i>Abductive because I do not have any existing knowledge or information about that relationship to help me resolve</i>	<i>I think this is a symptom because it reminds me of something I have seen before. When my husband's cousin tried to break up a long term relationship,</i>	<i>I'm thinking Katie has been abducted by her ex-boyfriend</i>

		<i>that doubt. I only know that it is not impossible for relationship breakups to lead someone to violence- but I don't even know if any violence is involved here. Katie is just missing. I have nothing to go on.</i>	<i>her boyfriend abducted her and kept her prisoner for several days. We did not know where she had gone.</i>	<i>and is being kept prisoner or has been killed by him.</i>
Katie's best friend, Amy had a key to Katie's apartment and let herself inside (19:39)				
Everything was in perfect order, although the cat hadn't been fed, and Katie wasn't there.(19:30)				
Katie's mother: "She [Amy] knew something was really wrong and so she called and she said 'I don't want to alarm you, but I'm worried about Katie, I don't know where she is and I can't find her.'(19:22)				
Police put out a Bulletin for Katie's car - a maroon-colored Chevy Impala (19:12)				
Katie's employer said her last appointment on Friday afternoon was to check on an insurance claim of a leaking roof at a home in Tampa's Sulfur Springs section (19:05)				
Katie's mother: "I knew the kind of neighborhood it was, it was an extremely bad neighborhood (18:54)				
Katie's father: "Katie for some reason was having trouble finding it, and Amy was back at the office on, I think, Mapquest, and was directing Katie to the property (18:51)				
According to Katie's co-worker, she [Katie]finally found the property - and Katie's co-worker hears her say "Oh, I think I found it, someone is walking up to the car, I'll talk to you later"(18:38).				
Katie's parents drove out to the home at 1503 Mulberry St. and spoke to the occupants and found Jason Funk and Pamela Hintz. The couple had just moved into the property three days earlier(18:25)				
Jason Funk: "We moved in and now we have strangers knocking at our door asking 'hey have you seen Katrina Froeschle here?' and then people asking, um, 'Well, have you seen, you know, an insurance car?'"(18:11)				
Jason and Pamela told the Froeschle's				

the didn't see Katie on Friday because they weren't there (17:58)				
They [Jason and Pamela] said there was no leak in the roof that they knew of and that the landlord said nothing to them about an insurance adjustor coming by to look at it (17:51)				
Just a mile away, in the parking lot of a local bar, Katie's parents found her abandoned car, and called police (17:40)				
The car was unlocked with Katie's keys still inside (17:31)				
Katie's mom: "My first thought was that she was in the trunk"(17:24)				
Katie's dad: "You wanted them to open it, but you didn't want them to open it, you just didn't"(17:23)				
Katie Froeschle was not found In the locked trunk of her car(17:08)				
The only thing there [in the trunk of Katie's car] was Katie's purse. Her money and credit cards were missing (16:59)				
Katie's father: "You were relieved because she wasn't there, but she wasn't there, so you were still looking, and you didn't know where to look" (16:54)				
Forensic scientists searched for evidence inside the car. They did not find any blood or fingerprints, but they did find skin cells on the steering wheel"(16:43)				
Crime Lab Analyst: "Swabbings from the steering wheel of Katie's car were submitted to the laboratory and DNA testing was performed on these samples- and we found a mixture of DNA of at least two contributors. (16:32)				
One [contributor] was Katie Froeschle. The other DNA profile was presumably the killer's (16:17)				
Other than an empty bank envelope inside the glove compartment of the car, investigators found nothing else"(16:09)				
Prosecutor: "It was obvious whatever happened to Katie didn't happen inside of that car (16:02)				
Police interviewed residents and workers in the area and found a janitor who said a man left the car [Katie's car] in the parking lot [of the bar] the night before (15:56)				
The witness [janitor] had seen a white male, approximately 6'2" or 6'3" walking away from the car (15:46)				
Katie's father: "He [unidentified				

man] had driven the car up and had gotten out of the car and had started walking away, and had just dropped the keys in the car and left it unlocked" (15:39)				
Investigators searched the area between Katie's last scheduled appointment and where her car was discovered- roughly a mile away- on a hunch- detective Massucci searched the shores of the Hillsboro river (15:28)				
Detective Massucci: "As I was scanning the water with my flashlight, I caught a glimpse of white and I went back to it, and it took me several minutes to recognize what it was- but eventually it appeared to me to be a bra. I could see a little bit of a bra strap. (15:09)				
Detective Massucci: "I realized that we were beyond red flags- that we had something potentially tragic here"(14:52)				
Everyone's worse fears were confirmed. It was Katie Froeschle (14:44)				
Katie's mother: I just fell down. I remember just, just, like somebody punched me in the stomach. I just doubled up and just fell down to the ground and I just couldn't believe it" (14:35)				
She [Katie] had been in the water for approximately 30 hours (14:19)				
It appeared she [Katie] had also been sexually assaulted (14:13)				
Katie's father : "This doesn't happen to people like us. This happens to other people. We read about it in the paper. We see it on TV, but this doesn't happen to us (14:09)				
The autopsy revealed blunt force injuries to the back of Katie's head (13:58)				
Forensic Pathologist (Examiner): "It was very apparent that this was not a drowning, but in fact, she was probably murdered and then put into the water. There certainly remains a possibility that she may have been alive when she was put in the water. I don't know that that can be ruled out"(13:52)				
But the medical examiner found distinct marks on Katie's skull- marks known as pattern injuries (13:39)				
Examiner: "There was a mark left behind by the weapon that was very characteristic. It was a circular mark				

that 1.2cm "(13:29)				
The medical examiner told investigators that the wounds may be matched to the murder weapon if it could be found (13:17)				
Examiner: "If you detect a pattern injury and then you can in fact find the weapon, that's a huge help to the investigation (13:10)				
A rape test kit was inconclusive (13:01)				
Investigator attempted to find out how far Katie's body traveled down the river before police found her. This could potentially identify the crime scene (12:57)				
Investigators would have to determine the speed of the current and the time it would take for water moving at that speed to reach the location where the body was found (12:43)				
Investigators learned that there was a dam a few miles upstream. When it opens, it significantly increases the water current (12:28)				
Detective Massucci: "In the 28 hour period between the time we believe Katie was put into the river to the time I found her, the dams had been closed off". That meant that Katie's body entered the river pretty much where she was found(12:17)				
The home at 1503 Mulberry St. was just 100 feet from where Katie's body was discovered (11:44)				
The couple living there said they were shocked and insisted they weren't home on the Friday afternoon the murder took place (11:38)				
Detective Massucci: "These people are oblivious to what could have potentially happened at their house"(11:31)				
Jason Funk: "You know, I'm kind of drawing a blank on my emotional state at that time, but no, I know I wasn't nearly as anxious as my girlfriend is. I'm more of a realist person. It's just whatever is gonna happen is out of my control, out of her control, just relax and let it take its course"(11:24)				
The home was a rental, and it was the landlord who told Katie's insurance company about the leaking roof (11:05)				
Taking matters into his own hands, Katie's father (Jeff Froeschle) interviewed the landlord himself (10:58)				

The landlord said that he had sent her [Katie] there, but he had never seen her or talked to her and -according to the family- he acted in a suspicious manner (10:49)				
The landlord provided an alibi. Detective Massucci: "He had a worker with him through the majority of the day of the 12th when Katie was known to have gone missing" (10:40)				
Prosecutor: "It's our belief that the landlord probably did not tell the renters that Katie or anybody else would be coming that day (10:30)				
Narrator: "Investigators decide to search Katie's credit card records to see if anyone used them after her murder, but felt it was a long shot, since few criminals are that inept" (10:19)				
Prosecutor: "Sure enough, there were at least four attempts, and of the four attempts I think one was actually successful, and that led to a whole new avenue of evidence for us" (10:05)				
One of the locations where Katie's credit card was used was a grocery store which had surveillance video. It showed a white male, about 6 feet tall using Katie's debit card.(9:52)				
According to the clerk, the customer said the card belonged to his girlfriend, but instead of signing Katie's name, he [customer] signed his own (9:36)				
The name signed on the credit card slip was Jason Funk , the man renting the home on Mulberry St. (9:26)				
Detective Massucci: "We were almost shocked at his stupidity. I can't even recollect what he was thinking or how he thought he could get away with something so obviously stupid" (9:17)				
In Jason's backyard, investigators found what looked like a fire pit.(9:03)				
In the fire pit they found burnt hunks of carpet and a burnt belt buckle (8:58)				
Prosecutor: "It most certainly was consistent with the style and the size belt that Katie would have had on that particular day" (8:51)				
Investigators moved inside the house. They noticed what looked like a bloodstain on the rear door frame (8:44)				
On the living room ceiling there was				

blood spatter (8:36)				
Prosecutor: "And the realization that hit me as I was doing that [investigating the home] was- I really felt I was standing exactly in the spot where Katie Froeschle had died- in order for that blood to get up there" (8:31)				
Investigators also found a pre-paid highway toll device with a serial number registered to Katie (8:20)				
Investigators found her [Katie's] business card on a shelf above the oven (8:11)				
Katie's father (Jeff) "And then you're claiming you never met her before, you've never seen her before, and her business card is in your house? I mean, its almost like leaving breadcrumbs, I mean, for heaven's sakes!"(8:07)				
Investigators looked for an item in the home that could have been the murder weapon, and in the living room they found a 4 foot long motorcycle muffler (7:56)				
Det. Massucci: "It was sanitized to the point there were no discernable fingerprints and no attainable blood evidence" (7:39)				
On the end of the muffler was a circular mounting bracket (7:33)				
The mounting bracket was measured and then laid over photographs of Katie's fatal wounds. The round outer edge of the bracket was the exact size of the blunt force injuries on Katie's head.(7:23)				
Examiner: "The circular portion on the muffler was the exact same size as the injury on her scalp, and gave a lot of credibility to that being the murder weapon" (7:06)				
During the interrogation of Jason Funk, detectives noticed what appeared to be blood droplets on his Nikes (6:54)				
A presumptive test indicated this was human blood (6:37)				
Investigators sprayed the bank envelope found in Katie's car with Ninhydrin, which revealed an almost perfect set of fingerprints (6:32)				
Katie's fingerprints were on the envelope, and so were Jason Funk's (6:18)				
Massucci: "That told us, scientifically, that Jason Funk had been in Katrina Froeschle's vehicle"(6:11)				

Jason Funk continued to deny he was in any way involved. He claimed he was on a jet-ski in the river at the time of the murder (6:05)				
Jason Funk: "If I would have been home that day instead of out on my jet ski, who's to say I couldn't have prevented this whole thing from happening" (5:55)				
Jason Funk had prior convictions for assaulting women (5:05)				
Two days before Katie's murder Jason had lost his job (4:58)				
Massucci: "They [Jason Funk and Pamela Hintz] were having money problems. They had spent of their savings on the security deposit for this residence, so I think he was motivated by greed. That's my belief"(4:53)				
Narrator: "Investigators now know that Katie arrived at Funk's home because she told her co-worker on the phone that she had found it. They [investigators] believe it was Jason who approached her. When she went inside to inspect the roof damage, Jason was home alone. His girlfriend Pam was at work. Prosecutors think Jason might have made a sexual advance- no one knows. What the evidence shows is that he picked up the motorcycle muffler and struck Katie on the back of her head. This left a blood spatter on the ceiling and on his sneakers. As he exited the house with the body, Katie's blood stained the back door frame. The house was concealed enough that Jason could dump the body in the river without being seen. He abandoned Katie's car near a bar a mile away. Handled the bank envelope looking for money, and took her cash and credit cards. He burned the bloodstained living room carpet at Katie's clothing in order to remove the evidence. He also cleaned the murder weapon, but he left so much other evidence his efforts were hardly worth it. Using her credit card and signing his own name was a classic. (4:33)				
Massucci: "She was absolutely in the wrong place at the wrong time and fell victim to something that she should have never been a victim of (2:38)				
Six months after the murder the forensic lab finished the DNA testing. The blood in Jason's home and on his sneakers was Katie Froeschle's (2:16)				

The skin cells on the steering wheel of Katie's car were Jason's (2:03)				
Faced with a possible death sentence, Jason Funk agreed to plead guilty to the murder and in return was given a life sentence without parole. Jason Funk still maintains he had nothing to do with the murder. He claims he only pled guilty to avoid the death sentence (1:41)				

Figure A5: Module 2 Reasoning Styles Screen Shot

Module 2: Reasoning Styles

Introduction to the Three Reasoning Styles

Search this course

Reasoning Styles

13

LEARNING OBJECTIVES

- Identify the three primary reasoning styles; abduction, deduction, and induction, using everyday examples.
- Explain each style of reasoning.

Introduction to the Three Reasoning Styles

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Figure A6: Did I Get This Activity Example Question

Read each scenario and choose the appropriate reasoning process. Click the "hint" button for assistance.

This cat is black. That cat is black. A third cat is black. Therefore all cats are are black.

hint

- Deductive
- Inductive
- Abductive

NEXT >> [Reset this Activity](#)

Figure A7: Monty Python Video Clip Screen Shot and Example Question

Watch the following video and pay close attention to the characters' reasoning styles.



Based on the clip, label the parts of the following argument.

Argument: Witches are to be burned. This woman is a witch. This woman should be burned.

did I get this

Witches are to be burned.

hint

- Conclusion
- General Rule
- Specific Example

Figure A8: Sherlock Holmes Video Clip Screen Shot and Reasoning Checkpoint

Watch the following video and pay close attention to the characters' reasoning styles.



Based on the clip, answer the following questions about Holmes' reasoning style.

quiz
➔

Reasoning Checkpoint
➔

[Learning Dashboard](#)

Figure A9: Proportion correct across items for the Did I Get This activity where students were asked to identify the reasoning style in each example.


Where did students make the most mistakes?


Question	Students	% Correct
Question 3	30	67%
Question 7	29	72%
Question 11	22	73%
Question 9	27	74%
Question 1	32	75%
Question 4	31	77%
Question 8	27	78%
Question 10	23	78%
Question 2	32	81%
Question 6	30	83%


Figure A10: Response breakdown for questions 1 and 2 of the Did I Get This activity.

Question 1

33 responses, 76% correct

A
 3

B
 25

C
 5


This cat is black. That cat is black. A third cat is black. Therefore all cats are are black.


A. Deductive
B. Inductive
C. Abductive


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Question 2

33 responses, 79% correct

A
 26

B
 5

C
 2

All men are mortal. Joe is a man. Therefore, Joe is mortal.

A. Deductive
B. Inductive
C. Abductive

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Figure A11: Proportion correct and answer breakdown for the second Did I Get This activity related to the Monty Python video clip.

Where did students make the most mistakes?

Question	Students	% Correct
Question 2	30	27%
Question 3	30	70%
Question 1	30	90%

Question 1

30 responses, 90% correct

A

27

B

1

C

2

[Back to Questions](#)

Witches are to be burned.

A. General Rule

B. Specific Example

C. Conclusion

Question 2

30 responses, 27% correct

A

0

B

22

C

8

[Back to Questions](#)

This woman is a witch.

A. General Rule

B. Specific Example

C. Conclusion

Question 3

30 responses, 70% correct

A

1

B

21

C

8

[Back to Questions](#)

This woman should be burned.

A. General Rule

B. Specific Example

C. Conclusion

Figure A12: Results from DataShop displaying the error rate tied to the skill for identifying abductive reasoning. Results indicate no learning.

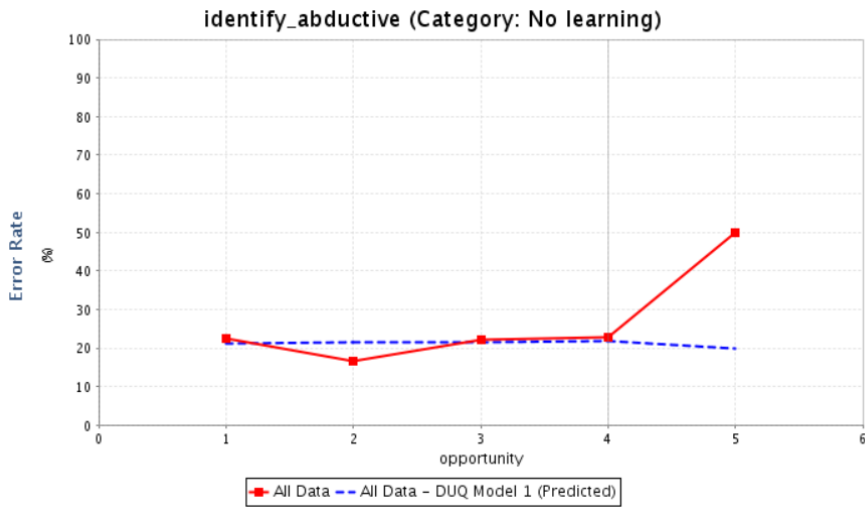


Figure A13: Results from DataShop displaying the error rate tied to the skill for identifying a general rule. Results indicate too little data.

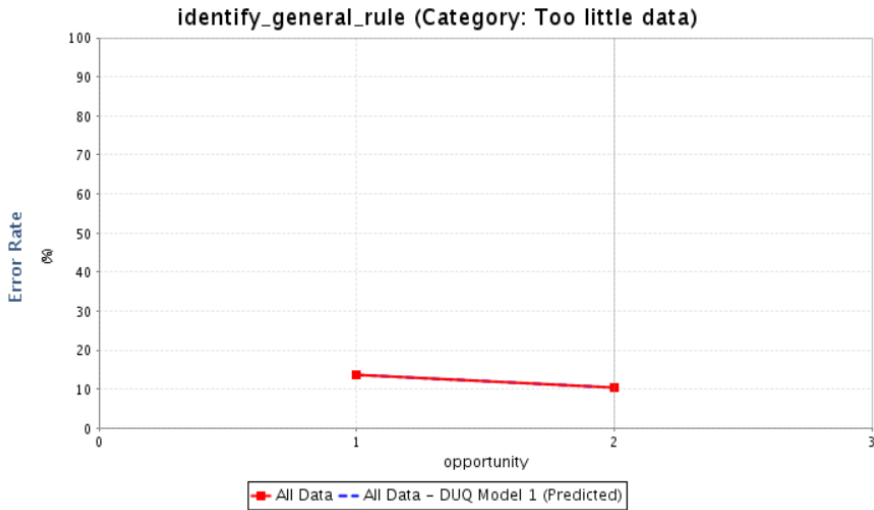


Figure A14: Results from DataShop displaying the error rate tied to the skill for identifying a specific example. Results are categorized as good, which indicates student learning.

