

UNIVERSITY OF KWAZULU –NATAL
SCHOOL OF LAW, HOWARD COLLEGE

The Role of the Minimally Invasive Forensic Autopsy in South Africa:
A Legal Perspective

YULISHA SINGH
207516305

Submitted in partial fulfilment of the degree of Master of Laws, coursework masters.
University of KwaZulu-Natal, Howard College Campus

Supervisor: Dr. T. Naidoo

2021

Declaration regarding originality

I, Yulisha Singh, do hereby declare that:

- A. The research reported in this dissertation, except where otherwise indicated, is my original research.
- B. This dissertation has not been submitted for any degree or examination at any other university.
- C. This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
- D. This dissertation does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
 - a. their words have been re-written, but the general information attributed to them has been referenced;
 - b. where their exact words have been used, their writing has been placed inside quotation marks, and referenced.
- E. Where I have reproduced a publication of which I am an author, co-author or editor, I have indicated in detail which part of the publication was written by myself alone and have fully referenced such publications.
- F. This dissertation does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the sources being detailed in the dissertation/thesis and in the References sections.

Signed:



Date: 8th NOVEMBER 2021

DEDICATION

I dedicate this dissertation to: -

*My daughter, Atarah, you are a beautiful reminder to me that life is full of pure joy and
blissful moments,*

*My husband, Donavan, for his ever-present love, encouragement, patience and support
during my research.*

*My parents, for the special love, pride and confidence they bestowed upon me and for always
inspiring me to reach greater heights.*

My late In-laws for their guidance, love and continuous blessings.

*My supervisor, Dr Threnesan Naidoo, for his complete faith in me and for his constant
motivation.*

TABLE OF CONTENTS

Abstract.....	7-8
---------------	-----

Chapter One: Introduction

1.1 The title.....	9
1.2 The topic.....	9-10
1.3 The research design and methodology applied.....	10-11
1.4 The background of the topic.....	12
1.5 The problems that manifest in respect of this topic.....	12-13
1.6 The purpose of conducting research in respect of this topic.....	13-14
1.7 Structure of the dissertation.....	14-15

Chapter Two: The Autopsy

2.1 The Autopsy.....	16-18
2.2 Types of autopsies.....	18-21
2.3 Who conducts a forensic autopsy?.....	21-22
2.4 The post-mortem report.....	22-23

Chapter Three: The conventional forensic autopsy v The minimally invasive forensic autopsy

3.1 The conventional forensic autopsy- Still the Gold Standard?.....	24
3.2 The techniques utilised during the conventional forensic autopsy.....	25-27
3.3 The advantages and disadvantages of the conventional forensic autopsy.....	28-30
3.4 Defining the minimally invasive forensic autopsy.....	30-31
3.5 Different modalities of minimally invasive forensic autopsies.....	31-37
3.6 The advantages and disadvantages of the minimally invasive forensic autopsy.....	37-39

Chapter Four: The South African Legislative Framework

4.1 The Inquests Act, 58 of 1959.....	40-45
4.2 The National Health Act, 61 of 2003 and The Regulations Regarding the Rendering of Forensic Pathology Service.....	45-48
4.3 The admissibility of electronic evidence obtained using minimally invasive autopsy techniques.....	48
4.3.1 The Criminal Procedure Act, 51 of 1977.....	48
4.3.2 The Electronic Communications and Transactions Act, 25 of 2002	49

Chapter Five: What are the court's expectations from an Inquest?

5.1 What is an inquest?.....	50
5.2 The need for conducting an inquest.....	50-52
5.3 The court expectations from an inquest.....	53-55

Chapter Six: Selected religious considerations and objections to autopsies

6.1 Judaism	56-57
6.2 Islam	57-59
6.3 Hinduism	59-60

Chapter Seven: The implementation of the minimally invasive forensic autopsy in other jurisdictions

7.1 Autopsy practices in Islamic countries	61-63
7.2 Mozambique	63-64
7.3 United States of America	64-65
7.4 Ireland.....	65-66
7.5 Switzerland.....	66-67
7.6 Australia....	67
7.7 Germany	68

Chapter Eight: Recommendations and Conclusion.....69-73

Bibliography.....	74-83
-------------------	-------

ABSTRACT

The purpose of the study is to provide a legal perspective on the role of the minimally invasive forensic autopsy in South Africa in light of the wide discretion conferred upon autopsy practitioners by the Inquests Act 58 of 1959. Autopsies are essential not only to identify cause of death and related pathology but also for healthcare quality control, vital statistics and medical education. Forensic autopsies received widespread attention internationally however the field in South Africa seems to be falling behind in light of the legislature failing to revisit the legislation regulating the field. In light of autopsies becoming more sophisticated there are now several different modalities that are used to perform both an academic autopsy and forensic autopsy other than a complete dissection of the body. These modalities can be defined as minimally invasive forensic autopsies. It has been extensively argued that diagnostic technology has rendered the conventional autopsy redundant. The dissertation aims to assess these modalities in comparison to the conventional autopsy.

In recent times, the option of a minimally invasive forensic autopsy including the non-invasive virtopsy and verbal autopsy has acquired considerable attention worldwide. However in South Africa, the extent of the medico-legal post mortem examination is not exactly prescribed by the Inquests Act 58 of 1959 and therefore left to the discretion of the autopsy practitioner as per the perceived needs of the case. Hence it is essential to provide a legal perspective to assess

whether minimally invasive forensic autopsies will fulfil the statutory obligations imposed by the Inquests Act and withstand judicial scrutiny in South Africa.

The writer submits that there is compelling evidence to promote the introduction of the minimally invasive forensic autopsy in South Africa. There is no legal prohibition in this regard. However, the implementation thereof will inevitably require a review of current legislation, especially the Inquests Act 58 of 1959 which is arguably outdated. In this way, the role of the minimally invasive forensic autopsy in South Africa will be supported by a robust legal framework.

CHAPTER ONE

Introduction

1.1 The Title

The Role of the Minimally Invasive Forensic Autopsy in South Africa: A Legal Perspective

1.2 The Topic:

As inferred by the title, the area of law under examination is medical law with specific reference to forensic medicine and pathology. The purpose of the study is to provide a legal perspective on the potential role of the minimally invasive forensic autopsy in South Africa in light of the wide discretion conferred upon autopsy practitioners by the Inquests Act¹. Such an undertaking

¹ 58 of 1959

requires comprehensive research with critical appraisal of minimally invasive forensic autopsies and related legislation, especially the Inquests Act, 58 of 1959. Furthermore, comparison with international norms, standards and practice is essential to determine how these different modalities are being used worldwide and if such techniques can survive judicial scrutiny and interrogation.

1.3 The research design and methodology applied:

The research methodology employed in this dissertation is primarily desktop research, relying mainly on a study of written texts. Visits to various libraries were undertaken and frequent use of the inter-library loan facility was utilised. Relevant South African and international sources were also consulted, including:

- Books
- Journal articles
- Conference papers
- Policy documents and recommendations
- Statutes
- South African and international law reports
- Case law
- Articles from the internet
- Articles from local and international newspapers and magazines.

The following databases were accessed:

- Juta,
- Lexis Nexis,
- Heinonline,
- Google Scholar,
- Sabinet,
- West law,
- SAFLII.

The research design encompassed a qualitative and descriptive approach that considered the utility and acceptability of minimally invasive forensic autopsies in South Africa in light of the Inquests Act². A discussion of the Inquests Act³ was therefore essential with specific reference as to whether it would be necessary for the legislature to revisit the provisions of this act.

This approach allowed for the exploration and critical appraisal of minimally invasive forensic autopsies, including the discretion that the autopsy practitioner must inevitably exercise when performing a forensic autopsy. Clarity was obtained by considering the application and suitability to South African law, supplemented by international comparisons and various other publications.

² Ibid

³ Ibid

1.4 The background of the topic:

In recent times, the option of a minimally invasive forensic autopsy (as opposed to the conventional autopsy) has received much attention worldwide.

In South Africa, however, the extent of the medico-legal post-mortem examination is not exactly described or prescribed by the Inquests Act⁴ and therefore left to the discretion of the autopsy practitioner as per the perceived needs of the case. Hence, it is essential to provide a legal perspective to assess whether minimally invasive forensic autopsies will fulfil the statutory obligations imposed by the Inquests act⁵ and withstand judicial scrutiny in South Africa.

1.5 The problems that manifest in respect of this topic:

South Africa is classified as a developing country. As such, it is generally accepted that it would take time before sophisticated technologies are introduced and utilised. The option of utilising minimally invasive forensic autopsy techniques is being exercised worldwide. However, the practice is uncommon in South Africa and related research studies have not been conducted in our local context. A further problem that arises is the outdatedness of our primary legislation

⁴ Ibid

⁵ Ibid

that regulates the field. The Inquests Act⁶ was introduced in 1959 and the sections that relate to how the forensic autopsy should be conducted have not been revisited since its adoption. The act does not set out precisely how an autopsy should be conducted. The nature and extent thereof is consequently left to the discretion of the autopsy practitioner.

1.6 The purpose of conducting research in respect of the topic:

The purpose of conducting research for this dissertation is to examine each of the aforementioned areas and to determine whether there are any statutory obligations, requirements and/or restrictions that are imposed by the Inquests Act on the autopsy practitioner and, if so, precisely what are such obligations, requirements and/or restrictions. It is further crucial to determine whether the present legislation is still relevant and applicable. This will allow for a discussion as to whether current statutory provisions are sufficient in view of the various technological advancements being introduced into the field. In order for the readers to fully understand these technological developments, a description and comparison of conventional and minimally invasive forensic autopsy techniques is essential. This will be done by identifying the potential and documented advantages and disadvantages of the minimally invasive forensic autopsy, including its limitations and shortcomings in terms of findings, accuracy and religious/cultural objectives. Other fundamental aspects that need to be discussed are what our courts would consider acceptable as evidence based on the prescribed rules and

⁶ Ibid

laws of evidence. In this way, the study attempts to establish an accurate legal perspective as to whether minimally invasive forensic autopsies would be acceptable in terms of South African law.

1.7 Structure of the dissertation:

The structure of the dissertation is determined by the chapters as follows:

Chapter one of the dissertation provides an introduction and sets out the aims, relevance and purpose of this study, together with a contextual background to the relevant issues in general. It also provides the conceptual framework, research questions and methodological approach adopted for this dissertation.

Chapter two focuses on the autopsy in general and the different types of autopsies. The chapter will also deal with aspects relating to who conducts an autopsy as well as the post-mortem report which is compiled after the autopsy has been conducted. This will provide the reader with a sturdy foundation and background information that will facilitate understanding of the main issues for discussion and analysis.

Chapter three discusses the conventional autopsy (including the advantages and disadvantages thereof) before describing the different modalities that can be considered as being comparatively minimally invasive (including the advantages and disadvantages thereof).

Chapter four ascertains the acceptability of minimally invasive forensic autopsies in South Africa by discussing the relevant legislation pertaining to the field. This chapter provides a detailed analysis into the Inquests Act⁷ and its interpretation as well as a general overview of the applicable regulations. It will also be crucial to establish whether the electronic evidence obtained from minimally invasive autopsies would be admissible in South African courts hence the latter part of chapter four will address the issue of admissibility of evidence.

Chapter five aims to illustrate how our courts have applied the law discussed in chapter four and will further elaborate on the purpose of conducting an inquest and the court's expectations from an inquest. The application of the Inquests Act⁸ will thereafter be discussed and illustrated in the case of *Wessel Marais N.O v Elizabeth Tiley*⁹.

Chapter six will aim to explore the religious and cultural objections to the autopsy and the implications of a forensic autopsy on a person's right to autonomy.

Chapter Seven proceeds to demonstrate the implementation of minimally invasive forensic autopsies in other jurisdictions worldwide.

Chapter eight will conclude the dissertation by providing various recommendations on the way forward and will summarise the salient arguments presented in the preceding chapters of the dissertation.

⁷ 58 of 1959

⁸ Ibid

⁹ 377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

CHAPTER 2

2.1 The Autopsy

“The death of a loved one is probably the most difficult event any of us will experience in our lifetime.”¹⁰

Death can be defined as the end of a person’s or organism’s life.¹¹ Death may be caused by aging, predation, malnutrition, disease, suicide, homicide, starvation, dehydration, and accidents or major trauma.¹² The critical question that arises in specific cases is exactly why did the person die? Over many years and throughout the history of medicine, this question has remained a fundamental issue.¹³ The answer, however, has inevitably raised several uncertainties which medical practitioners have attempted to resolve by conducting an autopsy.¹⁴

A post-mortem is an examination of a dead body to discover the cause of death.¹⁵ The term ‘autopsy’ is arguably a more accurate description of the post-mortem examination. However,

¹⁰Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

¹¹ Random House Webster’s Unabridged Dictionary, © (2019) Random House, Inc.

¹² Zimmerman L. "Must all organisms age and die?" *Massachusetts Institute of Technology School of Engineering*. (2010) <https://engineering.mit.edu/engage/ask-an-engineer/must-all-organisms-age-and-die/> date accessed 20 July 2019

¹³Bassat Q et al ‘Resuscitating the Dying Autopsy’ *PLOS Med* (2009) DOI 10.1371/journal.pmed 1001927

¹⁴ Ibid

¹⁵ South African *Oxford School Dictionary* 2nd Revised edition. 2006 Cape Town : Oxford University Press

the words ‘post-mortem examination,’ ‘necropsy’ and ‘autopsy’ can be used interchangeably¹⁶ and are generally synonymous, referring to the investigation of the human corpse, including an external and internal examination.¹⁷ The word autopsy is derived from the Greek word *autopsia* meaning ‘to see with one’s own eye’s’. An autopsy can be defined as the post-mortem dissection of the body to determine the cause of death with specific reference to the nature of injuries and/or disease processes which may be present.¹⁸

The notion of the post-mortem examination began around 100 BC and the first medico-legal autopsy was performed in 1302 AD in Italy.¹⁹ Throughout history, autopsies have been significant in understanding the pathologic basis of disease and the cause of death.²⁰ The history of the autopsy stems from a close association between anatomy and medicine and its origins can be traced to the practice of haruspicy which relates to the study of animal entrails to predict the future.²¹ Academic autopsies date back to ancient Talmudic law which stated “*Thou shalt not eat anything that dyeth of itself.*” Slaughtered animals therefore had to be closely examined for disease by the Rabbis.²² In Egypt, there was greater focus on the association of wounds and

¹⁶Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

¹⁷Bajaj Rachna ‘*The Conventional Autopsy still has an Important Role in Modern Medicine*’2006 The pathological Society of Great Britain undergraduate essay

¹⁸ Bajaj Rachna ‘*The Conventional Autopsy still has an Important Role in Modern Medicine*’2006 The pathological Society of Great Britain undergraduate essay

¹⁹ Manoj Kumar Mohanty et al Autopsy : The Changing Trends (2011) *International journal of Medical Toxicology and Forensic medicine* p17-23

²⁰ Jan G. van den Tweel, Wittekind Christian ‘The medical autopsy as quality assurance tool in clinical medicine: dreams and reality’ *Virchow’s Arch* (2016) 468: 75-81

²¹ Finkbeiner, Walter E et al *Autopsy Pathology: A Manual and Atlas 2nd Edition* (2009) by Saunders.

²² Ibid

fractures to anatomy as compared to the study of diseases.²³ In 16 AD, the world's first recorded anatomic dissection of a human body took place in China.²⁴

Autopsies are essential not only to identify the cause of death and related pathology, but also for healthcare quality control, to establish vital statistics and lay a foundation for medical education.²⁵

2.1 Types of autopsies:

Autopsies can be sub-divided into forensic autopsies and academic autopsies.²⁶ The primary difference is that a forensic autopsy attempts to address the manner of death which refers to the circumstances that caused the death²⁷ whereas an academic autopsy is usually performed in cases of natural deaths to diagnose which disease caused the death when ante-mortem efforts have failed to do so.²⁸ Natural deaths are those that occurred as a result of a disease or through the ageing process.²⁹

Academic autopsies are even conducted when the cause of death was established prior to death and aims to study the disease process for the purpose of enriching medical knowledge and

²³ Ibid

²⁴ Ibid

²⁵ Blokker BM, et al. 'Non-invasive or minimally invasive autopsy compared to conventional autopsy of suspected natural deaths in adults: a systematic review' *Eur Radiol.* 2016;26(4):1159-1179. doi:10.1007/s00330-015-3908-8

²⁶ Kotabagi RB, Charati SC, Jayachandar D. Clinical Autopsy vs Medicolegal Autopsy. *Med J Armed Forces India.* 2005; 61(3):258-263. doi:10.1016/S0377-1237(05)80169-8

²⁷ McGraw-Hill *Concise Dictionary of Modern Medicine.* (2002) the McGraw-Hill Companies, Inc.

²⁸ Du Toit-Prinsloo, L., & Saayman, G. (2012). Performance of autopsies in South Africa: Selected legal and ethical perspectives. *Continuing Medical Education*, 30(2), 53-55.

²⁹ McGraw-Hill *Concise Dictionary of Modern Medicine.* (2002) the McGraw-Hill Companies, Inc.

training.³⁰ Academic autopsies also allow medical students to grasp pathology in clinical contexts.³¹

Forensic autopsies are also known as medico-legal autopsies.³² A forensic autopsy is performed when the cause of death is unnatural, doubtful, undiagnosed and unidentified.³³ Unnatural deaths are generally defined as deaths that are a result of external causes which includes injury or poisoning.³⁴ In South Africa, the legal definition of unnatural deaths was recently expanded to also include those deaths resulting from an act or omission as well as sudden, unexplained or suspicious deaths and procedure-related deaths.³⁵ Forensic autopsies are performed with the aim of providing answers to questions about the identity of the deceased, cause of death, time of death and circumstances of death³⁶.

In medico-legal cases, the autopsy imposes several responsibilities on the autopsy practitioner.³⁷ An investigation of death can be considered as incomplete and unsatisfactory without an autopsy having been conducted.³⁸ Before a forensic autopsy can be performed on the deceased, a special instruction is obtained from a legal authority.³⁹

³⁰ Du Toit-Prinsloo, L., & Saayman, G. (2012). Performance of autopsies in South Africa: Selected legal and ethical perspectives. *Continuing Medical Education*, 30(2), 53-55.

³¹ Hill RB, Anderson RE. 'The uses and value of autopsy in medical education as seen by pathology educators.' *Acad Med* 1991;66:97-100.

³² Lt Col R.B Kotabagi, Lt Col SC Charati et al. 'Clinical autopsy v Medico legal autopsy' *MJAFI* 2005 (61) 258-263

³³ Ibid

³⁴ McGraw-Hill *Concise Dictionary of Modern Medicine*. (2002) the McGraw-Hill Companies, Inc.

³⁵ Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003

³⁶ Lt Col R.B Kotabagi, Lt Col SC Charati et al. 'Clinical autopsy v Medico legal autopsy' *MJAFI* 2005 (61) 258-263

³⁷ Manoj Kumar Mohanty et al Autopsy : The Changing Trends (2011) *International journal of Medical Toxicology and Forensic medicine* p17-23

³⁸ Ibid

³⁹ Ibid

There are various differences between the forensic autopsy and the academic autopsy. Unlike the forensic autopsy, academic autopsies do not require requisition from a law-keeping authority. However, consent from the next-of-kin is vital prior to conducting the autopsy.⁴⁰

Forensic autopsies are conducted by a forensic pathologist whilst an academic autopsy is carried out by a designated forensic medical autopsy practitioner.⁴¹ Furthermore, an academic autopsy is aimed at expanding medical knowledge whereas a forensic autopsy is aimed at providing assistance to the criminal justice system in order to solve a crime.⁴² The need and outcomes of a forensic autopsy is much greater as opposed to that of an academic autopsy. A forensic autopsy therefore has to be performed much more pedantically than an academic autopsy.⁴³ Another crucial factor that distinguishes the forensic autopsy from the academic autopsy is the fact that the autopsy practitioner conducting the forensic autopsy is often furnished with unreliable and inadequate background information relating to the circumstances surrounding the death whereas the autopsy practitioner conducting the academic autopsy is usually provided with trustworthy ante-mortem clinical information which makes their task much easier.⁴⁴

The forensic autopsy practitioner is also faced with various other challenges during an autopsy, one of which is that a forensic autopsy may be conducted on a body that has been decomposed or mutilated as opposed to an academic autopsy which is conducted on a complete and fresh

⁴⁰ Manoj Kumar Mohanty et al Autopsy: The Changing Trends (2011) *International journal of Medical Toxicology and Forensic medicine* p17-23

⁴¹ Lt Col R.B Kotabagi, Lt Col SC Charati et al. 'Clinical autopsy v Medico legal autopsy' *MJAFI* 2005 (61) 258-263

⁴² Ibid

⁴³ Ibid

⁴⁴ Ibid

body. The other challenge is that the findings of a forensic autopsy are subjected to intense scrutiny through cross-examination in court whilst the outcome of a clinical autopsy is only subjected to peer review.⁴⁵

As far as forensic autopsies are concerned, the increase in crime rates and associated fatalities have resulted in an increase in the number of forensic autopsies that are required to be performed on a daily basis.⁴⁶ In comparison to forensic autopsies, it has been noted that there has been a huge decline in academic autopsy rates nationally and internationally.⁴⁷ This decline can be attributed to several factors namely, the distaste of the procedure in both the physicians and the relatives, lack of financial incentives, increased faith in imaging technologies, fear of litigation, lack of importance of the autopsies in the teaching curriculum and poor communication skills on part of the requesting physicians.⁴⁸

2.2 Who conducts a forensic autopsy?

A forensic autopsy is conducted by a designated autopsy practitioner, preferably a specialist forensic pathologist.⁴⁹ Their main task is the examination of persons who die suddenly, unexpectedly or violently.⁵⁰ The forensic pathologist is an expert that bears the responsibility

⁴⁵ Ibid

⁴⁶ Pollak, Stefan. (2007). 'Medical criminalistics.' *Forensic science international*. 165. 144-9. 10.1016/j.forsciint.2006.05.014.

⁴⁷ Berger F. 'Clinical diagnosis and the function of necropsy'. *J R Soc Med* 2000 93: 662a

⁴⁸ Charlton R. Autopsy and medical education: a review. *J R Soc Med*. 1994 Apr; 87(4):232-6.

⁴⁹ Lt Col R.B Kotabagi, Lt Col SC Charati et al. 'Clinical autopsy v Medico legal autopsy' *MJAFI* 2005 (61) 258-263

⁵⁰ Stefan Timmermans, *Post-mortem: How Medical Examiners Explain Suspicious Deaths* University of Chicago Press, 15 Apr 2007 - Law - 367 pages

of determining the cause and manner of death.⁵¹ These experts are specifically trained to extract evidence to determine how the individual passed away.⁵²

In terms of the Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003, a mandated or authorised person to conduct an autopsy means a medical practitioner registered as a forensic pathologist or a forensic medical officer in terms of the Health Professions Act 56 of 1974, to perform post mortem examinations or autopsies on a body and appointed in terms of Regulation 16.⁵³

Ultimately the responsibility for the forensic autopsy and the quality of the autopsy lies upon the forensic pathologist, who must directly supervise support staff.⁵⁴ Allowing non-forensic pathologists to conduct forensic autopsy procedures without direct supervision and guidance is fraught with the potential for serious errors and omissions.⁵⁵

2.3 The Post-mortem Report

⁵¹ Bajaj Rachna ‘*The Conventional Autopsy still has an Important Role in Modern Medicine*’ 2006 The pathological Society of Great Britain undergraduate essay

⁵² Ibid

⁵³ Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003

⁵⁴ Garry F. Peterson, M.D. (Committee Chair, 2005) Steven C. Clark, Ph.D. et al Forensic Autopsy Performance Standards *The National Association of Medical Examiners 2015* p10

⁵⁵ Ibid

The death investigation process consists of various phases including: scene investigation, body assessment, medical records and the forensic autopsy.⁵⁶ The outcome of this investigation is documented in the death certificate, the investigator's report and the post-mortem report.⁵⁷

A post-mortem report is an important formal document that reflects the procedures and processes undertaken by the forensic pathologist during the post-mortem examination.⁵⁸ The post-mortem report has to be written in a manner that makes its contents understandable to non-scientists. This is necessary because the report is frequently admitted in courts unaccompanied by the forensic pathologist who compiled the report.⁵⁹ A complete post-mortem report records the findings of the autopsy and will include the cause of death and the related mechanism of death.⁶⁰ The post-mortem report can be very informative, especially when reviewed in conjunction with concurrent investigative reports and evidence.⁶¹

Forensic autopsies are being conducted nationally and internationally on a daily basis. Forensic autopsies are essential for the medico-legal investigation of death.⁶² The main objectives thereof are to determine the primary cause, mechanism and manner of death as well as identify

⁵⁶ S. Miyaishi, F. Moriya, in *Encyclopaedia of Forensic and Legal Medicine* (Second Edition), 2016

⁵⁷ Dean A. Beers, CLI, CCDI. Associates in Forensic Investigations, LLC Peer Reviewed White paper- Certified Legal Investigator (NALI 2009)

⁵⁸ Dean A. Beers, CLI, CCDI. Associates in Forensic Investigations, LLC Peer Reviewed White paper- Certified Legal Investigator (NALI 2009)

⁵⁹ Jackson A.R.W & Jackson J.M. 2004 *Forensic Science*. Harlow: Pearson/Prentice Hall p363

⁶⁰ Dean A. Beers, CLI, CCDI. Associates in Forensic Investigations, LLC Peer Reviewed White paper- Certified Legal Investigator (NALI 2009)

⁶¹ Ibid

⁶² Kotabagi RB, Charati SC, Jayachandar D. Clinical Autopsy vs Medicolegal Autopsy. *Med J Armed Forces India*. 2005; 61(3):258-263. doi:10.1016/S0377-1237(05)80169-8

contributing medical conditions and detect incidental pathologies.⁶³ In addition, autopsies inevitably provide vital information relating to burden of disease, epidemiology and healthcare quality control.⁶⁴

CHAPTER 3

The Conventional Forensic Autopsy v The Minimally Invasive Forensic Autopsy

3.1 The Conventional Forensic Autopsy – Still the Gold standard?

The conventional forensic autopsy is conducted by a designated and trained autopsy practitioner, preferably a qualified specialist forensic pathologist.⁶⁵ The autopsy involves the macroscopic examination of the main organs of the deceased which is variably accompanied by microscopic examination, toxicological studies and/or other biochemical tests.⁶⁶ Mahanta⁶⁷ states that a complete autopsy is necessary to substantiate the truth of evidence of eyewitnesses.

⁶³ Blokker BM, et al. 'Non-invasive or minimally invasive autopsy compared to conventional autopsy of suspected natural deaths in adults: a systematic review. *Eur Radiol.* 2016;26(4):1159-1179. doi:10.1007/s00330-015-3908-8

⁶⁴ Ibid

⁶⁵ Kotabagi RB, Charati SC, Jayachandar D. Clinical Autopsy vs Medicolegal Autopsy. *Med J Armed Forces India.* 2005; 61(3):258-263. doi:10.1016/S0377-1237(05)80169-8

⁶⁶ Semsarian C, Hamilton RM. Key Role of the Molecular autopsy in sudden death. *Heart Rhythm* 2012;9:145-150

⁶⁷ Dr Putul Mahanta The medico-legal autopsy – Its religious and social attitudes. *J Indian Acad Forensic Med*, 32(2) p183-188

During the course of a conventional forensic autopsy, the autopsy practitioner performs an in-depth examination of all body cavities in a systematic way to ensure that every detail is paid attention to.⁶⁸ In this way, the autopsy practitioner ensures that incidental findings are discovered and recorded, even if such findings are apparently unrelated to the primary underlying cause of death.⁶⁹ The lack of resources and personnel have led to a major backlog in these autopsies being performed inevitably resulting in a delayed criminal justice system.⁷⁰

3.2 The techniques utilised during the conventional forensic autopsy:

The autopsy practitioner commences the conventional autopsy by reviewing the available ante-mortem/clinical history of the deceased.⁷¹ The complete conventional autopsy involves a thorough external and internal examination of the deceased which generally includes histopathological (i.e. microscopic) and toxicological examination.⁷² In all cases, the external examination involves the recording of various measurements, such as body weight and height with photography.⁷³ This external examination includes documenting all surgical scars, scars of old wounds, healed burns and traumatic defects.⁷⁴

⁶⁸ Ayoub T and Chow J 'The conventional autopsy in Modern Medicine' *J R Soc Med* 2008; 101:177-181 DOI 2008

⁶⁹ Ibid

⁷⁰ Du Toit-Prinsloo, Lorraine; Saayman, Gert. 'Performance of autopsies in South Africa: Selected legal and ethical perspectives'. *Continuing Medical Education*, [S.l.], v. 30, n. 2, p. 53-55, Feb. 2012. ISSN 2078-5143.

⁷¹ Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

⁷² Manoj Kumar Mohanty et al Autopsy : The Changing Trends (2011) *International journal of Medical Toxicology and Forensic medicine* p17-23

⁷³ Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

⁷⁴ Van der Westhuizen, J. (Ed) 1996. *Forensic criminalists*. 2nd edition. Johannesburg : Heinemann

The internal examination of the deceased consists of evisceration (i.e. removal of organs) and dissection.⁷⁵ The method used to dissect the body of the deceased will depend on the personal preference of the autopsy practitioner and can be performed either by creating a long surface incision from the top of the sternum down the midline to the pubis or by creating a U-shaped surface incision at the top between the shoulders.⁷⁶ In order to remove and examine the various internal organs, the autopsy practitioner then reflects the skin and underlying soft tissues to expose the rib cage and the contents of the abdomen.⁷⁷

There are four classic autopsy techniques namely the technique of R.Virchow, technique of C.Rokitansky, technique of A.Ghon and technique of M.Letulle.⁷⁸

The technique of R.Virchow involves the removal of organs one by one.⁷⁹ This method starts by exposing the cranial cavity and the spinal cord followed by the thoracic, cervical and abdominal organs.⁸⁰ It can be extremely beneficial in identifying pathological changes in organs. However, it does not allow for the interpretation of inter-organ relationships and regional disease.⁸¹

⁷⁵ Ibid

⁷⁶ Ibid

⁷⁷ Ibid

⁷⁸ J.Ludwig. 'Principles of Autopsy techniques, Immediate and Restricted Autopsies and Other special procedures.' *Handbook of Autopsy Practice.3rd Edition*. Humana Press Inc.

⁷⁹ Virchow R 'Description and explanation of the method of performing post-mortem examinations in the dead house of the Berlin Charite Hospital, with especial reference to medico-legal practice' London (1880) *Churchill*.

⁸⁰ Ibid

⁸¹ Ibid

The technique of C.Rokitansky relates to in-situ dissection which may be combined with the removal of organ blocks.⁸² Over time, this method has been reported to be unworkable, but the technical skill that is applied can be useful, especially if it allows for the examination of organs without it having to be removed from the body.⁸³

The technique of A.Ghon (with modifications) is widely used and entails the removal of the thoracic and cervical organs, abdominal organs and the genitourinary organs as separate organ blocks.⁸⁴

The technique of M.Letulle allows for the preservation of inter-relationships between the organs and is conducted by the removal of the thoracic, cervical, abdominal and pelvic organs as one organ block.⁸⁵ In comparison to the other techniques, this technique requires much more experience, but a fundamental advantage thereof is that the body can be made available within a shorter space of time.⁸⁶

The autopsy is considered as being completed only when the post mortem-findings, histopathology assessment and results of the additional investigations are compared and interpreted in light of the case history and circumstances surrounding the death.⁸⁷

3.3 The advantages and disadvantages of the conventional forensic autopsy:

⁸² Ibid

⁸³ Ibid

⁸⁴ J.Ludwig, 'Principles of Autopsy techniques, Immediate and Restricted Autopsies and Other special procedures. *Handbook of Autopsy Practice.3rd Edition*. Humana Press Inc.

⁸⁵ Finkbeiner, Walter E et al *Autopsy Pathology: A Manual and Atlas 2nd Edition* (2009) by Saunders.

⁸⁶ Ibid

⁸⁷ Ibid

3.3.1 The advantages of the conventional forensic autopsy:

The main reason as to why the conventional autopsy remains such a powerful tool is that it allows for direct observation and therefore a more objective investigation into the cause of death.⁸⁸ The main advantage of this is that the entire body can be examined in its original setting thereby providing more accurate interpretations of the findings.⁸⁹ As a result of direct observation, there is less speculation in identifying tissues and measuring fluids.⁹⁰ Another fundamental advantage of the conventional autopsy is that the autopsy practitioner is able to collect samples of specimens and fluids for testing.⁹¹

3.3.2 The disadvantages of the conventional forensic autopsy:

The conventional autopsy is still regarded as the ‘gold standard.’ However, it has several limitations. The first being that it is completely dependent on the knowledge, qualification and skills of the autopsy practitioner.⁹² The quality of the autopsy may thus vary from case to case and subjective interpretations between different autopsy practitioners may produce different results.⁹³

The second limitation occurs in instances where new evidence is discovered and a further interpretation of the body is required. In such a case, only the written documents, selected parts

⁸⁸ Ayoub T and Chow J ‘The conventional autopsy in Modern Medicine’ *J R Soc Med* 2008: 101:177-181 DOI 2008

⁸⁹ Ibid

⁹⁰ Ibid

⁹¹ ‘Criminal investigation’ available at <https://www.britannica.com/topic/criminal-investigation> date accessed 24th June 2019

⁹² Ayoub T and Chow J ‘The conventional autopsy in Modern Medicine’ *J R Soc Med* 2008: 101:177-181 DOI 2008

⁹³ Lundberg GD. Low tech autopsies in the era of high tech medicine: continued value for quality assurance and patient safety *JAMA* 1998;280 p 1273-1274

and/or specimens retained may be reviewed because the rest of the body would have been disposed of, thereby precluding direct re-appraisal of original findings.⁹⁴

A third limitation is that a traumatic injury that does not have external wounds and lesions can go unnoticed if advanced information is not furnished to the medical practitioner.⁹⁵

The fourth limitation is of utmost importance and relates to the amount of time that is required to perform a conventional autopsy.⁹⁶ These autopsies are time consuming and the increase in crime-related violent deaths inevitably results in an increase in the number of autopsies that are required to be performed in a short space of time.⁹⁷

According to Steele⁹⁸, the documentation of information observed at the conventional autopsy occurs in a haphazard, subjective and observer-dependent manner in most instances and once the body of the deceased is cremated, any information that has not been recorded is irreparably destroyed.⁹⁹

Due to the fact that conventional autopsies employ techniques and methods that are invasive and result in the desecration of the deceased's body, family members are not keen on

⁹⁴ Jang Gyu Cha et al. Utility of Post mortem Autopsy via whole body imaging: Initial observations comparing MDCT and 3.0T MRI findings with Autopsy findings. *Korean J Radiology*. 2010 July- Aug 11 (4) p 395-406

⁹⁵ Lundberg GD. Low tech autopsies in the era of high tech medicine: continued value for quality assurance and patient safety *JAMA* 1998;280 p 1273-1274

⁹⁶ Ibid

⁹⁷ Jang Gyu Cha et al. Utility of Post mortem Autopsy via whole body imaging: Initial observations comparing MDCT and 3.0T MRI findings with Autopsy findings. *Korean J Radiology*. 2010 July- Aug 11 (4) p 395-406

⁹⁸ Julie Steele 'The cut free autopsy – How data and digital imaging are shaping virtual autopsies' *Beautiful Visualization*. April 2010 pg. 418

⁹⁹ Ibid

consenting to the performance of such autopsy as it may cause disfiguring changes to their loved one's body.¹⁰⁰

A study conducted in Lausanne, Switzerland has shown that a major shortcoming of the conventional autopsy was that fractures in various parts of the body were undetected, especially in areas of the body that was difficult to access.¹⁰¹ Furthermore, small haemorrhages in muscle tissue are not easily detected during a conventional autopsy, but may be important findings in identifying and determining a cause of death.¹⁰²

The delay in the finalisation of post-mortem reports by autopsy practitioners due to the workload as well as the limited number of experts in the field have also become problematic in respect of the conventional autopsy.¹⁰³

In several countries, the rise in organ retention crimes has also contributed to decline in conventional autopsy rates.¹⁰⁴

3.4 Defining the minimally invasive forensic autopsy:

There is no clear and concise definition of the minimally invasive forensic autopsy, but it involves techniques that provide information on the cause of death with a significant reduction

¹⁰⁰ 'State coroners guidelines Australia 2012' available at <https://www.courts.qld.gov.au/courts/coroners-court/about-coroners-court/resources-and-legislation#state> date accessed 24th June 2019

¹⁰¹ Chevallier C, Doenz F, Vaucher P, Palmiere C, Dominguez A, Binaghi S, Mangin P, Grabherr S. 'Post-mortem computed tomography angiography vs. conventional autopsy: advantages and inconveniences of each . *Int J Legal Med* DOI 10.1007/s004-012-081-3

¹⁰² Ibid

¹⁰³ Bajaj Rachna 'The Conventional Autopsy still has an Important Role in Modern Medicine'2006 The pathological Society of Great Britain undergraduate essay

¹⁰⁴ Ibid

in any disfigurement of the deceased's body.¹⁰⁵ The minimally invasive forensic autopsy aims to attain scientific, educational, and public health benefits with the use of various other modalities without the performance of the conventional autopsy.¹⁰⁶ Tweel¹⁰⁷ and Wittekind¹⁰⁸ are of the view that minimally invasive autopsy techniques have been introduced in light of major objections of relatives against the conventional autopsy which are seen to be crude since it involves the mutilation of the deceased's body.¹⁰⁹ Both Dirnhofer (2006)¹¹⁰ *et al* and Thali M.J¹¹¹ *et al* are of the opinion that the minimally invasive forensic autopsy can play a vital role in forensic pathology as these techniques can be used in cases where a full dissection is not required and it can significantly reduce the time spent in conducting autopsies.

3.5 Different modalities of minimally invasive forensic autopsies:

3.5.1 Verbal Autopsy:

In developing countries, conventional autopsies have remained the 'gold standard' to determine the cause of death. However, these autopsies have not been performed regularly as required due to poor resource allocation and financial constraints.¹¹² A further contribution to the decline

¹⁰⁵ Fan, JKM; Tong, DKH; Poon, JTC; Lo, OSH; Beh, PSL; Patil, NG; Law, WL. Multimodality minimally invasive autopsy-A feasible and accurate approach to post-mortem examination. *Forensic Science International*, 2010, v. 195 n. 1-3, p. 93-98

¹⁰⁶ Ibid

¹⁰⁷ Jan G. van den Tweel, Wittekind Christian 'The medical autopsy as quality assurance tool in clinical medicine: dreams and reality' *Virchow's Arch* (2016) 468: 75-81.

¹⁰⁸ Ibid

¹⁰⁹ Ibid

¹¹⁰ Dirnhofer R...et al. 'Virtopsy: Minimally Invasive, Imaging-guided Virtual Autopsy' (2006) 26 (5) *RadioGraphics* 1305-1333

¹¹¹ Thali M.J et al. 'Virtopsy, a New Horizon in Forensic Pathology: Virtual Autopsy by Post Mortem Multislice Computed Tomography (MSCT) and Magnetic Resonance Imaging (MRI) – a Feasibility Study' (2003) 48 (2) *Journal of Forensic Sciences* 1-18

¹¹² Bassat et al. Development of a post mortem procedure to reduce the uncertainty regarding causes of death in developing countries. Published online 29 July 2013. www.thelancet.com Vol 1 September 2013

is that most deaths take place outside the health system and the communities have raised several religious and cultural objections in respect of the conventional autopsy.¹¹³ A non-invasive method, namely the verbal autopsy, has therefore been introduced by the World Health Organisation as an attempt to address these issues and can be defined as “*a protocolised procedure that allows the classification of causes of death through analysis of data derived from structured interviews with family, friends and caregivers.*”¹¹⁴

Verbal autopsies can further be described as a systematic retrospective inquiry of the family members about the circumstances, events, symptoms and signs of illness prior to death and to classify the broad patterns of mortality.¹¹⁵ Peter Byass *et al* states “*that even though verbal autopsies are not the most promising approach with regards to ascertaining cause of death, it is nonetheless an option that is better than allowing deaths to pass unrecorded.*”¹¹⁶

According to Anker¹¹⁷ *et al*, the verbal autopsy has been widely used as a method of ascertaining causes of death in children in places where the majority of deaths occur without medical supervision. Soleman¹¹⁸ *et al* elaborates that the verbal autopsy is an indirect method of ascertaining biomedical causes of death from information on symptoms, signs and circumstances preceding death. The author further confers that a verbal autopsy is the only

¹¹³ Ibid

¹¹⁴ ‘WHO. Verbal autopsy standards: ascertaining and attributing causes of death’ available at <http://www.who.int/healthinfo/statistics/verbalautopsystandards/en> accessed 03rd October 2016

¹¹⁵ Vendhan Gajalakshmi and Richard Peto. ‘Commentary: Verbal autopsy procedure for adults’ *International Journal of Epidemiology* 2006 (35) 748-750

¹¹⁶ Peter Byass *et al*. ‘Strengthening standardised interpretation of verbal autopsy data: the new InterVA-4 tool. *Glob Health Action* 2012, 5: 19281

¹¹⁷ Anker M, Black RE, Coldham C, Kalter HD, Quigley M, Ross D, *et al*. A standard verbal autopsy method for investigating causes of death in infants and children. Geneva: World Health Organization; 1999.

¹¹⁸ Nadia Soleman *et al*. ‘Verbal autopsy: current practices and challenges’ March (2006) 84 (3) *Bulletin of the World Health Organization* p 239-245

process currently available to obtain estimates of the distribution of causes of death in middle- and low-income countries.

It is crucial that agents that have been tasked with the collection of post-mortem information about a deceased comply with the necessary cultural norms and sensitivities.¹¹⁹ Further these agents are required to undergo specialised training concerning awareness and sensitivity to the distressed respondents.¹²⁰

Researchers are of the view that regardless of the fact that the popularity of verbal autopsies are increasing daily, it is difficult to ascertain the consistency and reliability of the data.¹²¹ Hence, several attempts are continuously being made by various institutions to improve the questionnaires of verbal autopsies and the analysis of data received.¹²²

3.5.2 The ‘Virtopsy’ (Imaging)

Conventional autopsies have also been challenged by the advent of the ‘Virtopsy’ (image-guided autopsy).¹²³ The concept of the ‘Virtopsy’ arose from the need to introduce new techniques that could be beneficial to forensic science.¹²⁴ The term ‘Virtopsy’ was created from the terms *virtual* and *autopsy*.¹²⁵ ‘Virtopsy’ involves the use of computerised tomography (CT) scans, magnetic resonance imaging (MRI) and image-guided minimally invasive biopsies to

¹¹⁹ Anne Riley, Maria Merritt, Joan Pettit. Studies using verbal autopsy data collection procedures. *JHSPH IN*

¹²⁰ Ibid

¹²¹ Frank Baiden, Ayaga Bawah, et al. ‘Setting international standards for verbal autopsy’. *Bulletin of the World Health Organization* August 2007, 85 (8)

¹²² Ibid

¹²³ Lavis R. ‘Response to: The value of post-mortem examinations after surgery.’ *Ann R CollSurgEngl (Suppl)* 2005; 87: 106-109

¹²⁴ Thali M.J et al. ‘Virtopsy, a New Imaging Horizon in Forensic Pathology: Virtual Autopsy by Post Mortem Multislice Computed Tomography (MSCT) and Magnetic Resonance Imaging (MRI) – a Feasibility Study’ (2003) 48 (2) *Journal of Forensic Sciences* 1-18

¹²⁵ Ibid

investigate the cause of death.¹²⁶ Authors are of the view that these modern cross-sectional imaging techniques can be utilised to supplement the traditional invasive “body opening” autopsies and have the possibility of replacing the traditional autopsy.¹²⁷ An autopsy that is conducted using ‘Virtopsy’ methods involves body volume documentation and analysis using CT, MR imaging and micro radiology together with three-dimensional (3D) body surface documentation using forensic photogrammetry and 3D optical scanning.¹²⁸

The Swiss virtual autopsy project

In 2000, a research project was developed to indicate that non-invasive imaging can yield positive results in predicting autopsy findings.¹²⁹ This project was conducted by The Institutes of Forensic Medicine and of Diagnostic Radiology at the University of Bern in Switzerland.¹³⁰ The study involved the use of multi-slice computed tomography (MSCT) and magnetic resonance imaging (MRI) in forty (40) forensic cases to determine the cause of death, relevant traumatological and pathological findings, vital reactions, reconstruction of injuries and visualization.¹³¹ The findings of these cases were subsequently corroborated by the performance of the conventional autopsy.¹³² Upon interpretation and analysis of the ‘Virtopsy’

¹²⁶Bajaj Rachna ‘*The Conventional Autopsy still has an Important Role in Modern Medicine*’2006 The pathological Society of Great Britain undergraduate essay

¹²⁷Dirnhofer R et al. ‘Virtopsy: Minimally Invasive, Imaging-guided Virtual Autopsy’ (2006) 26 (5) *RadioGraphics* 1305-1333

¹²⁸ Ibid

¹²⁹ Thali MJ *et al* Virtopsy- the Swiss virtual autopsy approach. *Legal Medicine* 9 (2007) 100-104

¹³⁰ Ibid

¹³¹ Thali M.J et al. ‘Virtopsy, a New Imaging Horizon in Forensic Pathology: Virtual Autopsy by Post Mortem Multislice Computed Tomography (MSCT) and Magnetic Resonance Imaging (MRI) – a Feasibility Study’ (2003) 48 (2) *Journal of Forensic Sciences* 1-18

¹³² Ibid

results, it was demonstrated that 55% of the causes of death was found independently using only radiography.¹³³ Furthermore, it showed that radiology was superior to the traditional autopsy in respect of detecting injuries and trauma to the cranium, skeleton and tissue.¹³⁴

3.5.3 Laparoscopic autopsies:

Laparoscopic autopsies are also challenging the place of conventional autopsies.¹³⁵ This technique allows one to accurately map certain types of wounds that lack sharpness and are deep.¹³⁶ Laparoscopy is a type of surgical procedure performed during the autopsy whereby a small incision is made in the anterior abdominal wall and through which a viewing tube or camera is inserted.¹³⁷ This allows the autopsy practitioner to examine the intra-abdominal organs on a video monitor connected to the tube.¹³⁸ Thoracoscopy refers to a similar procedure that is used to inspect inside the chest, identify fluid collections in the pleural cavity and assess injuries of the diaphragm.¹³⁹ The Kahrizak Forensic Medical Centre conducted a study in Iran which was aimed at evaluating the accuracy of laparoscopic autopsies compared to conventional autopsies by assessing damages to intra-abdominal organs in fatal traumas.¹⁴⁰

¹³³ Ibid

¹³⁴ Ibid

¹³⁵ Catheline JM, Turner R, Guettier C, Champault G. Autopsy can be performed laparoscopically. *Surg Endosc.* 1999 Nov; 13(11):1163-4.

¹³⁶ Cacchione RN, Sayad P, Pecoraro AM, Ferzli GS. Laparoscopic autopsies. *Surg Endosc.* 2001; 15(6):619-622. doi:10.1007/s004640000308

¹³⁷ Ibid

¹³⁸ Ibid

¹³⁹ Bajaj Rachna 'The Conventional Autopsy still has an Important Role in Modern Medicine' 2006 The pathological Society of Great Britain undergraduate essay

¹⁴⁰ Hassan Peyvandi MD *et al* The Role of Endoscopic Autopsy in Trauma cases: The first report from Iran. *Arch Iranian Med* 2009;12 (4): 353-357

From December 2005 to August 2006, laparoscopic autopsies were performed on 50 decedents who had passed away as a result of blunt abdominal trauma.¹⁴¹ Subsequently, conventional autopsies were performed on the corpses by a medical practitioner.¹⁴² At that stage, the results obtained from the laparoscopic autopsies were not disclosed to the medical practitioner.¹⁴³ Both results were then compared and the results were interpreted.¹⁴⁴ Laparoscopic autopsies were shown to be accurate and did not disfigure the corpse as opposed to the conventional autopsy.¹⁴⁵ The results of the laparoscopic autopsies further revealed a 100% accuracy for the spleen, diaphragm, stomach, small intestine and gallbladder, 82% accuracy for the liver, 73.3% accuracy with regards to sensitivity, 97.1% accuracy in terms of specificity and an overall accuracy of 90%.¹⁴⁶ An additional study conducted by Avrahami *et al*¹⁴⁷ also demonstrated a 100% correlation between the laparoscopic autopsy and the conventional autopsy when assessing abdominal injuries. However, laparoscopic autopsies also encompass various shortcomings, including the lack of technical laparoscopic expertise and difficulty in obtaining the appropriate equipment.¹⁴⁸

3.5.4 Needle necropsy

¹⁴¹ Ibid

¹⁴² Ibid

¹⁴³ Ibid

¹⁴⁴ Ibid

¹⁴⁵ Ibid

¹⁴⁶ Ibid

¹⁴⁷ Avrahami R, Watemberg S, Daniels-Phillips E, Kahana T, Hiss J. Endoscopic autopsy. *Am J Forensic Med Pathol.* 1995;16:147-150

¹⁴⁸ Hassan Peyvandi MD *et al* The Role of Endoscopic Autopsy in Trauma cases: The first report from Iran. *Arch Iranian Med* 2009;12 (4): 353-357

Needle necropsy has also attempted to replace the conventional autopsy. It entails the microscopic examination of post-mortem biopsies from selected organs.¹⁴⁹ This method is ideal for detecting conditions producing diffuse changes in an organ.¹⁵⁰

3.5.5 Post-mortem computed tomography (CT) angiography

Post-mortem computed tomography (CT) angiography is regarded by some as being superior to the conventional autopsy as it is better to determine the extent of deposition of fatty plaques in the coronary artery.¹⁵¹ This technique involves the use of X-ray imaging to observe the coronary arteries of the heart and provides data and information that can be revisited at any given time.¹⁵² Christian C *et al*¹⁵³ conducted a study in Lausanne Switzerland. The study involved a comparison between the reports obtained from autopsies using post mortem computed tomography angiography and those findings obtained at conventional autopsies in 50 forensic autopsy cases.¹⁵⁴ The study indicated that post-mortem CT angiography was extremely efficient in terms of revealing vascular findings.¹⁵⁵ Despite post-mortem CT

¹⁴⁹ JCE Underwood, DN Slater. *et al* 'The needle necropsy' *British medical journal* (286) 1632-1634

¹⁵⁰ *Ibid*

¹⁵¹ Bajaj Rachna 'The Conventional Autopsy still has an Important Role in Modern Medicine' 2006 The pathological Society of Great Britain undergraduate essay

¹⁵² 'CT coronary angiogram' available at <https://www.mayoclinic.org/tests-procedures/ct-coronary-angiogram/about/pac-20385117> date accessed 10th April 2019

¹⁵³ Chevallier C, Doenz F, Vaucher P, Palmiere C, Dominguez A, Binaghi S, Mangin P, Grabherr S. Post-mortem computed tomography angiography vs. conventional autopsy: advantages and inconveniences of each. *Int J Legal Med* DOI 10.1007/s004-012-081-3

¹⁵⁴ *Ibid*

¹⁵⁵ *Ibid*

angiography having positive results, however, it remained less sensitive to the conventional autopsy.¹⁵⁶

3.6 The advantages and disadvantages of the minimally invasive forensic autopsy:

3.6.1 The advantages of the Minimally Invasive Forensic Autopsy:

Since there is no destruction of information and evidence, the electronic data acquired during the minimally invasive autopsy procedure can be referred to at any time as new questions arise. It may be sent to other pathologists for a second opinion and the data can be analysed and re-examined as many times as may be required.¹⁵⁷

Findings such as air distribution in the body that are difficult to detect during a conventional autopsy can be easily detected in a full body CT scan.¹⁵⁸

CT scans are also invaluable with regards to locating foreign objects during an autopsy.¹⁵⁹

Furthermore, tissue samples that have been obtained by the use of minimally invasive procedures have been shown to be of a superior quality than those that have been obtained during a conventional autopsy.¹⁶⁰

¹⁵⁶ Ibid

¹⁵⁷ Laurent PE, Arieu Bonnet D, Bartoli C. JFR: Will virtual autopsy replace traditional autopsy? *Aunt Minnie Europe*. www.auntminnieeurope.com date accessed 09 November 2016.

¹⁵⁸ Julie Steele 'The cut free autopsy – How data and digital imaging are shaping virtual autopsies' *Beautiful Visualization*. April 2010 pg. 418

¹⁵⁹ Ibid

¹⁶⁰ Van Der Linden A, Blokker BM, Kap M, Weustink AC, Robertus JL, Riegman PH, Oosterhuis WJ. (2014) 'Post mortem tissue biopsies obtained at minimally invasive autopsy: An RNA quality analysis.' *PLoS One*. 2014 Dec 22;9 (12);e115675

The use of minimally invasive procedures can also be described as a reasonable compromise and alternative to the conventional autopsy with regards to the religious and cultural objections from family members against the dissection and disfigurement of the body.¹⁶¹

3.6.2 The disadvantages of the Minimally Invasive Forensic autopsy:

The use of minimally invasive forensic autopsy imaging techniques involves the interpretation and reporting of data which is a joint effort between the radiologist and the forensic pathologist.¹⁶² The radiologist therefore plays a vital role in the process and should be familiar with post-mortem changes in CT and MRI images.¹⁶³ It is submitted that the lack of the proper training of radiologists in forensic medicine and pathology can impact negatively on the results of the autopsy.

‘Virtopsies’ involve the use of high-end imaging equipment.¹⁶⁴ The accessibility and availability of such equipment poses a serious obstacle to the utilisation thereof.¹⁶⁵ Due to the high number of reconstructions during the process, large data storage is required. Hence, the use of highly sophisticated equipment is essential to ensure that the data obtained is adequately stored.¹⁶⁶

¹⁶¹ Laurent PE, Arieu Bonnet D, and Bartoli C. JFR: Will virtual autopsy replace traditional autopsy? *Aunt Minnie Europe*. www.auntminnieeurope.com date accessed 09 November 2016.

¹⁶² I Wagenveld et al ‘How to implement a minimally invasive Autopsy procedure in a hospital setting; a practical guideline for radiologists.’ *European Society of Radiology*. DOI 10.1594/ECR2016/C-1235

¹⁶³ Knechtges PM, Carlos RC. ‘The evolving role of radiologists within the health care system.’ *J Am Coll Radiol*. 2007; 4(9):626-635. doi:10.1016/j.jacr.2007.05.014

¹⁶⁴ Gascho, D, Thali, MJ, Niemann, T (2018). ‘Post-mortem computed tomography: Technical principles and recommended parameter settings for high-resolution imaging.’ *Med Sci Law* 58, 70-82.

¹⁶⁵ Ibid

¹⁶⁶ Ibid

Biopsy sampling errors can also be seen as a problem that arises during the minimally invasive autopsy procedure. However, this can be solved with the application of 3D – stereotactic guided needle biopsies.¹⁶⁷

CHAPTER 4

The South African Legislative Framework and Judicial Scrutiny of the minimally invasive forensic autopsy

It has been more than twenty years since the adoption of the South African Constitution¹⁶⁸ which paved the way for the implementation of various amendments to the health sector with the aim of ultimately transforming and improving the rendering of health services within a democratic dispensation.¹⁶⁹ However, there has been comparatively less focus on the medico-

¹⁶⁷ Ibid

¹⁶⁸ Act 108 of 1996

¹⁶⁹ Constitution of the Republic of South Africa, Act 108 of 1996

legal post-mortem examinations that are being conducted daily. This chapter reviews progress (if any) in the implementation of legislation regulating the field as well as some of the key legislative developments over the past years. It also provides an overview of current legislation and discusses whether the minimally invasive forensic autopsy can withstand judicial scrutiny.

4.1 The Inquests Act 58 of 1959

All deaths due to unnatural causes and deaths that are believed to be due to natural causes but where the medical cause of death is uncertain or unknown are subjected to an inquest which can be defined as an official investigation to determine how the death occurred.¹⁷⁰ The objective of an inquest is to ascertain facts pertaining to death.¹⁷¹ This is achieved by an inquiry and at the conclusion of the inquest a verdict is arrived as to whether the death was due to a natural, accidental, suicidal or homicidal cause.¹⁷² Once the inquiry is complete and the cause of death is ascertained, the outcome of the inquest can lead to criminal prosecution.¹⁷³ The inquest system exists in all parts of the world. In South Africa, the first piece of legislation to introduce the inquest system was the Fire Inquest Act, 1883.¹⁷⁴ The Inquest Act, 12 of 1919 was thereafter enacted to provide more details as to how the inquiry should be conducted.¹⁷⁵

¹⁷⁰ Nadesan K. 'The importance of medico legal autopsy.' *Malays J Pathol*. 1997 Dec 19 (2) 105-9

¹⁷¹ Ibid

¹⁷² Ibid

¹⁷³ Akerson J D ' An Inquest law Inquest (1989) 5 *South African Journal on Human Rights* 209

¹⁷⁴ Ibid

¹⁷⁵ Ibid

The inquest inquiry required the hearing of oral evidence, but evidence in affidavits were permitted under exceptional circumstances.¹⁷⁶

Presently, the South African inquest system is regulated in terms of the Inquests Act, 58 of 1959. Under the current provisions, an inquest inquiry is not permitted if criminal prosecution has commenced or instances where the inquiry is in progress. As soon as criminal proceedings are instituted, the inquiry is immediately terminated.¹⁷⁷

The inquest inquiry begins at the place in which the deceased's body is discovered and the Inquests Act imposes the responsibility of field investigation onto attending police officials whose findings are thereafter reported to the public prosecutor.¹⁷⁸ The public prosecutor is then tasked with the duty of reporting all information to the inquest magistrate. This also includes requesting further information if necessary, and the hearing of evidence.¹⁷⁹

In cases of unnatural deaths, the act provides for a medico-legal investigation, including a medico-legal post-mortem examination.¹⁸⁰ Despite all the developments and changes in the legislation which imposed several duties on the police, public prosecutor and the inquest magistrate, the act failed to impose specific duties and responsibilities onto the medical practitioner tasked with conducting the medico-legal post-mortem examination and whose findings form an integral part of the inquiry, including *inter alia* the basis upon which the inquiry is founded.

¹⁷⁶ Ibid

¹⁷⁷ Ibid

¹⁷⁸ Ibid

¹⁷⁹ Ibid

¹⁸⁰ Act 58 of 1959

Section 3 of the act relates to the investigation of circumstances of certain deaths and states:

“3. (1) Subject to the provisions of any other law providing for an investigation of the circumstances of any death, any policeman who has reason to believe that any person has died and that such person has died from other than natural causes, shall investigate or cause to be investigated the circumstances of the death or alleged death.

(2) If the body of such person is available, any magistrate to whom the death is reported shall, if he deems it expedient in the interests of justice, cause it to be examined by the district surgeon or any other medical practitioner who may, if he deems it necessary for the purpose of ascertaining with greater certainty the cause of death, make or cause to be made an examination of any internal organ or any part or any of the contents of the body, or of any other substance or thing.

(3) For the purposes of any examination mentioned in subsection (2)

(a) any part or internal organ or any of the contents of a body may be removed therefrom;

(b) a body or any part, internal organ or any of the contents of a body so removed therefrom may be removed to any place.

(4) A body which has already been interred may, with the written permission of the magistrate or the attorney-general within whose area of jurisdiction it has been interred, be disinterred for the purpose of any examination mentioned in sub-section (2).

(5) At any examination conducted by a medical practitioner in terms of sub-section (2), no person other than

(a) a policeman; or

(b) any other medical practitioner nominated by any person who satisfies the magistrate within whose area of jurisdiction such examination takes place, that he has a substantial and peculiar interest in the issue of the examination, shall be present without the consent of such magistrate or the medical practitioner conducting the examination.

(6) Any person who contravenes the provisions of subsection (5), or who hinders or obstructs a medical practitioner, a policeman or any person acting on the instructions of a medical practitioner or policeman in carrying out his powers or duties under this section, shall be guilty of an offence and liable on conviction to a fine not exceeding two thousand rands or in default of payment to imprisonment for a period not exceeding six months or to such imprisonment without the option of a fine.”

The Act states that the autopsy practitioner may conduct an examination of the body if the autopsy practitioner deems it necessary for the purpose of ascertaining with greater certainty the cause of death.¹⁸¹ The manner in which the examination is conducted therefore lies completely upon the discretion of the autopsy practitioner. Upon an analysis of the wording of the relevant sections and legislature’s intention, the definition of the words “may” and “must” holds significant value. The word “must” can be defined as “being obliged to” which means

¹⁸¹Act 58 of 1959

that the obligation imposed is mandatory whereas the word “may” can be defined as “expressing possibility” which can be seen as discretionary.¹⁸² It is noteworthy that the intention of the legislature in using the word “may” as opposed to “must” is indicative of the discretion imposed onto the medical practitioner rather than the obligation. It is therefore submitted that the act does not provide mandatory obligations as to exactly how the medico-legal post-mortem examination should be conducted.

This introduces the possibility of utilising technologically enhanced minimally invasive autopsy techniques such as ‘Virtopsy,’ verbal autopsies, laparoscopic autopsies and the post-mortem CT angiography in South Africa without having to face judicial impediments. A medical practitioner who is duly authorised to conduct these medico-legal post-mortem examinations can therefore adopt these various modalities as the manner in which the examination is performed.

Until the legislature takes the necessary steps to amended section 3 of the Inquests Act, the legality of any findings of medico-legal post-mortem examination using minimally invasive autopsy techniques cannot be considered as illegal and/or inadmissible.

4.2 The National Health Act 61 of 2003 and the Regulations Regarding the Rendering of Forensic Pathology Service¹⁸³

¹⁸² South African *Oxford School Dictionary* 2nd Revised edition. 2006 Cape Town : Oxford University Press

¹⁸³ Regulation 341 of 2005

The National Health Act came into operation on the 2nd May 2005 and in terms of Section 90(1) (i) of the act various regulations were implemented.¹⁸⁴ The Regulations Regarding the Rendering of Forensic Pathology Service¹⁸⁵ was one of these regulations which was aimed at providing a framework for the rendering of forensic pathology services.¹⁸⁶

Regulation 3¹⁸⁷ deals with the Forensic Pathology Service and states that:

“The relevant member of the Executive Council of a province must within national policy and in terms of these regulations ensure that a Forensic Pathology Service is established within the respective provincial Department of Health.”

Regulation 4¹⁸⁸ goes further to emphasize what the Forensic Pathology Service entails and states:

“The Service contemplated in regulation 3 includes, but is not limited to, -

(e) maintaining evidence relating to a body and any associated items at all times;

(f) assisting, as far as is possible, the process of identification of the deceased;

¹⁸⁴ The National Health Act 61 of 2003

¹⁸⁵ Regulation 341 of 2005

¹⁸⁶ Ibid

¹⁸⁷ The Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003 (Regulation 341 of 2005)

¹⁸⁸ The Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003 (Regulation 341 of 2005)

- (g) conducting a post mortem investigation, including external and internal examination of a body and harvesting of material, tissue or fluids for evidentiary or diagnostic purposes;*
- (h) requesting and conducting appropriate special investigations;*
- (i) providing medico-legal reports, expert testimony and opinions;*
- (j) archiving documents, specimens and related materials;*
- (k) collecting, reviewing and analysing related data to determine trends or prevalence of incidents of unnatural death; and (l) providing information and advice to health or other government authorities or departments.’’¹⁸⁹*

The aforementioned provisions provide some indication regarding how forensic pathology service should be regulated. However, as in the case of the Inquests Act¹⁹⁰, a wide discretion is still conferred upon the medical practitioner as to how the medico-legal post-mortem examination should be conducted. This can evidently be ascertained from the wording “but is not limited to” contained in Regulation 4. A medical practitioner is therefore not restricted to perform the medico-legal post-mortem examination using the traditional or conventional autopsy techniques. The medical practitioner is at liberty to adopt any of various minimally invasive forensic autopsy procedures that he or she may deem necessary to conduct the examination. There are no specific techniques that are prescribed by law to perform the post-

¹⁸⁹ The Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003 (Regulation 341 of 2005)

¹⁹⁰ 58 of 1959

mortem examinations and the regulations do not specifically stipulate that a complete dissection of the body must be conducted.

In general, amendments to South African legislation regarding investigations into deaths have been stagnant, but some progress has been made with regards to less complex aspects.¹⁹¹ The overall situation continues to stem from the out-datedness of the Inquests Act which our legislature has neglected to revisit despite the various technological advancements that have been introduced into our country.

The present situation with regards to the performance of autopsies in South Africa can be variably attributed to inadequate legislation, high mortality rates, resource constraints, lack of trained professionals and appropriate mortuary facilities. More stringent legislation is required to be enacted to address these issues. Such measures have the potential to improve the quality and standards of the medico-legal post-mortem examination. In the interim, the implementation of various minimally invasive forensic autopsy procedures can also be of assistance in addressing the current state of affairs that forensic autopsy practitioners are faced with daily as these procedures are neither an encroachment on the basic principles of medical ethics nor a violation of present legislation.

4.3 The admissibility of electronic evidence obtained using minimally invasive autopsy techniques.

¹⁹¹ The Inquests Act 58 of 1959

4.3.1 Criminal Procedure Act, 51 of 1977

Section 210 of the Criminal Procedure Act, 51 of 1977 states that no evidence as to any fact, matter or thing shall be admissible which is irrelevant or immaterial and which cannot conduce to prove or disprove any point or fact at issue in criminal proceedings.

In the case of *S v Gokool*¹⁹² it was stated that *"The law of evidence is foundationally based on the principle that evidence is admissible if it is relevant to an issue in the case."*

4.3.2 The Electronic Communications and Transactions Act, 25 of 2002

This act specifically relates to the current legal position pertaining to the admissibility of electronic evidence in criminal and civil proceedings which is crucial in determining whether the data retrieved from minimally invasive autopsy techniques, such as multi-slice computed tomography (MSCT) and MRI, are admissible in South African courts. The Act further establishes the circumstances under which evidence stored or produced by a computer or other mechanically operated device can be admitted into evidence.¹⁹³

It's noteworthy that the Electronic Communications and Transactions Act, 25 of 2002 was formed using an electronic commerce model which specifically relates to commercial activities. Hence, the applicability of the Electronic Communications and Transactions Act, 25 of 2002 in governing the admissibility of electronic evidence in criminal proceedings is

¹⁹² 1965 (3) SA 461 (N) at 475G

¹⁹³ The Electronic Communications and Transactions Act 25 Of 2002

admittedly questionable. However, the Act ¹⁹⁴ does not expressly limit the provisions of the Act to commercial matters exclusively. Therefore admissibility of electronic evidence as evidence in legal proceedings would largely depend on the manner in which the Act¹⁹⁵ is interpreted and the perceived needs of the case.

CHAPTER 5

What are the court's expectations from an inquest?

Philosopher Voltaire said, "To the living we owe respect, but to the dead we owe only the truth."

5.1 What is an inquest?

An inquest can be defined as a judicial inquiry to ascertain facts relating to an incident.¹⁹⁶

In Wessel Marais N.O v Elizabeth Tiley¹⁹⁷ the court stated that

“An inquest is an official investigation into a death occurring otherwise from natural causes, which has not been the subject of a criminal prosecution.”

¹⁹⁴ Ibid

¹⁹⁵ Ibid

¹⁹⁶ Steyn, J.W.J 1992 *Inquest*. Pretoria : Justice College

¹⁹⁷ (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

5.2 The need for conducting an inquest:

Steyn¹⁹⁸ states that the aim of an inquest is to promote public confidence and satisfaction and to reassure the public that all deaths from unnatural causes will receive proper attention and investigation as a way of preventing similar deaths, and to ensure that those responsible for the deaths are prosecuted. An inquest is an investigative system and in South Africa the findings are placed before the inquest magistrate.¹⁹⁹

The decision of our courts can also have significant impact and development and implementation of our legislation.²⁰⁰

In the case of **Timol and Another v Magistrate, Johannesburg and Another 1972(2) SA 281 (T) at 287 H to 288 A** the court stated that:

"For the administration of justice to be complete and to instil confidence, it is necessary that, amongst other things, there should be an official investigation in every case where a person has died of unnatural causes, and the result of such investigation should be made known. Therefore the Inquests Act provides that, if there is reason to believe that a death has occurred, that such death was not due to natural causes and that it was not followed by the institution of criminal proceedings, there shall be an inquest as to the circumstances of the death"

¹⁹⁸ Steyn, J.W.J 1992 *Inquest*. Pretoria : Justice College

¹⁹⁹ The Inquests Act 58 of 1959

²⁰⁰ Camps Bay Ratepayers' and Resident Association and Another v Harrison and Another 2011 (4) SA 42 (CC),

and further (at 292 A - B) that:

"the inquest must be so thorough that the public and the interested parties are satisfied that there has been a full and fair investigation into the circumstances of the death".

The re-opened inquest into the death of Ahmed Essop Timol (IQ01/2017) [2017] ZAGPPHC 652 the court stated that:

"It is logical to expect that in inquest proceedings, one of the primary sources of evidence to determine the cause of death would be the autopsy (sometimes referred to as post mortem or medico-legal) report. While it is accepted that the autopsy report may inform on the direct cause of death, the agent directly responsible for the cause of death may not be apparent. Nevertheless, the autopsy report would ordinarily be the first point of call. Fortunately in this case, it was made available during the 2017 inquest proceeding, since it is one of the documents which survived the mysterious disappearance of some of the 1972 inquest records"

The main purpose of the re-opened inquest proceedings was to ascertain if the evidence that has been presented and led at the proceedings is enough to persuade the presiding officer to set aside the original finding. The re-opened inquest into the death of Mr Timol relied significantly on the forensic medical evidence and the preservation of such evidence is of utmost importance in the pursuit of justice. Furthermore, it can be inferred that the integrity of stored records and

the ability to revisit such records will be crucial in such matters. In this regard, it is submitted that minimally invasive autopsy techniques such as imaging studies offer superior and more reliable retention of evidentiary material in comparison to records of conventional autopsies, which are largely post-mortem reports only.

5.3 The court's expectations from an Inquest:

In ascertaining exactly what a court expects from an inquest it is crucial to reflect on the judgement handed down by the Appellate Division in the undermentioned case.

Wessel Marais N.O v Elizabeth Tiley²⁰¹

This was an appeal against the decision handed down by Magistrate Wessel Marais in Cape Town relating to the inquest into the death of the late George Williams.²⁰² The grounds for the appeal was the manner in which the inquest into the death of the late George Williams was conducted and whether the court a quo was entitled to interfere on review with the exercise of the appellant's discretion to hold a non-public inquest into the death only on the basis of affidavits and not oral evidence.²⁰³

The court expressed the view that the purpose of conducting an inquest was to ascertain the identity of the deceased, the cause or likely cause of death as well as the date of death and

²⁰¹(377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

²⁰² (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

²⁰³(377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

whether the death occurred as a result of an act or omission that related or amounted to an offence of any person.²⁰⁴

The court went further to state that:

*“public confidence and satisfaction would normally be best promoted by a full and fair investigation, publically and openly held, giving interested parties an opportunity to assist the magistrate holding the inquest in determining not only the circumstances surrounding the death under consideration, but also whether any person was responsible for such death. A full and fair investigation presupposes adherence to basic principles of procedure and would in the normal course require the hearing of viva voce evidence. The justice must be seen to be done is no less truism in the holding of inquests than it is in the hearing of trials.”*²⁰⁵

It was noted in this judgment that Section 10 of the Inquests Act²⁰⁶ was significant which reads:

*“Unless the giving of oral evidence is dispensed with under this Act, an inquest shall be held in public”.*²⁰⁷

²⁰⁴ (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

²⁰⁵ (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

²⁰⁶ Act 58 of 1959

²⁰⁷ (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

The interpretation of the abovementioned section was addressed by the court which stated that Section 10 contained a requirement that an inquest must be held publicly and that oral testimony must be heard and in essence as far as possible to ensure a full and fair inquiry.

The court was also of the view that:

*“The requirement in s 5(a) of the Act that an inquest must be held into the circumstances and cause of the death necessitates consideration only of such circumstances as will enable the inquest magistrate to make such findings as he is enjoined by s 16(2) to record. Only evidence relevant to such findings would be admissible, and only disputes relevant to such findings need to be resolved by oral evidence.”*²⁰⁸

In light of the above case, it can be construed that our courts have interpreted the relevant sections of the Inquests Act and our courts have an expectation that evidence at the inquest inquiry should be oral evidence. Deviation will only be permitted under specific circumstances. Although the purpose of the inquest has been laid out, our courts have failed to interpret Section 3 of the act²⁰⁹ which deals with the post-mortem examination.

The re-opened inquest into the death of Ahmed Essop Timol which directly related to the preservation of forensic medical evidence, the post mortem examination and report have also failed to revisit Section 3 of the act.²¹⁰ Had this been done, electronic evidence obtained from various minimally invasive autopsies would be regarded as admissible evidence. Such evidence

²⁰⁸ (377/88) [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

²⁰⁹ Act 58 of 1959

²¹⁰ Act 58 of 1959

can be easily preserved for future use in the event that there is a re-opening of an inquest many decades later, similar to the death of Mr Timol.

Our courts have constantly failed to set out specific guidelines as to what is expected from a post-mortem report and how the post-mortem examination should be conducted. Thus, without specific guidelines from our legislature and the common law, it is difficult to ascertain what our courts expect from a post-mortem examination. Consequently, the standards of the post-mortem examinations that are being conducted vary considerably and thereby become very questionable.

CHAPTER 6

Selected religious considerations and objections to autopsies

Throughout the world amongst various religions and cultural practices lies a common ground which deals with affording the deceased the utmost dignity and respect during the farewell ceremony.²¹¹ In many jurisdictions, consent from relatives of the deceased is not a requirement for the performance of the medico-legal post-mortem examination. This can be attributed to the fact that the purpose of the examination is to ascertain vital information as to how the death occurred. Requesting the consent of relatives may introduce a conflict of interest as guilty family members may object with the intention of concealing critical information.

6.1 Judaism

²¹¹ Segal, G 'Religion/Custom and Coronial practice: How to avoid either being compromised' (unpublished 2011)

The disposal of the deceased's body and the process of death forms an integral part of the religion which encompasses various specific laws to regulate how the process should be conducted.²¹² It is a common belief in Judaism that the cremation of the deceased's body is not permitted and that the deceased should only be buried.²¹³ Maintaining the dignity of the deceased is paramount and as an attempt to perform a higher religious duty, Jews volunteer to attend to the necessary arrangements relating to the body of the deceased.²¹⁴ Another significant element in Judaism is that interference with the deceased's body is strictly prohibited and the body should be buried in its entirety.²¹⁵ It is submitted that this is crucial in considering the performance of minimally invasive forensic autopsy techniques as opposed to the conventional autopsy as the less invasive techniques offer greater respect to the restrictions imposed by religious beliefs. Judaism also dictates that the burial ceremony should commence as soon as possible and should be concluded on the day on which the death occurred.²¹⁶

6.2 Islam

Currently, a frequent obstacle encountered by autopsy practitioners relate to Islamic objections to the performance of autopsies. According to Islam, it is important to maintain the body as a whole after death.²¹⁷ In this regard, the Islamic religion shares very similar sentiments to

²¹² Ibid

²¹³ Ibid

²¹⁴ Ibid

²¹⁵ Ibid

²¹⁶ Ibid

²¹⁷ Carpenter, Belinda, Tait, Gordan, Quadrelli, Carol (2013) 'Arguing the autopsy: Mutual suspicion, jurisdictional confusion and the socially marginal.' *Crime, Justice and Social Democracy: Proceedings of the 2nd International conference*, Crime and Justice Research centre, Queensland University of Technology, Gardens Point, Brisbane, Australia, pp10-18

Judaism. There are three major grounds upon which the objections against the conventional autopsy are based which is of significance.²¹⁸ The first is that the performance of the autopsy is time consuming which results in a delay in the burial of the deceased which conflicts with the principle that the burial should be performed within 24 hours after the death.²¹⁹ The second ground is premised on the idea of the sacredness of the body which stems from the religious belief that the body belongs to God.²²⁰ Lastly, the third objection is built on the concept that despite death the body experiences pain as per the words of Prophet Mohammed who stated that *“the breaking of the bone of the dead person is equal in sin to doing this while he is alive”*.²²¹ However, it is noteworthy that the Qur’an does not specifically mention the autopsy or the post-mortem examination. In instances where contentious issues arise which are contrary to Islam law, scholars are approached to provide a *fatwa* or a legal opinion.²²² These opinions are nonetheless not binding but provide clarity in respect of issues that conflict with the religion.²²³

After the occurrence of death there are various practices that are required to be performed by Muslims which includes the straightening of the limbs, ensuring that the eyes and mouth of the deceased are properly closed and that the body is properly washed and draped without any

²¹⁸ Ibid

²¹⁹ Ibid

²²⁰ Ibid

²²¹ Ibid

²²² Burton EC, Gurevitz SA. Religions and the autopsy.’ Available from: <http://www.emedicine.medscape.com/article/1705993-overview#a1>. Date accessed 21st July 2018

²²³ Ibid

embalming.²²⁴ Furthermore, the body of the deceased should always be placed in the direction that faces Mecca and the body should be buried as opposed to cremation.²²⁵

Due to these rigorous rules and practices, the conventional autopsy is frequently discouraged.²²⁶ The various religious texts such as The Sharia dictate that the body should as far as possible be kept in its original form and that the burial should occur as close possible to the place where the death occurred.²²⁷ Forensic autopsies require that the body be transported to the laboratory/mortuary which may result in the body being transported far away from the place at which the death occurred and/or being damaged during transit.²²⁸ In addition, the procedures involved in the performance of the autopsy are time-consuming and thus conflict with the practices of the Muslim culture relating to expedited burial.²²⁹

6.3 Hinduism

Hinduism originated around 3000 BC and found its roots in the Indus valley.²³⁰ A fundamental belief of Hindus is that of reincarnation which involves the cycle of rebirth and death.²³¹ A central tenet of the religion is that the purpose of life is to bring to an end the cycle of

²²⁴Ibid

²²⁵ Ibid

²²⁶ Ibid

²²⁷ Amanat and Frank Griffel, 'Shari'a: Islamic Law in the Contemporary Context,' *Stanford University Press* 2007 ISBN:978-0-8047-5639-6

²²⁸ Castillo P, Ussene E, Ismail MR, et al. Pathological Methods Applied to the Investigation of Causes of Death in Developing Countries: Minimally Invasive Autopsy Approach. *PLoS One*. 2015; 10(6):e0132057. Published 2015 Jun 30. doi:10.1371/journal.pone.0132057

²²⁹ Sajid MI. Autopsy in Islam: Considerations for Deceased Muslims and Their Families Currently and in the Future. *Am J Forensic Med Pathol*. 2016; 37(1):29-31. doi:10.1097/PAF.0000000000000207

²³⁰ Ibid

²³¹ Ibid

reincarnation and enter the spiritual world.²³² Death is therefore seen as forming part of the cycle and surviving family members are tasked with ensuring that their loved one has a smooth journey into death.²³³

Once death occurs, the soul exits the body.²³⁴ However, the soul is still aware of the surroundings. Hindus are therefore of the view that the dissection of the body during an autopsy causes a disturbance to the soul.²³⁵ Once the soul is disturbed, it is viewed negatively and considered as being evil.²³⁶ The mutilation of the body during the Vedic age was looked upon as being detrimental to the fulfillment of life.²³⁷ Consequently, Hindus try as far as possible to avoid autopsies. Should the law and the interests of justice require an autopsy, however, then Hindus do not strongly object to it being performed.²³⁸

It is submitted that in light of the statutory recognition of the right to dignity²³⁹ enshrined in in the Bill of Rights²⁴⁰ in our value-based Constitution²⁴¹, religious considerations form a crucial role in maintaining the dignity of the deceased. This can be achieved by introducing less invasive forensic autopsy techniques which provide reasonably alternative means to conduct the autopsy and record the findings without having to desecrate the body.

²³² Ibid

²³³ Ibid

²³⁴ Ibid

²³⁵ Ibid

²³⁶ Ibid

²³⁷ Ibid

²³⁸ Ibid

²³⁹ Section 10 Constitution of the Republic of South Africa 1996

²⁴⁰ Chapter 2 of the Constitution of the Republic of South Africa 1996

²⁴¹ Act 108 of 1996

CHAPTER 7

The implementation of the minimally invasive forensic autopsy in other jurisdictions

Legislation pertaining to deaths due to unnatural causes differs between countries and even between jurisdictions falling within different countries.²⁴² Certain countries have now adopted more sophisticated systems regarding investigations into unnatural deaths.²⁴³ In addition, it is imperative to have due regard to countries that still perform autopsies using various other techniques which serve the interests of justice despite compelling religious objections to the dissection and perceived mutilation of the body.²⁴⁴

²⁴² T E Madiba et al 'The amended legislation on procedure related deaths-an advance in patient care, Medicine and the law,' April 2011 *SAMJ* Vol 101 No 4

²⁴³ Ibid

²⁴⁴ Du Toit-Prinsloo, Lorraine; SAAYMAN, Gert. Performance of autopsies in South Africa: Selected legal and ethical perspectives. *Continuing Medical Education*, [S.l.], v. 30, n. 2, p. 53-55, Feb. 2012. ISSN 2078-5143.

7.1 Autopsy practices in Islamic countries

Over the years, various research studies have been conducted on the Islamic perspective of autopsies.²⁴⁵ Seeing that the Qur'an does not expressly confer direction with regards to the performance of autopsies, the practice is therefore left upon the religious leaders to provide guidance.²⁴⁶ This, however, leads to conflicting opinions within which misunderstandings may occur.²⁴⁷ These opinions all advise that the advantages and disadvantages of the performance of the autopsy should be weighed up against each other and that necessity should outweigh the forbidden.²⁴⁸ Autopsies in Islamic countries are practiced in accordance with international standards. Nonetheless, minimal publications exist that provide guidance with regards to the standards of the practice in these countries.²⁴⁹

The negative connotations and characteristics of the traditional/conventional autopsy have inevitably resulted in a quest to introduce methods of autopsy procedures that are minimally invasive alternatives to the traditional autopsy.²⁵⁰ Notwithstanding the advent of various minimally invasive techniques that have now been implemented and the publication of various

²⁴⁵ Madadin Mohammed, MD Assistant Professor of Forensic Medicine, Magdy A. Kharoshah, Autopsy in Islam and current practice in Arab Muslim countries *Journal of Forensic and Legal Medicine* 23 (2014) 80e8382

²⁴⁶ Ibid

²⁴⁷ Madadin Mohammed, MD Assistant Professor of Forensic Medicine, Magdy A. Kharoshah, Autopsy in Islam and current practice in Arab Muslim countries *Journal of Forensic and Legal Medicine* 23 (2014) 80e8382

²⁴⁸ Ibid

²⁴⁹ Ibid

²⁵⁰ Ibid

related articles, it is noted that there has been no report of Islamic countries adopting the minimally invasive imaging autopsy techniques.²⁵¹

A recent study was conducted during the period from September 2013 to July 2015 and was designed to validate the use of minimally invasive autopsy techniques to determine the cause of death in deaths that occurred in low and middle income countries as well as its acceptability and feasibility.²⁵² The countries that formed part of the study were Gabon, Kenya, Mali, Mozambique and Pakistan and was aimed of achieving the results through different methods of understanding the perceptions and attitudes of members of the local community.²⁵³ During the study, several perceived advantages and concerns were raised relating to cause of death investigations and the minimally invasive autopsy.²⁵⁴ One of the most significant advantages of determining the cause of death amongst the community was that, apart from the method used to perform the autopsy in the clinical setting, the outcome achieved from the autopsy proved invaluable in the protection of other family members and the community from contagious diseases that are easily transmitted or hereditary.²⁵⁵ Furthermore, knowledge as to the cause of death gave peace to the bereaved families and avoided conflicts and confrontations relating to accusations of alleged witchcraft activities commonly practiced in these countries.²⁵⁶ In addition, the minimally invasive autopsy was also observed to be fast, easy and less disfiguring

²⁵¹ Ibid

²⁵² Maixenchs M, Anselmo R, Zielinski Gutie ´rrez E, Odhiambo FO, Akello C, Ondire M, et al. (2016) Willingness to Know the Cause of Death and Hypothetical Acceptability of the Minimally Invasive Autopsy in Six Diverse African and Asian Settings: A Mixed Methods Socio-Behavioural Study. *PLoS Med* 13(11): e1002172.doi:10.1371/journal.pmed.1002172

²⁵³ Ibid

²⁵⁴ Ibid

²⁵⁵ Ibid

²⁵⁶ Ibid

on the body.²⁵⁷The study illustrated that over 70 % of the participants interviewed were interested in establishing the cause of death of their relatives and accepted the performance of the minimally invasive autopsy on their relatives.²⁵⁸

7.2 Mozambique

Mozambique can be described as a middle to low income country where infectious diseases are a common cause of death.²⁵⁹ The performance of complete autopsies seldom occur due to lack of resources and strong cultural and religious backgrounds.²⁶⁰ An observational study was conducted in Mozambique which compared the use of minimally invasive autopsy techniques to the conventional autopsy.²⁶¹The minimally invasive autopsy was shown to be more widely accepted amongst the relatives of the deceased as opposed to the conventional autopsy.²⁶² It was also illustrated that the minimally invasive autopsy could easily be performed by trained technicians and was therefore beneficial because of the lack of pathologists in the country.²⁶³ The results of the autopsies using the minimally invasive techniques were compared to the ‘gold standard’ conventional autopsy which illustrated an 80% accuracy rate²⁶⁴, thereby

²⁵⁷ Ibid

²⁵⁸ Ibid

²⁵⁹ Castillo P, Marti ´nez MJ, Ussene E, Jordao D, LovaneL, Ismail MR, et al. (2016) Validity of a Minimally Invasive Autopsy for Cause of Death Determination in Adults in Mozambique: An Observational Study. *PLoS Med* 13(11): e10 02171. doi:10.1371/journal.pmed.1002171

²⁶⁰ Castillo P, Marti ´nez MJ, Ussene E, Jordao D, LovaneL, Ismail MR, et al. (2016) Validity of a Minimally Invasive Autopsy for Cause of Death Determination in Adults in Mozambique: An Observational Study. *PLoS Med* 13(11): e10 02171. doi:10.1371/journal.pmed.1002171

²⁶¹ Ibid

²⁶² Ibid

²⁶³ Ibid

²⁶⁴ Ibid

demonstrating that minimally invasive procedures can be used as valid tools in determining causes of death in countries such as Mozambique.

7.3 United States of America

Unlike the low to middle income countries, the United States of America possesses well established forensic pathology laboratories.²⁶⁵ However, Americans also share the same sentiments in respect of the decline in autopsy rates as various other countries.²⁶⁶ In 2005, the National Association of Medical Examiners developed the Forensic Pathology Performance Standards.²⁶⁷ These standards were developed to provide a rigid framework to ensure that forensic services are conducted by the professional forensic pathologist.²⁶⁸ It further provides minimum requirements that is expected from an autopsy and how the autopsy should be conducted.²⁶⁹ In doing so, the standards make provision for the use of the minimally invasive autopsy techniques.²⁷⁰ This is achieved by standards that make provision for the forensic pathologist to utilise specific scientific services and equipment.²⁷¹

7.4 Ireland

²⁶⁵ Garry F. Peterson, M.D. (Committee Chair, 2005) Steven C. Clark, Ph.D. et al Forensic Autopsy Performance Standards *The National Association of Medical Examiners 2015*

²⁶⁶ Ibid

²⁶⁷ Ibid

²⁶⁸ Ibid

²⁶⁹ Ibid

²⁷⁰ Ibid

²⁷¹ Ibid

In Ireland, the legal provisions that regulate post-mortem examinations are the Coroners Act 1962, The Anatomy Act 1832 and the Registration of Births and Deaths Act 1863. However, the Coroners Act remains the primary legislation.²⁷² There are many similarities with regards to the performance of post-mortem examinations between Ireland and South Africa. The first similarity is the distinction between the Coroner's post-mortem examination (which is also known as the medico-legal or forensic post-mortem) and the hospital post-mortem examination.²⁷³ The second similarity relates to the appointment of a coroner as an independent officer who has the responsibility of conducting an inquest into deaths that are sudden, unexplained, violent and unnatural.²⁷⁴ It is submitted that the appointment of the coroner is comparable to the inquest magistrate that is appointed in terms of the Inquests Act, 58 of 1959. Both these officers share similar duties and responsibilities and have the authority to direct that a post-mortem examination be conducted to ascertain the circumstances relating to the death. As in the case of the Inquests Act,²⁷⁵ the Coroners Act 1962 makes provision for the performance of the post-mortem examinations. The act, however, does not stipulate the manner in which the post-mortem examination must be conducted and has not been updated to make provision for technological advancements. It is therefore questionable as to whether the minimally invasive autopsy techniques would be permissible in Ireland seeing that the principle

²⁷² Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

²⁷³ Ibid

²⁷⁴ Ibid

²⁷⁵ 58 of 959

legislation is outdated and does not take into consideration modern medicine and variations in legal principles.²⁷⁶

The writer submits that the present situation regarding the performance of post-mortem examinations in Ireland and South Africa can be attributed to the outdatedness of their respective legislation and there is consequently an urgent need for stringent regulations to be implemented to navigate the way forward in both countries.

7.5 Switzerland

Switzerland has received much attention since the launch of the ‘Virtopsy’ project which was founded at the University of Bern in Switzerland.²⁷⁷ The project has drawn attention to the minimally invasive forensic autopsy in that it was aimed to replace or supplement the conventional autopsy.²⁷⁸ This minimally invasive autopsy technique is being used on a daily basis at the forensic institute in Bern, Switzerland. However, the advanced equipment, namely the 3D surface scan, post-mortem CT, post-mortem MRI, post-mortem CT angiography and post-mortem biopsy equipment are not readily available elsewhere in the world.²⁷⁹ Article 253 of the Swiss Code of Criminal Procedure allows for the use of these equipment and techniques in exceptional instances to supplement the conventional autopsy.²⁸⁰ Various Swiss forensic

²⁷⁶ Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

²⁷⁷ David Zimmermann Virtopsy & forensic imaging: legal parameters and impact *Asia-Pacific Coroners Society Conference Noosa, Queensland, 7-10 November 2011*

²⁷⁸ David Zimmermann Virtopsy & forensic imaging: legal parameters and impact *Asia-Pacific Coroners Society Conference Noosa, Queensland, 7-10 November 2011*

²⁷⁹ Ibid

²⁸⁰ Ibid

institutes such as the Institute of Forensic Medicine Zurich, forensic institutes in Lausanne and Geneva, and the forensic institutes in St. Gallen and Basel are presently utilising post-mortem CT and post-mortem CT angiography.²⁸¹ In addition, these imaging techniques have made much progress in that it has been produced as evidence in Swiss criminal trial cases.²⁸²

7.6 Australia

The Victorian Institute of Forensic Medicine (VIFM) in Melbourne, Australia has adopted a similar progressive approach to the Swiss forensic institutes in Bern, Zurich and Lausanne/Geneva with regard to the use of these minimally invasive forensic imaging techniques, such as post-mortem CT angiography, in daily death investigations.²⁸³

7.7 Germany

Section 87 (1) of The German Code of Criminal Procedure allows for the use of post-mortem CT scans during the external examination of the deceased when performing an autopsy.²⁸⁴ Moreover, German forensic institutes utilise in-hospital CT scanners for the purposes of conducting autopsies.²⁸⁵

This scalpel-free, non-invasive imaging technology has also been adopted in various developed and developing countries worldwide and is rapidly becoming an ethical solution in countries

²⁸¹ Michael Thali, Institute of Forensic Medicine, Zurich, Switzerland

²⁸² David Zimmermann *Virtopsy & forensic imaging: legal parameters and impact* *Asia-Pacific Coroners Society Conference Noosa, Queensland, 7-10 November 2011*

²⁸³ Ibid

²⁸⁴ Ibid

²⁸⁵ Ibid

where incisions and mutilation of the dead body are not recommended due to strong religious beliefs. The writer notes that the implementation of different minimally invasive autopsy techniques in various countries indicate that these techniques have now become an important addition to the range of forensic resources available to the autopsy practitioner.

CHAPTER 8

Recommendations and Conclusion

Death has and always will be an inevitable part of life. In cases where death is due to unnatural causes, the performance of a forensic autopsy becomes crucial in promoting the interests of justice. It has been centuries since autopsy procedures were introduced and these techniques are still being used. However, in many countries the rapid growth and evolution of technological advancements have paved a way for the development of various minimally

invasive forensic autopsy techniques. The striking question that has been set forth is whether these minimally invasive autopsy techniques will lead to the replacement of the traditional/conventional autopsy which is generally perceived as being the ‘gold standard’ of autopsies.

The writer submits that it is misguided and counter-productive to consider these techniques as being in competition with each other. Alternatively, these are supportive and collaborative procedures which aid in the administration of justice. The use of minimally invasive autopsy techniques can be used as an efficient supplementary tool to the conventional autopsy. It is further submitted that the implementation of these techniques must be subjected to several tests to determine its validity, acceptability, and cost effectiveness before we can consider it as feasible and reliable alternatives to the conventional autopsy.²⁸⁶ The reported benefits of minimally invasive autopsies can have a massive positive impact on the administration of justice. Nonetheless, standard operating procedures still need to be developed for autopsy practitioners to follow in order to achieve the desired results.²⁸⁷

Several problems may arise in low- and middle-income countries due to the escalating cost of the equipment.²⁸⁸ These countries are therefore restricted to adopting techniques such as the verbal autopsy and needle sampling. Whether these methods would be sufficient to completely satisfy the needs of justice are yet to be seen, but the potential benefits thereof are irrefutable.²⁸⁹

²⁸⁶ Byass P (2016) Minimally Invasive Autopsy: A New Paradigm for Understanding Global Health? *PLoS Med* 13(11): e1002173. doi:10.1371/journal.pmed.1002173

²⁸⁷ Byass P (2016) Minimally Invasive Autopsy: A New Paradigm for Understanding Global Health? *PLoS Med* 13(11): e1002173. doi:10.1371/journal.pmed.1002173

²⁸⁸ Ibid

²⁸⁹ Ibid

Despite several studies having being conducted worldwide to determine the acceptability of minimally invasive autopsy techniques, the writer advocates that much more practical experience and studies need to be conducted in the South African context to ascertain it's acceptability and practicality.²⁹⁰

From a legal perspective, there is currently no legislation that provides mandatory obligations as to exactly how the medico-legal post-mortem examination should (or should not) be conducted. This forms the legal basis for alternative considerations, including (but not limited to) technologically-driven minimally invasive autopsy techniques such as 'Virtopsy,' verbal autopsies, laparoscopic autopsies and the post-mortem CT angiography to be introduced into South Africa without having to face judicial impediments. Autopsy practitioners who are duly authorised to conduct these medico-legal post-mortem examinations can then utilise these various procedures, as the manner in which the examination is performed is not prescribed by legislation in South Africa.

Until our legislature takes the necessary steps to amended section 3 of the Inquests Act, the legality of the findings of medico-legal post-mortem examination using minimally invasive autopsy techniques cannot be considered as illegal and inadmissible. It is therefore crucial to draw attention to the act in considering the role of minimally invasive forensic autopsies in that there are currently no statutory limitations imposed by the Inquests Act in this regard.

In this dissertation, the writer addressed the role of the minimally invasive forensic autopsy and provided a legal perspective as to whether such modalities will be accepted by our South

²⁹⁰ Ibid

African courts. The frustration and anger experienced by grieving families of deceased persons at the failure of our forensic pathology services to provide quick and efficient post-mortem services is palpable. This is exacerbated by the manner in which the bodies of their loved ones are dissected during the performance of the traditional/conventional autopsy. Families therefore rely on autopsy practitioners to ensure that the bodies of their loved ones are treated and investigated with utmost dignity and respect whilst concomitantly providing clarity as to the cause, manner and mechanism of death.

Autopsy practitioners are also faced with similar challenges since the law does not prescribe the exact nature and extent of the post-mortem examination. Autopsy practitioners therefore refer exclusively to professional standards for guidance which are increasingly supporting the utility of minimally invasive autopsy techniques. Hence, they are usually unaware as to which techniques are permissible from a legal perspective. Many autopsy practitioners and forensic pathologists are concerned at the lack of clarity in this regard and feel frustrated at the criticism levelled against their adherence and compliance to longstanding (and possibly outdated) professional standards.²⁹¹

The following recommendations are hereby submitted:

1. It is imperative that the deceased must be treated with the utmost respect and dignity.
2. The public confidence and public awareness in forensic pathology services and procedures should be improved and restored.

²⁹¹ Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin*. Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

3. The absence of precise guidelines and prescribed techniques for the performance of autopsies in South African legislation has certainly led to difficulties in applying the law to individual cases. Statutory obligations need to be imposed by the Inquests Act and the act therefore needs to be revisited and updated as a matter of urgency. Amendments must address the manner in which a forensic autopsy should be conducted and what will be acceptable by our courts. Any legislation that may be introduced should be clear, consistent and transparent.²⁹²

4. Legislation should provide for the use of the minimally invasive forensic autopsy techniques and specify which techniques are permissible and can be used as reliable evidence in South African courts.

5. Specific legislation is required in cases where there are cultural and religious objections by family members of the deceased to ensure that these objections are respected and addressed, instead of being completely ignored without due consideration of reasonable alternatives.

6. Apart from legislation pertaining to forensic autopsies, it is further recommended that the legislation relating to the law of evidence would also require amendment to account for the manner in which the data and information derived and stored using the various minimally invasive techniques can be produced as admissible evidence to aid in the administration of justice.

8. A regulatory model of guidelines need to be introduced and updated on an ongoing basis to take into account medical, scientific and technological developments within a prescribed legal framework.

²⁹² Ibid

9. Proper education and training must be provided to forensic pathologists, autopsy practitioners, radiologists and other professionals to ensure the proper utilisation of the equipment and interpretation of data.

10. Research and studies need to be conducted in the local South African context to ascertain the acceptability, practicality and financial implications of minimally invasive forensic autopsy techniques.

In conclusion, the writer submits that there is compelling evidence to promote the introduction of the minimally invasive forensic autopsy in South Africa. There is no legal prohibition in this regard. However, the implementation thereof will inevitably require a review of current legislation, especially the Inquests Act 58 of 1959 which is arguably outdated. In this way, the role of the minimally invasive forensic autopsy in South Africa will be supported by a robust legal framework.

Bibliography

Books:

Dirnhofer R...et al. 'Virtopsy: Minimally Invasive, Imaging-guided Virtual Autopsy' (2006) 26 (5) *RadioGraphics* 1305-1333

Finkbeiner, Walter E et al *Autopsy Pathology: A Manual and Atlas 2nd Edition* (2009) by Saunders.

Jackson A.R.W & Jackson J.M. 2004 *Forensic Science*. Harlow: Pearson/Prentice Hall p363

J.Ludwig. Principles of Autopsy techniques, Immediate and Restricted Autopsies and Other special procedures. *Handbook of Autopsy Practice.3rd Edition*. Humana Press Inc.

Julie Steele ‘The cut free autopsy – How data and digital imaging are shaping virtual autopsies’ *Beautiful Visualization*. April 2010 pg. 418

McGraw-Hill *Concise Dictionary of Modern Medicine*. (2002) the McGraw-Hill Companies, Inc.

Random House Unabridged Dictionary, © Random House, Inc. 2019

South African *Oxford School Dictionary* 2nd Revised edition. 2006 Cape Town: Oxford University Press

S. Miyaishi, F. Moriya, in *Encyclopaedia of Forensic and Legal Medicine* (Second Edition), 2016

Journals:

Akerson J D ‘An Inquest law Inquest (1989) 5 South African Journal on Human Rights 209

Anker M, Black RE, Coldham C, Kalter HD, Quigley M, Ross D, et al. ‘A standard verbal autopsy method for investigating causes of death in infants and children.’ Geneva: World Health Organization; 1999.

Anne Riley, Maria Merritt, Joan Pettit. Studies using verbal autopsy data collection procedures. *JHSPH IN*

Amanat and Frank Griffel, ‘Shari’a: Islamic Law in the Contemporary Context,’ *Stanford University Press* 2007 ISBN: 978-0-8047-5639-6

Avrahami R, Watemberg S, Daniels-Phillips E, Kahana T, Hiss J. Endoscopic autopsy. *Am J Forensic Med Pathol.* 1995; 16:147-150

Ayoub T and Chow J 'The conventional autopsy in Modern Medicine' *J R Soc Med* 2008; 101:177-181 DOI 2008

Bajaj Rachna '*The Conventional Autopsy still has an Important Role in Modern Medicine*' 2006
The pathological Society of Great Britain undergraduate essay

Bassat Q et al 'Resuscitating the Dying Autopsy' *PLOS Med* 2009 DOI 10.1371/journal.pmed.1001927

Blokker BM, et al. 'Non-invasive or minimally invasive autopsy compared to conventional autopsy of suspected natural deaths in adults: a systematic review. '*Eur Radiol.*2016; 26(4):1159-1179.doi:10.1007/s00330-015-3908-8

Berger F. Clinical diagnosis and the function of necropsy. *J R Soc Med* 2000 93: 662a

Bassat et al. Development of a post mortem procedure to reduce the uncertainty regarding causes of death in developing countries. Published online 29 July 2013.www.thelancet.com
Vol 1 September 2013

Byass P (2016) Minimally Invasive Autopsy: A New Paradigm for Understanding Global Health? *PLoS Med* 13(11): e1002173. doi:10.1371/journal.pmed.1002173

Cacchione RN, Sayad P, Pecoraro AM, Ferzli GS. Laparoscopic autopsies. *Surg Endosc.* 2001; 15(6):619-622. doi:10.1007/s004640000308

Carpenter, Belinda, Tait, Gordan, Quadrelli, Carol (2013) Arguing the autopsy: Mutual suspicion, jurisdictional confusion and the socially marginal. *Crime, Justice and Social Democracy: Proceedings of the 2nd International conference*, Crime and Justice Research centre, Queensland University of Technology, Gardens Point, Brisbane, Australia, pp10-18

Castillo P, Ussene E, Ismail MR, et al. Pathological Methods Applied to the Investigation of Causes of Death in Developing Countries: Minimally Invasive Autopsy Approach. *PLoS One*. 2015; 10(6):e0132057. Published 2015 Jun 30. doi:10.1371/journal.pone.0132057

Castillo P, Martı ´nez MJ, Ussene E, Jordao D, LovaneL, Ismail MR, et al. (2016) ‘Validity of a Minimally Invasive Autopsy for Cause of Death Determination in Adults in Mozambique: An Observational Study’. *PLoS Med* 13(11): e10 02171. doi:10.1371/journal.pmed.1002171

Catheline JM, Turner R, Guettier C, Champault G. ‘Autopsy can be performed laparoscopically.’ *Surg Endosc*.1999 Nov; 13(11):1163-4

Charlton R. ‘Autopsy and medical education: a review.’ *J R Soc Med*. 1994 Apr; 87(4):232-6.

Chevallier C, Doenz F, Vaucher P, Palmiere C, Dominguez A, Binaghi S, Mangin P, Grabherr S. ‘Post-mortem computed tomography angiography vs. conventional autopsy: advantages and inconveniences of each.’ *Int J Legal Med* DOI 10.1007/s004-012-081-34

Chevallier C, Doenz F, Vaucher P, Palmiere C, Dominguez A, Binaghi S, Mangin P, Grabherr S. Post-mortem computed tomography angiography vs. conventional autopsy: advantages and inconveniences of each . *Int J Legal Med* DOI 10.1007/s004-012-081-3

David Zimmermann ‘Virtopsy & forensic imaging: legal parameters and impact’ *Asia Pacific Coroners Society Conference Noosa, Queensland, 7-10 November 2011*

Dean A. Beers, CLI, CCDI. Associates in Forensic Investigations, LLC Peer Reviewed White paper- Certified Legal Investigator (NALI 2009)

Dr Putul Mahanta ‘The medico-legal autopsy – Its religious and social attitudes.’ *J Indian Acad Forensic Med*, 32(2) p183-188

Du Toit-Prinsloo, Lorraine; SAAYMAN, Gert. Performance of autopsies in South Africa: Selected legal and ethical perspectives. *Continuing Medical Education*, [S.l.], v. 30, n. 2, p. 53-55, Feb. 2012. ISSN 2078-5143.

Fan, JKM; Tong, DKH; Poon, JTC; Lo, OSH; Beh, PSL; Patil, NG; Law, WL. ‘Multimodality minimally invasive autopsy-A feasible and accurate approach to post-mortem examination.’ *Forensic Science International*, 2010, v. 195 n. 1-3, p. 93-98

Frank Baiden, Ayaga Bawah, et al. ‘Setting international standards for verbal autopsy.’ *Bulletin of the World Health Organization* August 2007, 85 (8)

Garry F. Peterson, M.D. (Committee Chair, 2005) Steven C. Clark, Ph.D. et al ‘Forensic Autopsy Performance Standards’ *The National Association of Medical Examiners* 2015

Gascho, D, Thali, MJ, Niemann, T (2018). ‘Post-mortem computed tomography: Technical principles and recommended parameter settings for high-resolution imaging.’ *Med Sci Law* 58, 70-82.

Hill RB, Anderson RE. ‘The uses and value of autopsy in medical education as seen by pathology educators.’ *Acad Med* 1991;66:97-100.

Hassan Peyvandi MD *et al* ‘the Role of Endoscopic Autopsy in Trauma cases: The first report from Iran.’ *Arch Iranian Med* 2009;12 (4): 353-357

I Wagenveld et al 'How to implement a minimally invasive autopsy procedure in a hospital setting; a practical guideline for radiologists. *European Society of Radiology*. DOI 10.1594/ECR2016/C-1235

Jan G. van den Tweel, Wittekind Christian 'The medical autopsy as quality assurance tool in clinical medicine: dreams and reality' *Virchow's Arch* (2016) 468: 75-81

Jang Gyu Cha et al. 'Utility of Post mortem Autopsy via whole body imaging: Initial observations comparing MDCT and 3.0T MRI findings with Autopsy findings.' *Korean J Radiology*. 2010 July- Aug 11 (4) p 395-406

JCE Underwood, DN Slater et al 'The needle necropsy' *British medical journal* (286) 1632-1634

Knechtges PM, Carlos RC. 'The evolving role of radiologists within the health care system.' *J Am Coll Radiol*. 2007;4(9):626-635. doi:10.1016/j.jacr.2007.05.014

Lavis R. 'Response to: The value of post-mortem examinations after surgery.' *Ann R CollSurgEngl (Suppl)* 2005; 87: 106-109

Lundberg GD. 'Low tech autopsies in the era of high tech medicine: continued value for quality assurance and patient safety' *JAMA* 1998; 280 p 1273-1274

Lt Col R.B Kotabagi, Lt Col SC Charati et al. 'Clinical autopsy v Medico legal autopsy' *MJAFI* 2005 (61) 258-263

Manoj Kumar Mohanty et al Autopsy: The Changing Trends (2011) *International journal of Medical Toxicology and Forensic medicine* p17-23

Madadin Mohammed, MD Assistant Professor of Forensic Medicine, Magdy A. Kharoshah, 'Autopsy in Islam and current practice in Arab Muslim countries' *Journal of Forensic and Legal Medicine* 23 (2014) 80e8382

Maixenchs M, Anselmo R, Zielinski Gutie ´rrez E, OdhiamboFO, Akello C, Ondire M, et al. (2016) Willingness to Know the Cause of Death and Hypothetical Acceptability of the Minimally Invasive Autopsy in Six Diverse African and Asian Settings: A Mixed Methods Socio-Behavioural Study. *PLoS Med* 13(11): e1002172.doi:10.1371/ journal.pmed.1002172

Nadesan K. 'The importance of medico legal autopsy.' *Malays J Pathol.* 1997 Dec 19 (2)105-9

Nadia Soleman et al. 'Verbal autopsy: current practices and challenges' March (2006) 84 (3) *Bulletin of the World Health Organization* p 239-245

Peter Byass et al. 'Strengthening standardised interpretation of verbal autopsy data: the new InterVA-4 tool. *Glob Health Action* 2012, 5: 19281

Pollak, Stefan. (2007). 'Medical criminalistics' *Forensic science international.* 165. 144-9. 10.1016/j.forsciint.2006.05.014.

Report of Dr. Deirdre Madden on Post Mortem Practice and Procedures (2005) *Government Publications Office, Dublin.* Available at www.dohc.ie/publications/madden.html accessed on 20 July 2017

Sajid MI. Autopsy in Islam: Considerations for Deceased Muslims and Their Families Currently and in the Future. *Am J Forensic Med Pathol.* 2016; 37(1):29-31. doi:10.1097/PAF.0000000000000207

Segal, G *Religion/Custom and Coronial practice: How to avoid either being compromised* (unpublished 2011)

Steyn, J.W.J 1992 *Inquest*. Pretoria: Justice College

Thali MJ *et al* Virtopsy- the Swiss virtual autopsy approach. *Legal Medicine* 9 (2007) 100-104

Thali M.J et al. 'Virtopsy, a New Horizon in Forensic Pathology: Virtual Autopsy by Post Mortem Multislice Computed Tomography (MSCT) and Magnetic Resonance Imaging (MRI) – a Feasibility Study' (2003) 48 (2) *Journal of Forensic Sciences* 1-18

T E Madiba et al 'The amended legislation on procedure related deaths-an advance in patient care, Medicine and the law,' April 2011 SAMJ Vol 101 No 4

Van Der Linden A, Blokker BM, Kap M, Weustink AC, Robertus JL, Riegman PH, Oosterhuis WJ. (2014) 'Post mortem tissue biopsies obtained at minimally invasive autopsy: An RNA quality analysis.' *PLoS One*.2014 Dec22; 9 (12); e115675

Van der Westhuizen, J. (Ed) 1996. *Forensic criminalists*. 2nd edition. Johannesburg: Heinemann

Vendhan Gajalakshmi and Richard Peto. 'Commentary: Verbal autopsy procedure for adults' *International Journal of Epidemiology* 2006 (35) 748-750

Virchow R 'Description and explanation of the method of performing post-mortem examinations in the dead house of the Berlin Charite Hospital, with special reference to medico-legal practice' London 1880 *Churchill*

Cases:

Camps Bay Ratepayers' and Resident Association and Another v Harrison and Another 2011 (4) SA 42 (CC),

Wessel Marais N.O v Elizabeth Tiley 377/88 [1990] ZASCA 40; 1990 (2) SA 899 (AD); (30 March 1990)

Timol and another v Magistrate, Johannesburg and Another 1972(2) SA 281 (T) at 287 H to 288 A

S v Gokool 1965 (3) SA 461 (N) at 475G

The re-opened inquest into the death of Ahmed Essop Timol (IQ01/2017) [2017] ZAGPPHC 652

Legislation:

Inquest Act 58 of 1959

The Constitution of the Republic of South Africa, Act 108 of 1996

The Regulations Regarding the Rendering of Forensic Pathology Service of the National Health Act 61 of 2003

The National Health Act 61 of 2003

Criminal Procedure Act 51 of 1977

The Electronic Communications and Transactions Act 25 Of 2002

Internet Sources:

‘Criminal investigation’ available at <https://www.britannica.com/topic/criminal-investigation> date accessed 24th June 2019.

CT coronary angiogram’ available at <https://www.mayoclinic.org/tests-procedures/ct-coronary-angiogram/about/pac-20385117> date accessed 10th April 2019.

Burton EC, Gurevitz SA. Religions and the autopsy.’ Available from: <http://www.emedicine.medscape.com/article/1705993-overview#a1>. Date accessed 21st July 2018.

Laurent PE, Arieu Bonnet D, Bartoli C. JFR: Will virtual autopsy replace traditional autopsy? *Aunt Minnie Europe*. www.auntminnieeurope.com date accessed 09 November 2016.

‘State coroners guidelines Australia 2012’ available at <https://www.courts.qld.gov.au/courts/coroners-court/about-coroners-court/resources-and-legislation#state> date accessed 24th June 2019.

WHO. Verbal autopsy standards: ascertaining and attributing causes of death. <http://www.who.int/healthinfo/statistics/verbalautopsystandards/en> accessed 03rd October 2016.

Zimmerman L. "Must all organisms age and die?" *Massachusetts Institute of Technology School of Engineering*. (2010) <https://engineering.mit.edu/engage/ask-an-engineer/must-all-organisms-age-and-die/> date accessed 20 July 2019