



Short Communication

A cut above the rest? The value of post-mortem examinations in undergraduate forensic science education

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ABSTRACT

Very few people have the opportunity to witness a post-mortem first-hand in a mortuary environment. These spaces are typically reserved for those in the medical profession, including doctors in training. However, students enrolled on other programmes may go on to future careers that involve interacting with deceased individuals. Forensic Science graduates, for example, may enter professional roles that require the recovery, sampling, analysis and/or identification of the dead. In only a small number of cases will forensic students have had the opportunity to attend a post-mortem in person. In this article, we explore the value of incorporating post-mortem visits on undergraduate forensic science degrees from an academic (KS) and a student (FS) perspective. As part of this research, we obtained supplementary feedback from students who had also attended a post-mortem as part of their undergraduate degree at the University of Staffordshire. This research shows that while there can be logistical challenges when arranging post-mortem visits, students find the experience to be incredibly valuable, allowing them to improve their own personal and professional practice, and learn about up-to-date methods and processes used by practitioners. It could be argued that these visits are invaluable as they facilitate observational learning, especially the practical application of theoretical knowledge and understanding of post-mortems and the identification process, which in turn improves the employability of students.

1. Introduction

Seen as a way of humanising the dead, developing professional practice, improving biomedical knowledge, and awareness of medico-legal issues associated with death, post-mortem examinations have long been embedded within undergraduate medical curricula [1–4]. While the inclusion of autopsies in medicine degrees has declined over recent decades, in part due to limited resources, fewer post-mortems taking place due to the introduction of new technologies, costs, and increasing student numbers [2,5,6], this form of teaching can be instrumental for future practitioners. Akin to those within the field of medicine, graduates in forensic science are likely to encounter deceased individuals, or parts thereof, at some point in their career. However, unlike medical students who partake in dissection and may view a post-mortem(s) as part of their training, those enrolled on forensic science or forensic investigation courses are not universally required to attend an autopsy, nor is this considered in the educational component standards by The Chartered Society of Forensic Sciences [7]. This could potentially be of detriment to new recruits who will be working in a high-pressure

environment and may never have seen a deceased individual in the flesh. If their first experience of working on a case involves a body that has sustained trauma and/or dismemberment, this can have implications not only for their performance and focus, but also their mental wellbeing and desire to pursue a career in forensics [8]. The value of viewing a body in a supportive, controlled environment before entering the workforce has been raised by medical students in the past, one of which stated “during my career as a doctor I will at some time be confronted by, for example, a seriously injured crash victim needing treatment... having been shown autopsies ... may help me overcome the initial fear more quickly” [9]. In this respect alone, the inclusion of post-mortems in forensic science education is irreplaceable as it gives students the confidence to deal with the dead in their future career. While the practical aspects of post-mortems have been addressed elsewhere [8], this paper will explore the value and challenges of incorporating post-mortem examinations into undergraduate forensic science programmes in the United Kingdom (UK) from both an academic (KS) and a student (FS) perspective. Supplementary feedback from BSc (Hons) Forensic Science graduates from the University of Staffordshire was

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gathered in July 2024. This short questionnaire (see [supplementary materials](#)) was sent to all students who attended a post-mortem in the 2023–2024 academic year ($n = 8^1$), with four members (50 %) of the student body offering their thoughts on these visits. It is important to highlight here that these questionnaires were not intended to be the sole focus of this research but were designed to offer some additional insights from a student perspective. Ethical approval to conduct this research was granted on 3 July 2024 (reference number: SU_23_179).

2. Academic perspective

As part of the level six (third year) undergraduate module, *Techniques in the Identification of Human Remains* at the University of Staffordshire, students are offered the opportunity to visit a post-mortem at Stoke-on-Trent City Council Public Mortuary. These excursions are optional and as such, attendance does not affect student's grades for this module. For those interested in the visit, students must attend an induction run by the module leader (KS). This outlines the logistics and expectations (of the post-mortem itself and visitor conduct), and it gives students the chance to ask questions about the visit and post-mortem process. Students are then able to check their schedules and select a date they would like to visit the mortuary from a pre-defined list. The module leader does not assign students to set groups, instead they are able to sign up to a visit with their chosen classmates.² Research has shown that individuals cope better in stressful situations when they interact with friends as opposed to strangers [10–12]. This approach has thus been adopted as students can be nervous before attending their first post-mortem because they do not know what to expect.

On the date of the visit, students are handed a booklet which contains questions about the post-mortem and visual appearance of the deceased, inventory forms to note pathology and/or cause of death,³ a space for reflecting on the process, and a consent form (Fig. 1). Upon arrival at the mortuary, students complete the consent form and remove this sheet from their booklet. The mortuary manager then photocopies this form and retains a copy, while the university files the original form. These consent forms are kept as a record of who has attended a post-mortem. Upon completion of the relevant paperwork, students store their belongings and are given a tour of the mortuary facilities (including the post-mortem computed tomography (PMCT) scanning unit). By visiting different parts of the mortuary, students gain a more comprehensive understanding of the procedures that mortuary staff have to undergo before an autopsy can take place. Following the tour, students put on personal protective equipment (PPE) in the form of a disposable apron and shoe covers before making their way to the post-mortem room.

One aspect of the post-mortem process that is directly related to the associated course module is the use of visual identification and assessment of the preservational state of human remains. Students can observe how the pathologist and anatomical pathology technicians work together to identify and record scars, surgical devices (e.g. prosthetic limbs), tattoos and any other identifying traits. Consideration of how long-term health conditions can aid in the identification process are also explored. Students may also witness evidence of emergency medical intervention, for instance broken ribs caused by cardiopulmonary resuscitation (CPR) or cricothyroidotomy, or in-situ therapeutic devices, for example endotracheal tubes, feeding tubes, cannulas and intraosseous devices [13,14]. These are typically not depicted in forensic

¹ A total of nine students were enrolled on the MODULE NAME REDACTED FOR REVIEW module in 2023–2024. The cohort size on this module is small as it was only open to BSc (Hons) Forensic Science students.

² Students attend the mortuary in groups of four. This is in part due to space restrictions and also to ensure students get the most out of interactions with mortuary staff.

³ Identifiable information (e.g., name, address) about the deceased must not be recorded on these forms.

Consent Form

I agree to keep the details of any post-mortems attended confidential. I will not discuss the details of any post-mortem with anyone other than fellow Forensic Science students or members of the University teaching staff. I will not discuss the details of any post-mortem in situations where they may be overheard by members of the general public. I will not take any images, either still or recorded, within the Mortuary.

Signed _____

Name (BLOCK CAPITALS) _____

Date _____

Fig. 1. The consent form that must be completed prior to entering the mortuary.

textbooks or journal articles when tackling the subject of post-mortems, so physically seeing a body that has been subjected to emergency medical intervention can equip students with valuable knowledge and understanding going into their future career.

It is expected that undergraduate forensic science students have a theoretical understanding of changes to the body following death (e.g. pallor-, livor-, algor-, rigor mortis). These are normally communicated in lectures through the use of photographs, videos and/or virtual simulations. There is no denying that these mediums can be useful in higher education [3,15–17], however attending a post-mortem allows students to see some of these changes first-hand and the variability that occurs between bodies [18]. Viewing deceased individuals can be emotionally difficult for some individuals [2,19]. If human remains are poorly preserved, have sustained trauma or damage and/or are incomplete, this can have a greater psychological impact on a person. While students can look at photographs or watch videos of an autopsy, attending a post-mortem is more visceral, making it difficult to absorb information conveyed by the pathologist or anatomical pathology technician [2,20]. Ultimately, variably preserved human remains are a norm in casework and mortuary visits offer an important insight into forensic science as a career choice.

Mortuary visitors not only have to contend with the sights and sounds of their environment, but also the smells, which can be overwhelming for some [9]. Unlike reading books or watching videos, the 'hidden curriculum' plays an important role on mortuary visits. Given the interactive nature of post-mortems, students inadvertently learn about respect and ethical principles, dignity of the dead, compassion and professionalism when working in environments with deceased persons [1,3,4,21]. These experiences can shape student perception's, their own professional practice, attitudes towards the dead and their own mortality, and can build their resilience and ability to cope with stressful situations [4].

Despite the benefits of attending post-mortems, there are also challenges for academics and mortuary staff. The development and maintenance of ties between higher education institutions (HEIs) and hospital or city mortuaries is based on open communication, collaboration and trust over a number of years. HEIs need to be flexible if these excursions are to be embedded in the curriculum, though this can be difficult if there are logistical restrictions in place. In the case of our own institution, visits are restricted to Tuesday mornings as the pathologist allocates this period to teaching and training duties. Consequently, the academic involved must liaise with the university timetabling department to ensure students enrolled on the *Techniques in the Identification of Human Remains* module do not have any other classes on Tuesday mornings. In some instances, this is not possible, and students must change groups. In other cases, visits may be postponed to the following week, which can affect the dates students have signed up for. The absence of a pathologist, the post-mortem examination of an infected body (e.g. hepatitis, tuberculosis, viral haemorrhagic fevers) [21] or the lack of deceased individuals to assess are primary reasons a visit to the mortuary may be delayed (a point we will return to shortly). Akin to other institutions during the Covid-19 pandemic, all post-mortem visits were cancelled due to health and safety implications and the increased workload of mortuary staff [22], meaning students had to rely on videos and interactive online resources (e.g. [23]).

The Stoke-on-Trent City Council Public Mortuary is one of a small number of public mortuaries in the UK that has an in-house PMCT scanner. This facility was introduced in 2019 and is run by Digital Autopsy UK [24]. As a result of the increased use of post-mortem computed tomography, very few invasive autopsies are now needed [25–27]. Typically, these take place when cause of death cannot be established through imaging alone or when specifically requested by HM Coroner [28]. Consequently, when students now visit this mortuary, there are instances where there are no bodies to examine using invasive methods as PMCT could be used to identify them and/or establish cause of death. In these cases, students are given a lengthier tour of the mortuary facilities, including the PMCT scanning unit. While this can be disappointing for students who had hoped to view a post-mortem, it does demonstrate the changing shape of mortuary services, the challenges faced by practitioners working in this sector (e.g. lack of pathologists, periods when the mortuary receives high numbers of bodies) and increasing reliance on digital technologies [27]. The ability to learn about the sector first hand equips students with up-to-date knowledge that is essential for those hoping to pursue a career in forensic science or investigation.

3. Student perspective

From the perspective of a forensic science student (FS), the educational experience of attending a post-mortem examination is a vital component of undergraduate forensic science programmes [29]. Significant educational benefits result from incorporating autopsies into relevant undergraduate programmes, enhancing knowledge and practical skills. Directly examining and observing a deceased body provides a palpable reality that validates a theoretical understanding that students obtain; a quality that cannot be recreated in a lecture room setting [30,31]. This practical opportunity goes beyond traditional textbook learning by offering an extensive understanding of the intricacies involved in post-mortem examinations, allowing students to engage with professionals working on real life cases. This is reflected in additional student feedback:

“[I] gained a better understanding of how deceased bodies are processed in real life.”

Student 1 (22 year old male).

“Key benefits include the potential to view external and internal circumstances surrounding an individual’s death. It is an opportunity to gain

insight into different illnesses and treatments that people had during their lifetime. The pathologist at the post-mortem was very informative and asked appropriate questions to keep engagement, which was extremely beneficial from an educational perspective.”

Student 2 (32 year old female).

“Live demonstration, with pathologist and team. The post-mortem teams’ knowledge was outstanding. The session was interactive, with the opportunity to answer questions from the pathologist and likewise ask. The forms we had were very useful, as we could record findings like the technicians.”

Student 4 (21 year old female).

Observational learning of a post-mortem examination and engaging with professionals also highlights the importance of having a varied skill set when working in a mortuary environment. In particular, attention to detail (e.g. identifying anomalies in the body to provide some clues into the life history of the deceased, such as enlarged organs), meticulous record keeping and cross-referencing documents and tags are reminiscent of some of the skills needed in forensic science [32]. Likewise, the variability between cases in the mortuary and at crime scenes highlight the importance of adaptability in the workplace. When students attend the mortuary, there are typically two to three bodies being prepared or examined simultaneously [33]. The exposure to different individuals in each examination demonstrates the value of adopting a multi-faceted approach (e.g., physical examination, toxicology, histology and/or radiology) in post-mortem investigations; whether this is to ascertain the identity of the deceased, identify health conditions, injuries and/or previous medical intervention and/or to establish the cause of death [20,29]. The more cases individuals are exposed to, the greater their experience, which in turn improves their employability. Indeed, when considering how visits could be improved in the future, Student 4 recognised the value of attending multiple post-mortems, stating:

“The opportunity to visit more frequently and observe a range of different examinations.”

Student 4 (21 year old female).

Medical students have also highlighted the usefulness of repeated autopsy attendance [2,34]. Students enrolled on the *Techniques in the Identification of Human Remains* module only have the opportunity to attend one post-mortem, which may be deemed as a drawback for students, particularly where only PMCT imaging is used, for example a cause of death may be established through non-invasive imaging, thus meaning invasive autopsy is not carried out. As mentioned earlier, this new approach to post-mortems demonstrates changes within the sector and greater reliance on new technologies. Student 3 recognised this point when their visit only involved the non-invasive examination of the deceased using PMCT imaging:

“Hopefully rebook a visit to potentially see an actual post-mortem, however I understand post-mortems are not a necessity anymore so is not a guarantee.”

Student 3 (24 year old male).

The experience of attending a post-mortem examination can have a profound impact on the professional development and personal growth of a student. These visits accentuate the importance of respect, sensitivity and ethical awareness when handling and examining deceased individuals. While ethics and respectful treatment of the deceased are addressed in the classroom, observing professionals in a mortuary environment puts this information into context and facilitates observational learning [3]. These themes were raised in student feedback following their post-mortem visit:

“People were very respectful toward the deceased and those carrying out the post-mortem.”

Student 2 (32 year old female).

“Slight ethical concerns regarding whether the family of the deceased consented to forensic students being present.”

Student 4 (21 year old female).

The question of whether it is ethical to allow students to attend post-mortems outside of a hospital mortuary has been raised in the past (e.g. [35]). Stoke-on-Trent Public Mortuary only accept bodies from the community [33] and as such, HM Coroner is the custodian of any bodies admitted to this mortuary. Under the Human Tissue Act (2004) consent for the storage and use of a body is not required where there is authorisation from a coroner [36]. Consent for students to view post-mortems is therefore obtained from the mortuary manager and, ultimately, HM Coroner. This is in stark contrast to body donation programmes at medical schools in the UK whereby the deceased bequeaths their body for anatomical educational purposes [37,38]. Going forward, students enrolled on the *Techniques in the Identification of Human Remains* module will be required to attend a seminar prior to the post-mortem visits taking place. In this class, discussions will focus on the consent and ethics of observing post-mortems in forensic education.

4. Conclusion

The inclusion of post-mortem examinations on undergraduate forensic programmes are invaluable as they allow students to bridge the gap between theoretical knowledge and practical application. By witnessing a post-mortem and interacting with mortuary employees, students are able to truly understand the value of internal and external examinations, and how an individual’s clinical history can contribute to the identification process. Simultaneously, students in attendance are active participants in the ‘hidden curriculum’ whereby they hone their observational and critical thinking skills, while bolstering their own professionalism and ethical awareness in the field of forensic science. Yet despite the benefits of making these visits available for students enrolled on undergraduate forensic courses, there are challenges. In particular, the absence of professional links between HEIs and hospital or council mortuaries may be a barrier to offering post-mortem visits on undergraduate forensic science programmes. In these instances, it is beneficial for academics to reach out and network with pathologists and anatomical pathology technicians in the local area. The decreasing number of invasive post-mortems also means it is more challenging to arrange these visits, particularly when faced with additional logistical barriers, such as fitting in visits around student and staff timetables and times when visitors can attend the mortuary. In instances where only non-invasive post-mortems take place, students can learn about current practices and procedures followed by practitioners. While students may view the lack of an invasive autopsy on their visit to be second-rate, particularly in cases where multiple opportunities to view a post-mortem are not offered, academic tutors should stress that their up-to-date knowledge of post-mortem methods and firsthand experience in a mortuary will improve their employability when applying for positions in forensics, disaster victim identification and other related disciplines.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.scijus.2024.09.009>.

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