Medicolegal Death Investigation: Coroner and Forensic Pathology Functions and Processes in Victoria, Australia

David L. Ranson, Lyndal Bugeja

ABSTRACT

The medicolegal death investigation in Victoria, Australia is a traditional coroner system based on the model in England and Wales in the early 20th Century. In 1985, the first of a series of legislative amendments were made that proved the vanguard of reform of the coroners' jurisdictions in Australia. The Victorian Institute of Forensic Medicine (the Institute) was established by the Coroners Act 1985 (Vic.), now the Victorian Institute of Forensic Medicine Act 1985 (Vic.), to provide forensic pathology, medical, and related scientific services needed by the justice system.

In addition to death investigation, other forensic and scientific services are performed by the Institute including: clinical medical examinations and support services for assault victims and perpetrators, forensic toxicology services and molecular biology, and anthropology and odontology services in relation to human identification. Medical and nursing staff provide medical information and support to families in a therapeutic setting, as well as direct referral to clinical medical specialists. This takes place where a medical death investigation procedure uncovers genetic or familial disease that may place other family members at risk of future illness. A donor tissue bank ensures that a death also provides the opportunity for families to donate organs and tissues from the deceased for transplantation. Today, the traditional autopsy is one of several modalities of death investigation with postmortem radiology and imaging playing a significant role.

This paper describes the principles and new processes at the Institute that support the coroner in death investigation and prevention as well as the therapeutic services designed to relieve the burden of disease on the community. *Acad Forensic Pathol.* 2017 7(4): 567-581

AUTHORS

David L. Ranson BM BS, Victorian Institute of Forensic Medicine

Roles: Project conception and/or design, data acquisition, analysis and/or interpretation, manuscript creation and/or revision, approved final version for publication, accountable for all aspects of the work, principal investigator of the current study, general supervision.

Lyndal Bugeja PhD, Department of Forensic Medicine, Faculty of Medicine, Nursing and Health Sciences, Monash University

Roles: Data acquisition, analysis and/or interpretation, manuscript creation and/or revision, approved final version for publication, accountable for all aspects of the work, general administrative support, writing assistance and/or technical editing.

CORRESPONDENCE

David L. Ranson BM BS, 65 Kavanagh Street, Southbank Victoria 3006, Australia, david.ranson@vifm.org.au

ETHICAL APPROVAL

As per Journal Policies, ethical approval was not required for this manuscript

STATEMENT OF HUMAN AND ANIMAL RIGHTS

This article does not contain any studies conducted with animals or on living human subjects

STATEMENT OF INFORMED CONSENT

No identifiable personal data were presented in this manuscript

DISCLOSURES & DECLARATION OF CONFLICTS OF INTEREST

The authors, reviewers, editors, and publication staff do not report any relevant conflicts of interest

FINANCIAL DISCLOSURE

The authors have indicated that they do not have financial relationships to disclose that are relevant to this manuscript

KEYWORDS

Forensic pathology, Forensic medicine, Coroner, Death investigation

INFORMATION

ACADEMIC FORENSIC PATHOLOGY: THE OFFICIAL PUBLICATION OF THE NATIONAL ASSOCIATION OF MEDICAL EXAMINERS

©2017 Academic Forensic Pathology International • (ISSN: 1925-3621) • <https://doi.org/10.23907/2017.048>

Submitted for consideration on 6 Oct 2017. Accepted for publication on 3 Nov 2017

INTRODUCTION

Recent Legislative Changes and Victorian Coroners' Death Investigations

The development of the Coroners Act 2008 (Vic.) and the Victorian Institute of Forensic Medicine Act 1985 (Vic.) represented the beginning of a significant reform to the way medicolegal death investigations were conducted in Victoria (1, 2). The 2008 legislation elevated the prevention mandate of coroners and established the Coroners Court of Victoria as an independent court entity headed by a senior Judge. In addition, it reinforced the therapeutic jurisprudence activities of the court with respect to the bereaved and the broader cultural needs of community. The Court has set out the major principles and functions of the new service in a guide which is available online (3).

This new legal framework also initiated and underpinned the start of a series of operational reforms to the practice of death investigation in the State. Over the ensuing years, there have been widespread changes to both the legal procedures and the medical and scientific activities associated with death investigation, some of which are not generally found in other coroners' jurisdictions (**Table 1**).

Around the world, death investigation takes place in a medical, scientific, administrative, and legal environment that is specific to the local community and legal jurisdiction within which the death occurred. At the most mechanical level, records are generated and re-

tained about who has died. A cause of death is usually assigned and recorded within government agencies or by public officers who form part of the bureaucracy, generally by recording on a death register the cause of death given on a certificate provided by the treating doctor. In selected deaths, however, it will be a medical examiner, medical coroner, or a judicial official such as a legal coroner, who carries out an independent death investigation providing the cause and manner of death and the other particulars required to register the death of the individual.

The maintenance of a death register and a birth register has important social implications. A community needs to know information about who makes up its population. From a practical perspective, this is needed to ensure that community services are appropriate to the size and makeup of the population. However, at a deeper level, our concerns about threats to our safety generate a desire to find out more about deaths that occur in our community and to understand what has brought them about so that we can assess and modify our personal, social, and corporate behaviors in the interests of public health and safety. In addition, grief and loss can have deep effects on the functioning of individuals, families, and, in some cases, a whole community. In this environment, supporting the grief process by ensuring a society's ability to independently investigate deaths from a perspective that is focused beyond that of any individual professional group, such as scientists, the medical profession, or the police, has important therapeutic benefits.

Table 1: Key Changes to Legal Procedures and the Medical and Scientific Activities Associated with Death Investigation in Victoria

"Medicalization" of the "front end" reporting and initial investigation processes
A higher level of family consultation during and following the medical death investigation
A formal "preliminary examination" system
Death certificate reviews for the Registrar of Births Deaths and Marriages
Inclusion of routine, mortuary-based, whole body computed tomography scans
Rapid (overnight) toxicology analysis covering over 300 drugs and toxins
Integration of postmortem tissue retrieval for transplantation
Increased support for family support and consultation
Genetic disease support with specialist medical referral

The recognition of the interplay between the legal processes of death investigation and the medical processes was clearly recognized in Victoria, Australia in the earlier Coroners Act 1985 (Vic.), which led the way for changes to coroner's legislation around Australia. The establishment of the Victorian Institute of Forensic Pathology, later renamed the Victorian Institute of Forensic Medicine, was enshrined in the Coroners Act 1985 (Vic.), and the statutory basis for the medical death investigation process was continued with the 2008 amendments to this act resulting in it being renamed the Victorian Institute of Forensic Medicine Act 1985.

Prior to 1985, coroners in Victoria were magistrates in the lower courts who operated completely independently and covered their own local jurisdictions within the State. Magistrates in the mid-20th century were either lawyers or court clerks who had been appointed as stipendiary magistrates to deal with minor criminal and civil matters. The amendments to the Coroners Act in 1985 for the first time created the role of State Coroner and effectively allowed for the appointment of full-time coroners, all of whom were to be legal practitioners of greater than five years standing. The majority of these new coroners were existing magistrates and the State Coroner's Office remained a subdivision of the Magistrates Court. Importantly, the 1985 legislation created the Victorian Institute of Forensic Pathology as a statutory agency with specific powers and duties that were aimed at supporting the State Coroner in the medical aspects of the death investigation process. This allowed for the appointment of full-time forensic pathologists, as well as scientists, to provide the analytical support for a comprehensive death investigation process. It was recognized that research and teaching would be necessary to both advance the discipline of forensic pathology and related sciences and to ensure continuity of service through the training of new practitioners. Accordingly, the state government and Monash University entered into a deed of agreement so that the Institute effectively operated as the Department of Forensic Medicine at Monash University in Melbourne and provided for the sharing of infrastructure and resources.

A later substantial parliamentary review of the legislation led to reform of the jurisdiction and the Coroners Act 2008 established the Coroner's jurisdiction within the state as an independent Coroner's Court (1). Coroners became independent judicial officers separate from the Magistrates' Court and since that time State Coroners have all been judges of the County Court. This elevation of the judicial status of coroners has had significant implications for the communication and influence of coroners' decisions and recommendations regarding death prevention. In addition, the new legislation explicitly articulated the purpose of the court as a vehicle for public health and safety.

The powers and duties relating to the medical processes of death investigation were also enhanced while still retaining the primacy of the judicial coroner in controlling the overall death investigation process. This resulted in considerable changes to the day-to-day procedures undertaken by the Institute's forensic pathologists, nurses, technical staff, and scientists.

An indication of the significance of these changes can be seen in the fact that the overall autopsy rate for coroners' death investigations in Victoria has dramatically dropped from approximately 85% in 2000 to under 50% in 2017 (4). The reasons for the reduction in the rate of autopsy in Victoria are complex and include social and cultural shifts. However, the existence of legislative changes giving effect to the inclusion of new medical and scientific technologies (radiological imaging and rapid toxicology analyses in particular) to the traditional autopsy-based legal death investigation process has been an important part of the change. These new processes and procedures have had a major impact on families, particularly in the way in which their wishes can influence and contribute to the death investigation process (3).

DISCUSSION

The First 24 Hours

While most deaths are reported to the coronial system by police and medical personnel, in Victoria anyone in the community can report a death to the coroner, in-

cluding family members. Today, the State of Victoria has a population of approximately 6.2 million (5) and over 6000 deaths are reported to the Coroners Court each year. In common with many jurisdictions, coroners in Victoria investigate any death that is not due to natural causes. This includes deaths as a result of an accident, be it a road traffic accident, recreational, domestic, or industrial accident; intentional deaths including homicide and suicide; as well as deaths occurring in certain circumstances such as police or prison custody (regardless of how the death occurred) or following a medical procedure or related treatment event. Even if the death appears to be a natural death, if a doctor cannot certify the cause of death or no death certificate is available, the death must be investigated by the coroner. In practice, natural deaths comprise the majority of deaths investigated with homicides being the least common investigation.

In addition to these immediate death reports, around 500 deaths are separately reported to the coroner by the Victorian Registrar of Births, Deaths and Marriages (6). This occurs because the Registry employs a formal procedure for the medical review of all death certificates. These deaths are reported to the coroner because the review identified irregularities in the death certificate or the cause of death stated on the certificate indicates that the death is a possible reportable death. In most of these cases, the body of the deceased will have already been disposed of. However, the process of investigation of these cases involves the Institute obtaining the relevant healthcare records from the certifying and or treating medical practitioner and may include obtaining formal statements regarding the circumstances of the death. A case management conference between the Institute's medical reviewer and the duty coroner allows for discussion of the investigation findings so that the coroner can determine whether the death is reportable and if so what the probable medical cause and manner of death might be. Very occasionally, it has been necessary to proceed to an exhumation in these cases.

Deaths are reported to the coroner by ringing the Coroners Court and speaking to the staff of the Coronial Admissions and Enquiries Office (CAE). These calls

are taken by Victorian Institute of Forensic Medicine personnel who staff the CAE, and include experienced senior nurses with emergency department and intensive care unit experience. Their tasks include helping the caller determine whether the death is reportable to the coroner. Reporters have 24-hour direct access to a duty or on-call forensic pathologist and a duty coroner, who for much of the day are located in the same office suite. In addition, if a death is determined to be reportable, the role of the CAE staff is to collect accurate and timely medical and circumstantial information to support the ongoing medical and legal death investigation. In addition, they provide information to the caller regarding the nature of the coroner's investigation process and what is required of them.

The CAE staff are also supported by the mortuary technical team, who deal with the admission and release of deceased persons from the mortuary; a forensic anthropologist and odontologists, who assist with the identification of deceased persons; and staff of the Donor Tissue Bank of Victoria, who manage the donation of human tissues for transplantation.

Having collected the necessary demographic information regarding the deceased, the staff of the CAE organize the collection of medical records from hospitals and general practitioners and will request the police to attend at the death scene and to complete an initial police information investigation form for the coroner that outlines in more detail the circumstances of the death (Victoria Police Form 83). The CAE team also arrange for the imaging data files of clinical radiology investigations in life and any pathology samples held in laboratories to be delivered to the Institute in relevant cases. The CAE will arrange for the body of the deceased to be transported to the mortuary at the Victorian Institute of Forensic Medicine or occasionally to a regional hub.

A critical duty of the CAE nursing staff is to make initial contact with the family of the deceased to ascertain who is the legal senior next of kin and to obtain further information regarding the deceased's medical history and lifestyle factors. Contact details for the deceased's general practitioner, dentist, and executor are also col-

lected and they also obtain information regarding the family's cultural background and wishes regarding autopsies. Any concerns the family may have about the death are canvassed at this time and reported to the duty pathologist and coroner. An important part of this communication with the family is the provision of information to them about the coronial process and providing them with information regarding sources of initial bereavement support as well as with pathways to further medical support and care.

If the senior next of kin feels unable to cope with the decision making required around this time, they can nominate another family member who can act for them in communications with the Court. If the deceased person has not been formally identified at the death scene, arrangements may be made for a family member to attend the CAE for a formal visual identification. In practice, this is rarely required since identification is usually performed by other means, including identification by treating medical staff or, in the case of individuals who cannot be visually identified, formal DNA testing, dental examination, or more rarely circumstantial assessment. Choice of the final process of identification and acceptance of individual identifications is a statutory role of the coroner.

All of the information gathered and entered is time and date stamped and recorded in an electronic case management system accessible by forensic pathology and coroners' court staff. The information can be reviewed and updated as part of the ongoing investigation process, as well as being made available as part of the public record of the investigation process. Critical data from the case management system is also uploaded to the National Coronial Information System (NCIS).

In the case of suspicious deaths or complex community deaths, it may be necessary for the on-call coroner and forensic pathologist to attend at the scene to examine the deceased *in situ* and collect relevant environmental information, as well as assist/instruct police in aspects of their forensic investigation required by the coroner.

The Preliminary Examination

On admission to the mortuary, the deceased is subject to a range of immediate examinations as part of a statutory "preliminary examination" of the body, the nature of which is set out in the relevant legislation.

Section 3 of the Coroners' Act 2008 defines a medical examination as meaning a preliminary examination, an identification procedure, or an autopsy (1). Each of these procedures are distinctly different, although they can occur concurrently. Autopsies, and identification directions as a subset of autopsies, are procedures that coroners traditionally authorize and direct to be performed. The process of preliminary examination, however, is a novel power in the 2008 legislation and has transformed the efficiency of the operational procedures of coroners' death investigations in Victoria.

The legislative basis for these three methods of medical examination is set out in sections 23, 24, and 25 of the new legislation (**Figure 1**) (1).

Coroners may direct a medical investigator to perform an autopsy or a procedure for identification of a deceased person but cannot formally direct that preliminary examination be conducted or set limits on or direct that specific components of the preliminary examination must be performed. In practice, however, there is a close working relationship between the duty pathologist and the duty coroner who work in "next door" offices in the CAE and meet to discuss cases regularly throughout the day.

What constitutes a preliminary examination is set out in section 3 of the Coroners' Act 2008 (**Figure 2**) (1).

In contrast to a preliminary examination, an autopsy is defined in Section 3 (**Figure 3**) (1).

As can be seen from the above, a "preliminary examination" is more than the mere inspection of the outside of the body. It involves a set of procedures, some of which might be considered to be relatively invasive. It can include the collection of samples from inside wounds and the mouth and the collection of

fluid and blood samples from the body, which may involve a skin puncture or incisions to be made. The preliminary examination also includes the testing of the samples collected and there is no explicit restriction on the potential scope of such tests, the principle being that the testing should be aimed at assisting the coroner in the exercise of their statutory functions.

While some pathology procedures, such as dissection, are specifically excluded from preliminary examinations, there is considerable scope for additional pro-

cedures to be undertaken that are not otherwise specifically described. For example, it would appear to be possible for endoscopy to be undertaken to explore the bowel or upper airway so long as no dissection of the body or removal of tissue occurs. However, although postmortem computed tomography (CT) angiography is commonly performed, with several such procedures each week, this requires formal dissection of the femoral region, injection of contrast media, and requires the approval of a coroner.

Figure 1: Legislative Basis for Methods of Medical Examination (1)

Section 23 Preliminary examinations

- (1) The purpose of a preliminary examination is to assist the coroner in the performance of his or her functions in respect of a death.
- (2) A coroner may provide a body to a medical investigator to enable a preliminary examination to be performed on the body.
- (3) The provision of the body authorizes the conduct of the preliminary examination.

Section 24 Identification directions

A coroner may direct a medical investigator to perform any procedure on a body (including the removal of tissue but not including a preliminary examination) for the purposes of identifying the deceased person.

Section 25 Autopsies

- (1) The purpose of an autopsy is to assist a coroner to perform his or her functions in respect of a death.
- (2) A coroner must direct a medical investigator to perform an autopsy on a body under the control of the coroner if the coroner believes that—
 - (a) the autopsy is necessary for the investigation of the death; and
 - (b) it is appropriate to give the direction.
- (3) After consulting with, and seeking advice from, the Institute or a pathologist, a coroner may—
 - (a) impose conditions on the manner in which an autopsy on a body is to be performed; and

Example

Conditions under subsection (3) could include the number of cavities to be explored or the organs to be removed.
- (b) direct the medical investigator to perform certain tests on a body or on tissue or other material removed from the body.
- (4) Nothing in this Act prevents a preliminary examination or an identification procedure from being performed concurrently with an autopsy.

Figure 2: Definition of a Preliminary Examination (1)

Preliminary examination in relation to a body means any of the following procedures—

- (a) a visual examination of the body (including a dental examination);
- (b) the collection and review of information, including personal and health information relating to the deceased person or the death of the person;
- (c) the taking of samples of bodily fluid including blood, urine, saliva, and mucus samples from the body (which may require an incision to be made) and the testing of those samples;
- (d) the imaging of the body including the use of computed tomography (CT scan), magnetic resonance imaging (MRI scan), x-rays, ultrasound, and photography;
- (e) the taking of samples from the surface of the body including swabs from wounds and inner cheek, hair samples, and samples from under finger nails and from the skin and the testing of those samples;
- (f) the fingerprinting of the body;
- (g) any other procedure that is not a dissection, the removal of tissue, or prescribed to be an autopsy.

Preliminary examinations can also include the collection of personal data and health information relating to the deceased. This empowers the medical investigator to contact individuals who hold this information and to collect and review the information for the purpose of the preliminary examination. In addition to the power the medical investigator has to collect and review such personal and medical information, the Principal Registrar of the Coroners Court must ensure that the medical investigator is provided with any information held by the Coroners Court that the coroner believes would be necessary or helpful to the medical investigator in carrying out any of the medical investigations including preliminary examinations, identification procedures, and autopsies.

Although the medical investigator may collect personal and medical information as part of a preliminary examination, individuals holding such information are not compelled to provide information to the medical investigator. In practice, this limitation is of little effect since the person who reported the death to the coroner and medical practitioners who were responsible for the individuals care prior to death must give the coroner any information that the coroner requests for the purpose of the investigation. The new legislation also imposes upon coroners a requirement to consult with and seek advice from appropriate medical investigators regarding the scope of any autopsy and the nature of any testing of samples collected at autopsy that may need to be carried out.

Initial Case Management

On completion of the preliminary examination, forensic pathologists prepare a preliminary examination report and take part in a case management meeting with

the coroner. This meeting also includes the nursing staff from the CAE and may involve other court staff and police officers seconded to the Coroners Court.

At this daily case management meeting, the CAE nursing staff provide the coroner with information about the next of kin and the family's wishes regarding any autopsy examination that might be contemplated and any concerns they may have regarding the circumstances of the death. The pathologist provides the coroner with information regarding the results of the medical examination to date, including the results of the external and postmortem CT examinations and any toxicological testing. If these medical examination processes reveal a cause of death and the circumstances do not suggest that further medical investigation, such as an autopsy, would be appropriate, the coroner will release the body of the deceased to the family. If, however, the coroner believes that an autopsy will be required then arrangements are made for the procedure to be carried out.

The meeting is structured to provide the coroner with the necessary medical, scientific, and family information to enable determination of the next steps of the investigation; in particular, whether an autopsy needs to be performed. The decisions of the coroner at the meeting are recorded within the case management system, which can print the necessary formal legal documents that are required by funeral directors and the family.

Regardless of the procedures ordered by the coroner, following the case management meeting further family contact is always made with the senior next of kin to present the coroner's decision. Again, this provides an opportunity for family input as well as an opportu-

Figure 3: Definition of an Autopsy (1)

Autopsy means—

- (a) the dissection of a body (including the removal of tissue); or
- (b) any other prescribed procedure in relation to a body—

but does not include—

- (c) a preliminary examination; or
- (d) an identification procedure.

nity to both communicate the coroner's issues to the family and to receive feedback regarding their concerns. The legislation provides for formal processes of reconsideration of a coroner's decision, and an appeal system is in place for judicial review of a coroner's legal determination regarding whether an autopsy should be performed.

The preliminary examination process is underpinned by the recent technical developments in forensic pathology and toxicology that are finding application in many forensic centers around the world. Postmortem CT scans and other imaging techniques are specifically catered for in the current Victorian legislation. In addition, new toxicological analytical techniques permit quantitative toxicological drug analysis on approximately 300 drugs to be reported within 24 hours. The application of these new technologies means that medical investigators can provide coroners with a far wider range and depth of information at an early stage of the investigation, which can be used in case management decision making.

These new techniques also enhance communication with bereaved families since the conversations can include far more detailed information regarding the scientific and medical evidential basis for a coroner's decision regarding the need to proceed to autopsy or the reasons for dispensing with an autopsy.

Postmortem Imaging in Death Investigation

Perhaps the most significant of the recent technical developments in death investigation in Victoria has been the introduction of routine postmortem CT scans (PMCT). Mortuary-based CT scanners are becoming increasingly common in the major forensic pathology centers in Australia and elsewhere (7). Today, all deceased persons admitted to the mortuary at the Victorian Institute of Forensic Medicine have a whole body PMCT performed including a high-resolution scan of the head and neck. The PMCT scans are reviewed by forensic pathologists, with ongoing training, case review, audit, and specialist opinion referral being provided by part-time radiology specialists with specific postmortem radiology experience.

The expanding role of radiology in death investigation is challenging the traditional practice of forensic pathologists and their preeminent position as the provider of autopsy evidence to coroners regarding the cause and manner of death (8). The term "Virtopsy" has been coined by some to cover imaging investigations that, taken together, could be sufficient to mean that autopsy dissection might no longer be required to answer critical questions regarding the cause and manner of death (9). In addition, family concerns including religious, social, and cultural influences have driven legal death investigators to explore options other than traditional postmortem dissection.

Debate regarding the value of postmortem radiological examination and similar imaging procedures in death investigation is ongoing. The shape of the debate and the medical and legal questions posed change from time to time – can imaging replace traditional invasive autopsy procedures, what are the best imaging modalities to use, what diseases might be missed by imaging, what trauma might be missed in a traditional invasive autopsy, and what degree of diagnostic certainty is required by a coroner?

The debate has also been polarized by a degree of medical professional rigidity exemplified by the position taken that "radiologists do radiology and pathologists do pathology" and that the "gold standard for death investigation is necessarily the autopsy." Part of the challenge in exploring these issues lies in the focus, in some jurisdictions, on a direct scientific comparison between the results of PMCT and the traditional invasive autopsy. The Hutton Review of Forensic Pathology argued that:

In terms of meeting the needs of justice, it is for instance difficult to see why, other than to meet the conditions of the Code of Practice, all the viscera have to be examined in detail when someone previously healthy (who occupied a passive role in the events), has died suddenly from decapitation in a terrible road accident (10).

The British Association of Forensic Medicine responded to this stating:

This shows a lack of understanding of how forensic pathology actually works – a complete and thorough post mortem examination is essential. In forensic pathology, rare things do happen (that is why such occurrences are rare and not impossibilities). Therefore to satisfy the court (on a balance of probabilities or stronger) it is absolutely essential to do a thorough examination. This is precisely why a properly conducted autopsy is considered to be the gold-standard in medical audit – studies of, for instance, post-operative deaths have consistently shown that the autopsy picks up unexpected findings not appreciated by clinicians, which have had a major contribution to the cause of death – doing a limited examination on the basis of what is expected from the circumstances of a case is fraught with danger (8).

This response raises several problematic issues at the interface of forensic pathology practice and the jurisdiction of the coroner. These issues are not new and include matters such as whether it should be the medical pathologist or the Legal Coroner who sets the scope and depth of a medicolegal death investigation. In addition, while it is true that autopsies in postoperative deaths often reveal clinically unexpected findings, the arrows go both ways – it is also the case that radiological examination can reveal findings that were not identifiable during traditional routine autopsy dissection (11).

The “scope of practice” of medical specialities is continually changing as their disciplines evolve. For instance, minimally invasive radiological procedures such as coronary artery angiography used to be performed by radiologists but today are largely the province of cardiologists. Interpretation of CT scans in trauma cases and natural disease used to be the sole province of radiologists but now they are widely examined by emergency physicians, neurosurgeons, and chest physicians in their routine clinical practice. Focusing on the needs of a jurisdiction’s medicolegal death investigation system, rather than on the partisan needs of different specialist groups of the medical profession, is a viewpoint often missed in the debate

about whether the traditional invasive autopsy should be retained, enhanced, replaced by imaging modalities.

The question of which is better for death investigation – a postmortem CT scan or a traditional autopsy – begs the questions, better for what and better for whom? While the technical and diagnostic aspects of postmortem imaging may be interesting from an academic medical perspective, the purpose for which these examinations are undertaken in a coronial context should not be forgotten. The needs of judicial coroners, who are required to meet specific legislative objectives and are operating in a legal investigative environment, can sometimes be overlooked by medical investigators who are often more focused on the establishment of a medical evidence base for the determination of the manner and cause of death.

When it comes to medicolegal death investigation, a purely medical or scientific approach will not necessarily meet the social and legal requirements. In a responsive and community-relevant death investigation system, social, legal, religious, and cultural impacts may be as important as scientific or medical factors. The debate regarding the use of radiological imaging in death investigation is often fueled by these considerations including those that see the dissection of a body as a desecration (12–14), and therefore something which is to be avoided whenever possible. Indeed, there may be considerable differences in community views regarding what a coroner’s investigation should attempt to achieve and the financial and physical resources and approach that should be utilized.

Postmortem CT scanning as well as magnetic resonance imaging (MRI) scanning have been the main imaging modalities proposed to replace or enhance traditional autopsy dissection, but these are currently costly investigations and the radiological equipment involved may not be easily accessed in all jurisdictions. Increasingly, forensic mortuaries are becoming equipped with sophisticated CT scanners and a few have MRI scanners as well. In some jurisdictions, medical radiologists have been encouraged to evaluate the use of these scanning techniques as a direct

replacement for the physical autopsy in determining a cause of death for the coroner. While the use of imaging techniques in this way is academically interesting, determining the cause of death is only one aspect of the benefits that the autopsy brings to death investigation. In addition, validating radiological imaging techniques for this singular purpose still has some way to go (15).

Many of these imaging procedures are considered by pathologists to be part of the scope of the autopsy process. Indeed, radiographs have been an important part of certain autopsies for many years, for example, in firearm and diving-related deaths. Today, a routine coroner's autopsy in Victoria will always include full toxicology screening and histological examination of body tissues, although not all autopsies will include the collection and analysis of microbiological specimens. The decision to proceed to microbiological testing will usually be based on the clinical history and the type of death being investigated – for example, infant deaths where routine tests for infectious disease are part of autopsy protocols.

Similarly, identifying the source of an intraabdominal hemorrhage during an autopsy is highly problematic and often impossible with traditional dissection techniques, in part because the vascular defect may be very small and the lack of blood pressure causes vascular collapse. Although the routine PMCT undertaken as part of the preliminary examination in all deaths investigations can assist, the problem of the cause of intra-abdominal hemorrhage is often resolved when postmortem CT angiography is performed before the autopsy dissection.

Given the acceptance of the need for radiological experience in clinical disciplines and the presence of opportunity for professional development, there is no reason why forensic pathologists should not be able to gain adequate skills in the interpretation of PMCT scans to assist them in their day-to-day casework. Increasingly, postgraduate professional development courses include postmortem imaging and its role in death investigation. These courses are not just attended by pathologists, but also by clinical radiologists

who, although experienced in radiology applied to the living, may have little experience in the interpretation of postmortem CT scans.

Today, at the Victorian Institute of Forensic medicine, there is an expectation that any forensic pathologist undertaking an autopsy should review the whole body PMCT scan before beginning the dissection. There are practical considerations that underpin this. Not only can a postmortem CT scan inform the pathologist about the possible autopsy dissection findings, but it can help the pathologist to focus the dissection in the most relevant areas. In addition, prior knowledge of the presence of infectious hazards such as pulmonary tuberculosis, physical hazards such as surgical clips or stents, and radiological hazards such as radiation implants can allow specific precautions to be taken to minimize the risk to pathologists and mortuary forensic technical staff. This use of postmortem radiology as an occupational health and safety tool by identifying dissection hazards in advance can greatly improve the safety of those working in a mortuary.

Death Investigation and Public Communications: Delivering the Prevention Message

The Coroners Court in Victoria, in common with coroners jurisdictions in many parts of the world, employs the public inquest hearing as a major process for investigatory transparency and as a vehicle of communication of findings. For a jurisdiction to go beyond this, and for legislation to enforce the engagement of courts in public media as a direct statutory function and duty is unusual. Still, more unusual is the legislation requiring engagement of a court in ongoing dialogue with a party following the conclusion of the hearing and the delivery of the judgement or finding.

The death investigation process of the Coroners Court of Victoria is, again, an exception to these general legal principles. The public health and safety aspects of the jurisdiction, established in the 2008 Coroners Act, can be seen in the preamble to the legislation which states:

The coronial system of Victoria plays an important role in Victorian society. That role involves the independent investigation of deaths and fires for the purpose of finding the causes of those deaths and fires and to contribute to the reduction of the number of preventable deaths and fires and the promotion of public health and safety and the administration of justice (1).

The Act further states in section 1(c) that the purposes of the Act is:

to contribute to the reduction of the number of preventable deaths and fires through the findings of the investigation of deaths and fires, and the making of recommendations, by Coroners...(1).

While the publication of inquest findings is potentially an important vehicle for the communication of public health and safety information, the traditional publishing of judgements and law reports is unlikely to be easily accessed by the general public or health and safety organizations. While many recorded court judgements are now published on the Internet, the courts themselves are largely separated from the details of this aspect of court reporting. In contrast, the Victorian Coroners Act 2008 places a direct obligation on coroners to publish inquest findings, comments, and recommendations and directs that this publication must be made on the Internet. Section 73 (1) states:

Unless otherwise ordered by a Coroner, the findings, comments and recommendations made following an inquest must be published on the Internet in accordance with the rules (1).

There are some limitations to this publication on the Internet since the Coroner must restrict publication in certain situations Section 73 (2) stating:

A Coroner must order that a report about any documents, material or evidence provided to the Coroner as part of an investigation or inquest into a death or fire is not to be published if the Coroner reasonably believes that publication would—

(a) be likely to prejudice the fair trial of a person; or

(b) be contrary to the public interest (1).

These sensible limitations would appear to prevent publication negatively impinging on the work of other courts while retaining the broad public health and safety benefits that might come from publication of coroners' findings and recommendations.

It might be thought that Internet publication is merely an example of a court being brought up to date with modern communication and publications technologies. Certainly, electronic publication is likely to provide greater general public access since the Coroners Court of Victoria's website and findings pages are easily accessed through search engines. Given that the work of the court includes a requirement "*to contribute to the reduction of the number of preventable deaths and fires...*" (1), use of publication modalities that lead to efficient communication of recommendations to those who can adopt them is an example of the court's contribution to public health and safety.

The communication role of the Coroners Court of Victoria and the Institute has also been supported by the inclusion of public relations and communications specialists who are able to coordinate the broader aspect of these communication and publication activities in a way that assists the Institute and the Court in "contributing" to the reduction of preventable deaths.

A further aspect of this contribution to death prevention can be seen in the way in which the Court's publication process puts certain parties publically "on notice" with respect to following up on coroners' recommendations. The potential for recommendations to be ignored is a risk to the death prevention activities of the Court. While the Victorian government stopped short of legislating that a coroners recommendation should take the form of a court order, they did provide provision for a feedback loop directing that "*Ministers, public statutory authorities or entities*" should formally respond to coroners' recommendations (1). Such a process puts the individual or organization

on public notice and provides potential future civil litigants with an evidence base to the effect that the “defendant” knew of the risk and what steps they had intended to take to address or mitigate it.

These provisions are set out in Section 72 of the Coroners Act 2008 that deals with the reports and recommendations of coroners (**Figure 4**) (1).

The requirement for the agency to formally report back to the coroner in writing, including a formal “statement of actions” that have been taken or will be taken in response to the recommendations, provides an important follow-up of the recommendations. But the legislation goes further than this, mandating that the coroner must publish the agency’s response on the Internet. Taken together, these requirements have an indirect effect of encouraging the recommendations to be taken up as any departure from this process will be openly published.

Family Medical Liaison and Genetic Services

While the results of the coroner’s investigation process have important ramifications for society in the areas of public health and safety, every death has a

personal and family dimension that must never be forgotten. The Coroners Act 2008 (Vic.) addresses this specifically (**Figure 5**) (1).

For families, dealing with the administrative and financial issues that arise after a death is only the beginning of what can be a challenging and confusing time. Coming to terms with the death of a loved one can be emotionally and psychologically challenging, and this can be compounded when the nature of the death and its cause is not understood by family or friends. The Institute actively encourages our forensic pathologists and our nursing staff to communicate with and meet families. While forensic pathologists and our family liaison nursing staff are not bereavement counselors, they are very experienced in talking about medical findings and health issues with family members at a time of bereavement. Our family liaison nursing staff coordinate these activities and it is essential that the immediate and long-term therapeutic opportunities offered by these consultations are not missed.

The identification of specific medical conditions during an investigation may have significant health ramifications for the biological family of a deceased person. Although the incidence of the detection at

Figure 4: Coroners Reports and Recommendations (1)

- (2) A Coroner may make recommendations to any Minister, public statutory authority or entity on any matter connected with a death or fire which the Coroner has investigated, including recommendations relating to public health and safety or the administration of justice.
- (3) If a public statutory authority or entity receives recommendations made by the Coroner under subsection (2), the public statutory authority or entity must provide a written response, not later than 3 months after the date of receipt of the recommendations, in accordance with subsection (4).
- (4) A written response to the Coroner by a public statutory authority or entity must specify a statement of action (if any) that has, is or will be taken in relation to the recommendations made by the Coroner.
- (5) The Coroner must—
 - (a) publish the response of a public authority or entity on the Internet; and
 - (b) provide a copy of the response to any person—
 - (i) who has advised the principal registrar that they have an interest in the subject of the recommendations; and
 - (ii) who the principal registrar considers to have a sufficient interest in the subject of the recommendations.

Figure 5: Legislative Provisions Addressing Distress of Family Members, Friends and Community (1)

When exercising a function under this act, a person should have regard, as far as possible in the circumstances, to the following—

- (a) that the death of a family member, friend or community member is distressing and distressed persons may require referral for professional support or other support; and
- (b) that unnecessarily lengthy or protracted coronial investigations may exacerbate the distress of family, friends and others affected by the death; and
- (c) that different cultures have different beliefs and practices surrounding death that should, where appropriate, be respected.

autopsy of pathological processes that suggest or identify the presence of inheritable (or communicable) disease is relatively low, many such diseases can be found. The detection of such processes may have enormous ramifications for the family of the deceased person and potentially the health of the wider community. The identification at autopsy of a medical condition not previously diagnosed or suspected may lead to improved health care outcomes for a number of people. For example, in the scenario where a traditional autopsy of a young person who died suddenly and unexpectedly fails to identify an anatomical cause for the death. It may well be that the death was a result of a genetic abnormality affecting the cardiac conduction system, leading to a fatal cardiac arrhythmia (16). Some of these conditions may be detectable in the living so that active medical follow-up of family members may be lifesaving. To ensure that these clinical issues are actively addressed, the Victorian Institute of Forensic Medicine's family medical liaison service employs a nurse with genetic counseling qualifications who works with bereaved families and healthcare specialists in genetic disease to ensure appropriate medical follow-up is available for all who wish for it.

It must never be forgotten that for the legal, medical, and administrative staff working in the coroner's jurisdiction, dealing with bereaved families and investigating the circumstances of what are often confronting and traumatic deaths has its own challenges to their personal well-being. Staff welfare is an essential component of the work of the Victorian Institute of Forensic Medicine and the Coroners Court of Victoria, and the respective human resources departments of these organizations work actively to support staff in the challenging work they undertake (17).

Organ and Tissue Transplantation

The new processes involved in medicolegal death investigation in Victoria have also improved the therapeutic opportunity created by the death investigation by providing an opportunity to retrieve human tissues from a deceased person for human transplantation. These procedures also facilitate the ethical provision

of human tissues for medical research. The Donor Tissue Bank of Victoria had been an operational unit of the Victorian Institute of Forensic Medicine for nearly 30 years; processing, storing, and dispatching heart valves, skin, and musculoskeletal tissues to hospitals in the State and around Australia. Since therapeutics and medical research lie outside the jurisdiction of the coroner, obtaining the relevant informed consent of families is the responsibility of the Institute's Tissue Bank, while the coroner is involved in approving access to the deceased, ensuring that such therapeutic endeavours do not interfere with the ongoing medico-legal investigation requirements.

From a family perspective, being provided with the opportunity to donate tissues and organs from a loved one can be therapeutic. Indeed, donation is seen by some as providing a positive aspect to what would otherwise be an intensely negative emotional event, and this may, perhaps, provide a focus for one positive outcome of a loved one's death. Unfortunately, the timing of the procedures to enhance this opportunity are extremely short (in the first 24–48 hours) and involve families having to make decisions at a time when they may still be coming to terms with the death. While a few families are confronted about being contacted to consider donation so soon after a death, most families are understanding of the issues and others actively want to donate and seek contact with the service to ensure that this happens. Indeed, such families are often upset if they discover that donation is not possible for medical or legal reasons. When families have previously discussed their individual wishes about donating organs and tissues after death with each other, this makes any decision to donate easier for all concerned.

Maintaining a balance between the benefits that an individual coroner's death investigation can bring to the community with the community health benefit achieved by making tissues and organs available for transplantation can sometimes be problematic. Deaths need to be evaluated individually and the forensic pathologist and coroner both perform an essential role in facilitating access to human tissues for transplantation. The coroner, as an impartial legal umpire, has the

task of balancing these complex public interests at the interface of law and medicine.

CONCLUSION

Both Judicial Coroners and forensic medical staff have an essential role to play in the health of our community. This goes beyond public safety and justice and involves broader aspects of public health, including disease prevention and mental health support. It should not really matter which of the various medical examiners' or coroners' systems forensic pathologists find themselves working in, they still need to ensure that the death investigation they are a part of never loses sight of the social importance of the work they undertake. It is all too easy to become involved in the technical and scientific aspects of solving the death puzzle so that we fail to be aware of the personal, family, and community loss that has taken place. Similarly, it is easy to become enmeshed in the often complex administrative and bureaucratic processes that surround death investigation, with the result that the human aspects of grief and loss become invisible.

The debate about which model of medicolegal death investigation is "best" has beset jurisdictions for decades. Perhaps this misses the point. Regardless of the model a jurisdiction chooses, there needs to be a true partnership between the technical experts and the judicial or administrative systems that underpin it. This needs to focus not only on individual cases but also on the community benefits that can be achieved by broadening the scope of the investigation and focusing on maximizing the health and wellbeing of the community, an outcome that is directly enhanced by ensuring that the justice elements are properly served.

The interface of medicine and law is inherently problematic. Indeed, traditional legal and medical/scientific investigation processes are fundamentally different and often apply different weight to individual items of information or evidence. While medical practitioners bring a scientific focus to the death investigation, the trained lawyer is an expert in decision making who can transcend the individual knowledge area of a wide range of professional disciplines. The partnership that

is created by forensic pathologists and judicial coroners working collaboratively in a death investigation team is far more powerful and influential than either working alone. At a government policy level, the ability to work together to ensure that health and justice policy development is "in sync" in key areas of public health and safety is a benefit that has the potential to significantly enhance community welfare.

Personal commitment to the wider aspects of death investigation on the part of individual forensic pathologists and judicial coroners is essential. Ongoing training of coroners and forensic pathologists, including mutual training events, is vital both to ensure service quality and the professional needs of the participants. While accreditation, audit, and quality assurance of legal services has still some way to go, these are all essential elements of the Institute's technical and managerial operations and the forensic pathologists and scientists undertake a range of service and discipline-based audit and assessment activities as part of our overall quality and risk management focus. This is essential, particularly when new technologies are being actively incorporated into the service structure.

The benefits of a death investigation system that balances and integrates both the medical and legal aspects of investigations and actively communicates findings in a transparent manner with broad public access goes some way to alleviate community concerns regarding certain deaths especially those involving state agencies such as law enforcement and correctional services. However, for these system benefits to be realized requires robust, quality driven investigation and evidence generating procedures to be in place and this requires adequate service funding and resourcing. The installation and maintenance of CT scanners in public mortuaries, some of which are completely separate from hospital facilities, is a fiscal challenge. Similarly, acquisition of the technology and development of the processes that permit quantitative toxicology results within 24 hours is costly and requires continual development to take into account the appearance of new and emerging drugs. For governments to commit to the provision of these resources, the service agencies must deliver benefits that can be seen and approved of

by the wider community, and it is part of the duty of forensic pathologists and coroners to ensure that their work is seen as enhancing public health and safety in the same way that emergency service providers are able to do.

The Victorian death Investigation system is intrinsically a judicial coroners process operated by a fully independent court with coroners who are full-time, merit-based, State-appointed judicial officers headed by a County Court Judge. The legal death investigations can include full court-based inquest hearings with a public communication system that includes web-based publication of findings, a requirement for parties to respond to the coroner's finding and publication of those responses. To achieve this, the legal investigation is supported by a comprehensive medical and scientific service delivered by a statutory agency governed by an independent board or council. Integrating these two very different systems of death investigation allows for a degree of "hybrid vigor" that ensures that the scope of investigation is not hindered by discipline differences between the various experts and encourages development of resources to meet overall community and government needs.

REFERENCES

- 1) Coroners act 2008. Melbourne: Parliament of Victoria; 2008 [amended 2017 Jul 1; cited 2017 Oct 6]. 131 p. Available from: http://www8.austlii.edu.au/au/legis/vic/consol_act/ca2008120.pdf.
- 2) Victorian Institute of Forensic Medicine Act 1985. Melbourne: Parliament of Victoria; 1985 [amended 2014 Nov 20; cited 2017 Oct 6]. 34 p. Available from: http://www8.austlii.edu.au/au/legis/vic/consol_act/viofma1985405.pdf.
- 3) The coroners process: information for family and friends [Internet]. Southbank (VIC): Coroners Court of Victoria; 2016 Jul [cited 2017 October 31]. 59 p. Available from: <http://www.coronerscourt.vic.gov.au/resources/9bce4a2d-554b-4e38-a549-37a2c3f4b269/coroners+process+booklet+2016.pdf>.
- 4) Ranson D. The Coroners Act 2008 (Vic): a medical investigator's perspective. *J Law Med*. 2010 Feb; 17(4):487-92. PMID: 20329452.
- 5) Australian Bureau of Statistics [Internet]. Belconnen (ACT): Australian Bureau of Statistics; c2017. Victoria records highest population rise of all states and territories; 2017 Jun 27 [cited 2017 Sep 20]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/MediaReleasesByCatalogue/C508DD213FD43EA7CA258148000C6BBE?OpenDocument>.
- 6) Neate SL, Bugeja LC, Jelinek GA, et al. Non-reporting of reportable deaths to the coroner: when in doubt, report. *Med J Aust*. 2013 Sep 16; 199(6):402-5. PMID: 24033213. <https://doi.org/10.5694/mja13.10246>.
- 7) Rutty GN, Morgan B, O'Donnell C, et al. Forensic institutes across the world place CT or MRI scanners or both into their mortuaries. *J Trauma*. 2008 Aug; 65(2):493-4. PMID: 18695489. <https://doi.org/10.1097/TA.0b013e31817de420>.
- 8) A response to the Hutton review of forensic pathology [Internet]. London: British Association in Forensic Medicine; 2015 2017 Sep 20]. 24 p. Available from: http://docs.wixstatic.com/ugd/0751ed_f98b08cf48d54b5e9dd8a5bbaa059f2.pdf.
- 9) Thali MJ, Yen K, Schweitzer W, et al. Virtopsy, a new imaging horizon in forensic pathology: virtual autopsy by postmortem multislice computed tomography (MSCCT) and magnetic resonance imaging (MRI)--a feasibility study. *J Forensic Sci*. 2003 Mar; 48(2):386-403. PMID: 12665000. <https://doi.org/10.1520/jfs2002166>.
- 10) A review of forensic pathology in England and Wales [Internet]. London: UK Minister of State for Crime Prevention; 2015 cited 2017 Sep 20]. 107 p. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/477013/Hutton_Review_2015__2_.pdf.
- 11) Ross SG, Bolliger SA, Ampanozi G, et al. Postmortem CT angiography: capabilities and limitations in traumatic and natural causes of death. *Radiographics*. 2014 May-Jun; 34(3):830-46. PMID: 24819799. <https://doi.org/10.1148/rg.343115169>.
- 12) Barnes M, Carpenter B. Reliance on internal autopsies in coronial investigations: a review of the issues. *J Law Med*. 2011 Sep; 19(1): 88-100. PMID: 21988012.
- 13) Carpenter B, Barnes M, Naylor C, et al. Issues surrounding a reduction in the use of internal autopsy in the coronial system. *J Law Med*. 2006 Nov; 14(2):199-208. PMID: 17153525.
- 14) Carpenter B, Tait G, Barnes M, et al. Increasing the information available to coroners: the effect on autopsy decision-making. *Med Sci Law*. 2009 Apr; 49(2):101-8. PMID: 19537447. <https://doi.org/10.1258/rsmmsl.49.2.101>.
- 15) Roberts IS, Benamore RE, Benbow EW, et al. Post-mortem imaging as an alternative to autopsy in the diagnosis of adult deaths: a validation study. *Lancet*. 2012 Jan 14; 379(9811):136-42. PMID: 22112684. PMID: PMC3262166. [https://doi.org/10.1016/S0140-6736\(11\)61483-9](https://doi.org/10.1016/S0140-6736(11)61483-9).
- 16) Brugada P. Brugada syndrome: More than 20 years of scientific excitement. *J Cardiol*. 2016 Mar; 67(3):215-20. PMID: 26627541. <https://doi.org/10.1016/j.jicc.2015.08.009>.
- 17) Trabsky M, Baron P. Negotiating grief and trauma in the coronial jurisdiction. *J Law Med*. 2016 Mar; 23(3):582-94. PMID: 27323636.