

Forensic Pathology Education in Pathology Residency: A Survey of Current Practices, a Novel Curriculum, and Recommendations for the Future

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Abstract

Forensic pathology is a fundamental part of anatomic pathology training during pathology residency. However, the lack of information on forensic teaching suggests the highly variable nature of forensic education. A survey of pathology residency program directors was performed to determine key aspects of their respective forensic rotations and curriculum. A total of 38.3% of programs from across the country responded, and the survey results show 5.6% don't require a forensic pathology rotation. In those that do, most forensic pathology rotations are 4 weeks long, are done at a medical examiner's office, and require set prerequisites. A total of 21.1% of responding programs have residents who are not receiving documented evaluations for this rotation. While 39.6% of programs have a defined forensics curriculum, as many as 15% do not. Furthermore, nearly 43% of programs place no limit on counting forensic autopsies when applying for pathology board examinations. Our survey confirmed the inconsistent nature of forensic pathology training in resident education. Additionally, our curriculum was reorganized to create a more robust educational experience. A pre- and post-forensic lecture quiz and Resident In-Service Examination scores were analyzed to determine our curriculum's impact and effectiveness. Analysis of our pre- and post-lecture quiz showed an improved overall average as well as an increase in Resident In-Service Examination scores, indicating improved general forensic pathology knowledge. Using this knowledge, along with changes in our curriculum, we generated a number of recommendations for improving forensic pathology education in pathology residency.

Keywords

anatomic pathology, forensic pathology, medical education, pathology residency

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Introduction

Forensic pathology has long been considered a specialty on the fringes of medicine, even among our fellow pathologists. Despite this attitude, forensic pathology is a growing specialty, both in the number of practitioners and in recognition. Recent decades have brought a plethora of technological advances, popularized criminal cases, and even mainstream media programs that have thrust this specialty into the public view, adding to its demystification and professional esteem.

In spite of this long awaited appreciation, we suspect the educational experience of pathology residents to forensic

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pathology remains highly variable. This variability may be due, in part, to the generalized nature of the program requirements mandated by the Accreditation Council for Graduate Medical Education (ACGME) that state pathology residents must have “exposure” to forensic pathology.¹ Additionally, the lack of information and literature on forensic teaching in residency further suggests the inconsistent nature of this subject. Notably, the last study exploring this topic was published in 1979 by Sexton and Hennigar.² These fundamental issues may perpetuate the lack of importance placed in educational exposure and result in the dwindling numbers of interested residents and, inevitably, of forensic pathologists themselves.

It was this ambiguity and lack of uniformity that inspired our investigational survey to ascertain the formality and depth of forensic pathology training during pathology residency. The results of this survey, taken with changes to our own forensics curriculum, were then used to generate a list of recommendations or minimal good practices to assist in improving the scope and standardization of forensic pathology training in residency.

Methods

National Survey

A web-based questionnaire was generated using SurveyMonkey (Palo Alto, California) software and posted on the Pathology Program Directors national listserv. This posting requested program directors to take this short survey on a voluntary basis. It was accessible to program directors in all 141 pathology programs accredited by the ACGME from November 2016 through January 2017.³ Reminder e-mail postings with the survey link were sent on multiple occasions to allow for the maximal possible number of participants.

The survey consisted of 14 questions, including multiple-choice answer questions, yes or no questions, and open-ended fill-in-the-blank style questions. Nearly, all questions contained an open dialog, free-text box for explanations or comments. The free-text comments and explanation answers were carefully examined and were discarded if they were nonsensical or noncontributory or if the respondent seemed to misunderstand the question. For example, when asked if their program had a required forensic pathology rotation, 1 discarded response comment was “doesn’t every residency program.” The questions included if residents in their respective programs are required to do a forensic pathology rotation, where the rotation takes place, how or if the residents are evaluated on the rotation, if their department has a formal forensic pathology curriculum, and so on. Respondents were also asked if they could be contacted with additional questions or if they would like the survey results sent to them upon completion.

All individual survey responses were kept confidential and only aggregate data or unlinked comments were analyzed and presented. Not all questions were answered by every

Table 1. Reference Forensic Pathology Texts.

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- “*Forensic Pathology*” by Vincent DiMaio and Dominik DiMaio⁴
 - “*Forensic Pathology: Principles and Practice*” by David Dolinak, Evan Matshes, and Emma Lew⁵
 - “*Handbook of Forensic Pathology*” by Vincent DiMaio and Suzanne Dana⁶
 - “*Gunshot Wounds: Practical Aspects of Firearms, Ballistics, and Forensic Techniques*” by Vincent DiMaio⁷
-

respondent; thus, the total number of responses for each question might vary. See Appendix A for the complete survey.

Our Program

The Penn State Hershey Medical Center (PSHMC) Department of Pathology is an ACGME-accredited pathology residency program consisting of 16 residents. Forensic pathology is a required 4-week rotation taken while in the second year of training and is done at the regional Dauphin County Coroner and Forensics Center and Lancaster County Forensics Center under the supervision of a board-certified forensic pathologist and a coauthor of this article (W.K.R.). Traditionally, the forensics curriculum has consisted of the activities that take place while on rotation and under the forensic pathologist’s supervision including participating in all aspects of a forensic autopsy, death scene investigation, ancillary testing interpretation, observation of preparation for and testimony in criminal and civil court proceedings, and so on.

The improvements in our forensic pathology curriculum centered on the addition of several key intradepartmental and interdepartmental resources and opportunities. These were meant to allow every resident to establish a foundation of basic forensic pathology knowledge and the opportunity to apply that knowledge both to their forensic cases and in an interdisciplinary fashion among other medical specialties.

For our intradepartmental changes, the focus was primarily on introducing a lecture series into the core curriculum for residents to build and standardize a solid foundation of forensic knowledge. The lecture series consisted of 6 in-depth PowerPoint lectures on core forensic pathology topics using several well-respected and established forensic pathology texts as reference material, detailed in Table 1.⁴⁻⁷ The topics of these lectures, as well as multiple additional topics that are under consideration for future introduction to our curriculum, are outlined in Table 2. These lectures are stored in a shared file accessible to all pathology residents and are meant to be reviewed by the residents while on their forensic pathology rotation or when studying for the Resident In-Service Examination (RISE) or national board examinations. A senior resident, and a coauthor of this article (A.S.), then presented a 1-hour didactic summation lecture to the residents 4 weeks prior to the 2016 RISE as part of their core

Table 2. Suggested Core Curriculum Topics for Forensic Pathology.**Topics Currently Covered in Our Curriculum**

Introduction to forensic pathology
Postmortem changes and time of death

Asphyxia

Sharp force injuries

Blunt force trauma

Introduction to ballistics and gunshot wounds

Additional Suggested Topics Under Consideration

Introduction to toxicology

Pediatric forensic pathology

Death certification

Natural deaths

Environmental deaths/drowning

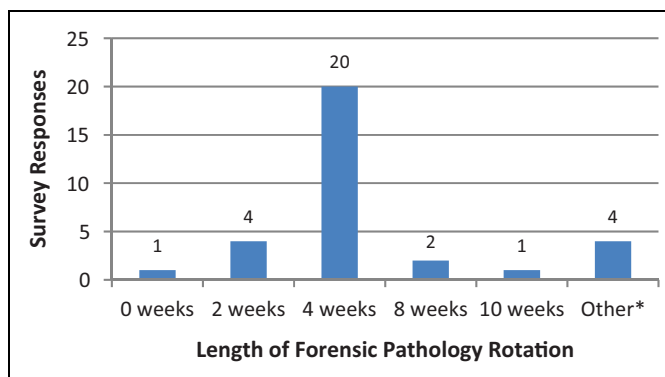
Deaths in custody

curriculum lecture series to review the important points of all available lectures.

In addition to the lectures, a question bank with 25 questions was generated and stored on a shared folder. The questions were written in a multiple-choice style format, with or without corresponding images, covering high-yield topics and all topics discussed within the lectures. Each of the answers to the questions included a detailed explanation of both the correct and incorrect choices.

Additionally, upon completion of their forensic pathology rotation, each resident presents a forensic case that he or she participated in to the department during the monthly autopsy conference. The presentation should include pertinent history, scene information, autopsy findings, ancillary testing results, clinicopathologic summary, and the final cause and manner of death. These presentations are meant to enhance the experience and understanding of the rotating resident and the conference attendees and should not disrupt or compromise an ongoing death investigation.

The interdepartmental activities were instituted to allow residents to gain a new perspective on cases and acquire additional skill sets that may assist in forensic practice. The activities included 4 on-site shadowing experiences at PSHMC in the departments of radiology, pediatrics, and cardiology. Each shadowing experience is typically 4 hours on an afternoon of the forensics rotation. The residents spend time with faculty in neuroradiology and pediatric radiology to review radiographic images in cases pertinent to forensics, such as cases of trauma or abuse. Understanding forensic radiologic interpretation is a necessary skill for good practice, especially as advancing radiologic technologies continue to be incorporated into this specialty.⁸ Residents shadow pediatricians in the PSHMC Center for the Protection of Children where they participate in consultations for suspected or confirmed child abuse, observe interviews with law enforcement or preparation of testimony for court proceedings, as well as review findings in historical cases. Residents also spend time in cardiology's echocardiography laboratory reviewing the findings and derangements that may be seen in heart disease to aid in

**Figure 1.** Length of forensic pathology rotation (n = 31). Other*: Programs indicated that forensic pathology is incorporated into autopsy pathology and cannot be delineated.

the pathophysiologic understanding behind the most common cause of death in our country.⁹

To determine the effectiveness of these curriculum changes, 2 independent testing parameters were examined. Anonymous web-based 10-question multiple-choice pre- and post-lecture quizzes were given to the residents 1 week prior to and 1 week following their didactic lecture. Each quiz question was written to test the information to be covered or learned in the lectures with no duplication. This didactic forensic pathology review lecture was given 4 weeks prior to their RISE. The residents RISE scores for forensic pathology were then able to be compared with their previous years' scores to determine long-term curriculum impact. Participants included both junior and senior residents, regardless of whether or not they had completed their forensic pathology rotation.

Results

National Survey

There were 54 responses (38.3% of the 141 programs) to our national survey from a diverse group of pathology residencies across the country, with the program's size ranging from 4 up to 38 combined anatomic and clinical pathology (AP/CP) or AP only residents. Although our survey showed that most programs do require a forensic pathology rotation (51 [94.4%] of 54 responses), there are still some programs that do not (3 [5.6%] of 54 responses).

In reviewing the results regarding the logistics of the offered forensic pathology rotations, some promising common themes emerged. Figure 1 shows that most forensic pathology rotations are 4 weeks in length. A small portion of these respondents indicated that the forensic autopsies are conducted within their hospital; thus, forensic pathology is an integral part of their autopsy service and curriculum. However, as expected, the majority of residents have their forensic pathology rotations at a medical examiner's office (see Figure 2). When asked if their programs have set prerequisites before taking the forensic pathology rotation, 23 (42.6%) of the 54 participants indicated

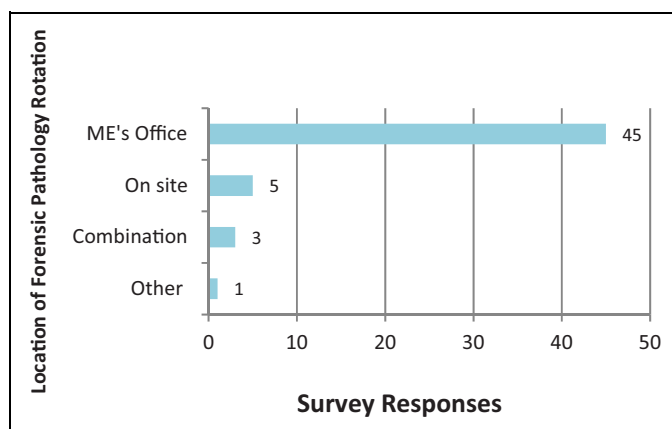


Figure 2. Location of forensic pathology rotation (n = 54). Other*: Programs that send residents to regional autopsy center.

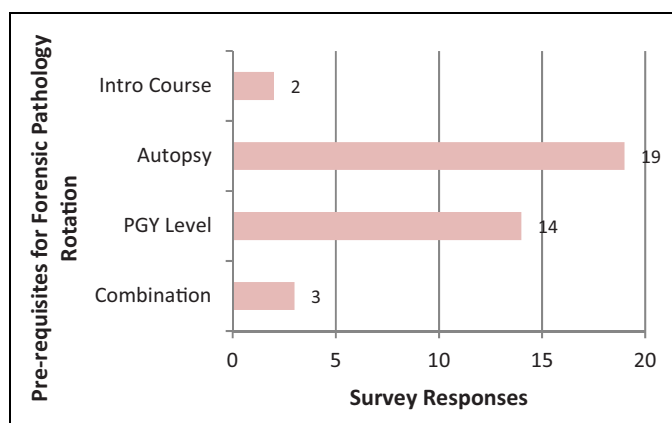


Figure 3. Prerequisites for forensic pathology rotation (n = 39).

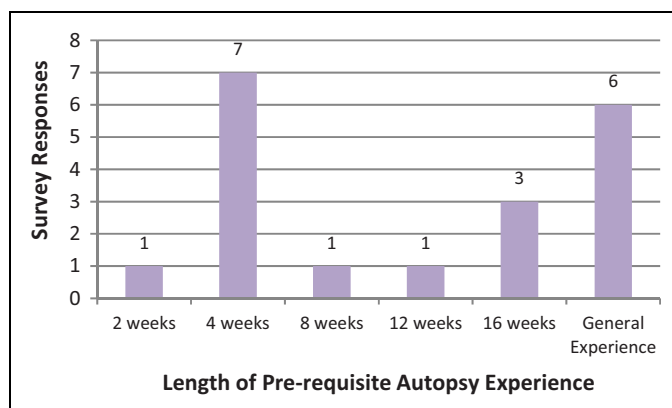


Figure 4. Length of prerequisite autopsy experience (n = 19).

that they did not. Of those that do, the prerequisites consist mostly of a certain amount of autopsy rotations, are delineated by the level of postgraduate training year (PGY), or some combination of both, as shown in Figure 3. The required autopsy exposure was found to be highly variable, ranging from undefined general autopsy experience to expecting completion of 4 months' worth of autopsy rotations (see Figure 4).

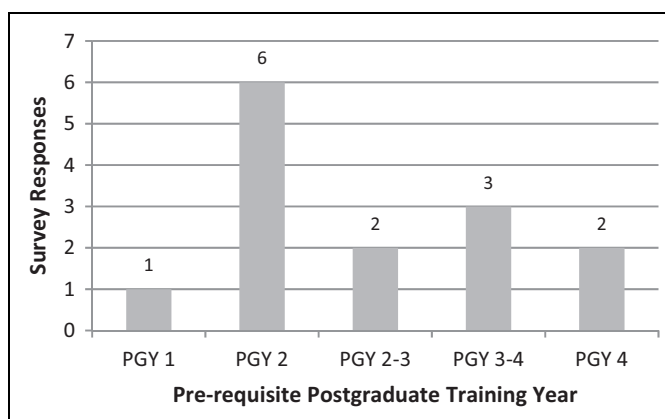


Figure 5. Prerequisite postgraduate training year (n = 14).

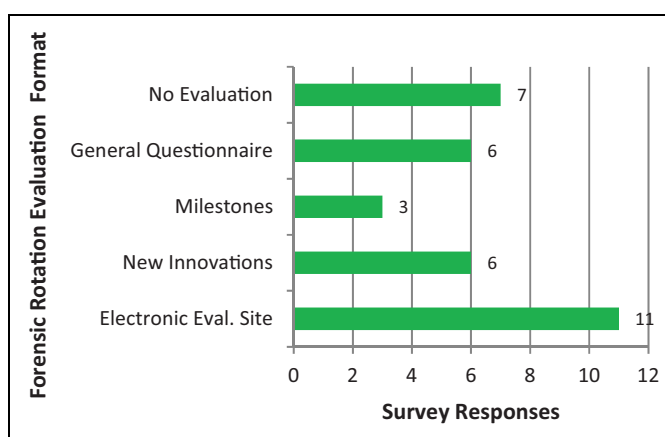


Figure 6. Forensic rotation evaluation format (n = 33).

Figure 5 illustrates that most residents have their forensic pathology rotation during the second or third postgraduate training year. A substantial number of residents, in at least 14% (2 of 14 respondents) of the programs, have their rotations during the fourth postgraduate training year. While on rotation, it was found that the residents are exclusively being evaluated by the forensic pathology faculty. As Figure 6 demonstrates, while most use an electronic evaluation form (MedHub, E*Value, or New Innovations), a considerable portion (7 [21.1%] of 33 responses) of these programs' residents are not receiving documented evaluations for this rotation.

Only 21 (39.6%) of the 53 respondents indicated that they have a defined forensic pathology curriculum. For those programs that have an established forensic pathology curriculum, 61% (11 of 18 respondents) stated that this curriculum was left up to the supervising forensic pathologist. Six participants commented that their curriculum is "very generic" or "needs work." The curriculum includes defined forensic pathology lectures for 37 (69.8%) of the 53 respondents, and for 32 (91.4%) of 35 programs, these lectures are given by a forensic pathologist. Interestingly, Figure 7 shows that the location of the lecture is variable, with some 27.3% (6 of 22 respondents) being given sporadically or on an "as-needed" basis.

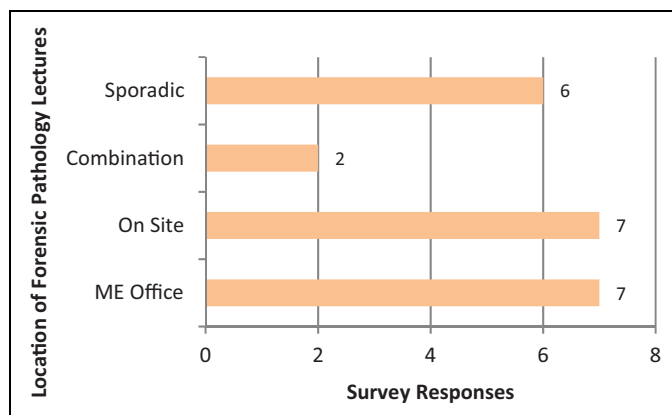


Figure 7. Location of forensic pathology lectures (n = 22).

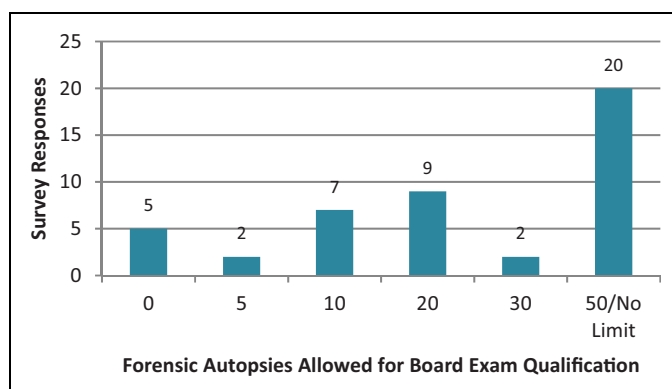


Figure 8. Forensic autopsies allowed for board examination qualification (n = 47).

Furthermore, only 1 respondent indicated that the forensic lectures were part of their residency's core curriculum.

When considering the utility of a forensic pathology rotation and curriculum for residents, the data show that on average each responding program has had 2 graduating residents pursue a forensic pathology fellowship within the last 5 years. Interestingly, over 7% of the programs (4 of 54 programs) indicated that they had 5 or more residents go into forensic pathology over the past 5 years. Regarding the residents not interested in forensics, the data revealed 18 (34%) of the 53 programs had nonforensic-oriented residents who express interest in doing forensic-related research/scholarly activity, quality improvement projects, or attending a national forensics conference/meeting. Concerning all pathology residents, Figure 8 shows that when applying for the national pathology board examinations, an astounding 42.6% of residency programs (20 of 47 respondents) place no restrictions on the counting of forensic autopsies toward the 50 total autopsies required by the ACGME and American Board of Pathology.^{1,10}

Our Program

Eight residents participated in the pre- and post-lecture forensics quiz. The score improved from a 50% overall

correct average to an 80% average ($P = .00089$ by 1-tailed t test). Furthermore, 8 PGY-2 through PGY-4 residents participated in the 2016 RISE for anatomic pathology including the forensic pathology section. In comparison with the 2015 forensic pathology RISE scores, the data show an increase in mean raw score from 486 in 2015 to 494 in 2016, resulting in a P value of .15 by a 1-tailed t test comparison. Additionally, 5 PGY-1 residents scored above the national mean for all PGY-1 residents in the United States, mean (standard deviation) = 476 (62), with an overall average raw score of 480 for the forensic pathology.

Discussion

The findings of our survey revealed that there is a large degree of disparity among programs for teaching forensic pathology in graduate medical education. This variation exists both in the forensics rotation and even more so in regard to the forensic pathology curriculum.

The ACGME dictates that pathology "residents must have exposure to forensic...autopsies" and "resident education...must include instruction in...forensic pathology."¹ Thus, all accredited pathology programs are required to provide each pathology resident, whether seeking a combined anatomic and clinical pathology or anatomic-only pathology training, with adequate training in these areas to maintain their accreditation. Unfortunately, these guidelines clearly lend themselves to a great degree of interpretation. This was also reflected in our survey results, where nearly 6% of programs currently do not have a required forensic pathology rotation. In 1979, a survey by Sexton and Hennigar² looked at the forensic pathology training available to residents and medical students. At that time, less than 7% of residency programs required a forensic pathology rotation, with 44 total residents being trained in forensics in the United States over the previous 4 years.² Although our findings are not so extreme, there is still room for improvement.

In 2015, recommendations by the National Commission on Forensic Science's Medicolegal Death Investigation Subcommittee stated that pathology residents should be required to spend a minimum of 4 weeks of training in medicolegal autopsies at a death investigation facility accredited by the National Association of Medical Examiners (NAME) and under the supervision of a board-certified forensic pathologist.¹¹ These suggestions are similar to our own recommendations outlined in Table 3. I would prefer that the tables maintain their original designation. Reassuringly, our data showed that over 83% of programs have their residents do rotations at a medical examiner's office with a forensic pathologist. Additionally, residents should have at least 1 year of pathology training and a minimum of 4 weeks of autopsy training before advancing to the new challenges of a forensic autopsy. This will help to ensure that the resident has been exposed to a greater amount and greater

Table 3. Eight Key Components of an Autopsy.^{1,10}

-
- Review patient history and circumstances of death
 - External examination
 - Gross dissection and evisceration
 - Review microscopic and laboratory findings
 - Write gross and microscopic findings description
 - Generate opinion of cause of death
 - Formulate a clinicopathologic correlation
 - Review autopsy report with faculty
-

diversity of medical autopsy cases, as well as gained the basic procedural and dissection skills necessary to undertake more complex cases.¹² The minority of programs, approximately 5% in our survey, in which the forensic autopsies are done on-site are a special consideration and may be seen as advantageous to residents as they have continual exposure to forensic cases.

Furthermore, the forensic rotation should take place sometime within the second or early third postgraduate training year. This timing will benefit the residents by allowing them to have sufficient time to pursue a fellowship in forensic pathology if desired. Early exposure in education or training is a known factor contributing to the choice of a medical specialty.¹³ In studies of general surgery residents, it has been shown that the largest groups of residents undecided on their future subspecialties are those in their first and second postgraduate training year. Interest in a specific subspecialty was also found to be greatly reduced following the residents' third postgraduate year.¹⁴ Although this study consisted of residents in a different specialty, similar outcomes are likely to also be seen with pathology residents. Additionally, competitive fellowship positions fill quickly and those residents applying later in their residency may miss training opportunities in highly desired programs.

Just as the rotation should be under the guidance of a board-certified forensic pathologist, so should the curriculum for the forensic pathology rotation. This rotation curriculum subject matter will be rightly left in the capable hands of those experts and is not within the scope of this article. However, a thorough understanding of the rotation goals, objectives, and expectations should be maintained by the residency program to ensure productivity and relevance to resident development and education. Although our data showed that nearly 40% of programs do have a defined curriculum for the forensics rotation, as many as 15% stated that they did not know what the curriculum consists of.

These recommendations will help to ensure that each resident is taught the standards of acceptable practice for this unique specialty. Another key aspect to improving a rotation experience is the appropriate implementation and use of documented evaluations. These evaluations are crucial for residents to understand their preparedness for independent practice and for the residency programs to monitor resident progress.¹⁵ Our survey indicated that over 21% of programs were not receiving these evaluations. The ACGME mandates

that overseeing "faculty must evaluate resident performance in a timely manner during each rotation . . . and document this evaluation at completion." The format of the evaluation may be variable but, ultimately, these parameters must be translatable to the resident milestones for evaluation of the resident's core competencies.¹⁶

Aside from the curriculum for residents while on their forensic pathology rotation, forensic pathology lectures should be incorporated into a program's routine core curriculum series. Our survey identified one program with such lectures as part of their core curriculum. Ideally, these lectures would also be given by a board-certified forensic pathologist; however, additional lectures by a forensic pathology fellow, an interested resident, pathologist, or even decedent care staff could also be beneficial. These lectures should be aimed at introducing residents to general high-yield topics in forensic pathology to ensure an appropriate level of knowledge in the field. These topics may include an introductory lecture, common injury or wound patterns (such as sharp force injuries, gunshot wounds, and blunt force trauma), asphyxia, time of death, postmortem changes, introduction to ballistics, introduction to toxicology, pediatric forensic pathology, and so on. These fundamental topics are typically highlighted in the standard forensic pathology texts, as demonstrated in Tables 1 and 2.

The Scientific Working Group for Medicolegal Death Investigation has recommended the College of American Pathologists and NAME collaborate to develop online lectures and course material to teach residents forensic pathology. They went on to suggest that the Association of Pathology Chairs (APC) endorse this tutorial and make it required within every programs curriculum.¹⁷ Although this project would be ideal, to date and to these authors' knowledge, no such material has been released. Despite this, the institution of even a small number of self-accessible lectures and, at minimum, a 1-hour didactic lecture will improve resident knowledge of this specialty, as evidenced by changes to our own program. These simple additions improved our residents' performance on a forensics quiz and increased the department's overall RISE scores for forensic pathology.

The importance of forensic pathology training during residency and the need for these improvements cannot be overlooked. The ultimate goal of every residency program is to graduate competent, capable pathologists. This can only be accomplished when programs are held to a certain standard to facilitate an optimal learning environment with more educational opportunities for residents.

The autopsy is a cornerstone of anatomic pathology. It's been said that "there is no such thing as a routine autopsy."¹² This is especially true for forensic autopsies. Each case brings with it a unique set of circumstances and challenges. The procedures and ancillary testing must be adapted and considered to best fit each case. Despite this, forensic autopsies hold an incredible abundance of natural pathology. Recent decades have seen a significant and steady decline in autopsies across

the country. So much so that the Joint Commission on Accreditation of Healthcare Organizations was forced to abandon their 20% hospital autopsy rate requirement in the 1970s.¹⁷ In 2011, the national autopsy rate was found to be a meager 8.5%, with only 4.3% of those being disease-related cases.¹⁸ In order to supplement these dwindling autopsy numbers, programs have been using forensic autopsies to count toward the required 50 autopsy cases needed to sit for the American Board of Pathology's anatomic pathology board examination.^{10,19}

Although forensic autopsies are a fantastic resource for learning general pathology, as well as the specialized information specific to the field, programs should be cautious in residents overrepresenting their amount of autopsy experience when applying forensic autopsies toward the pathology board requirement. Our survey indicated that 42.6% of programs placed no limit on the number of forensic autopsies used toward the required 50 autopsies. Although the reason for this laxity in reporting guidelines is not known, taken in conjunction with declining autopsy numbers nationwide, the situation leaves itself open for residents who may claim many autopsies while not having gained a meaningful learning experience from them. In order to remedy this issue, programs should ensure residents claim only appropriately completed autopsies when applying for board examinations. This will help to confirm the resident has had a thorough autopsy training that warrants qualification for the national board examinations.

The ACGME guidelines state that in order to count an autopsy, the resident must have completed all 8 of the key aspects of an autopsy including microscopic review of the case histology and generating a written description of the gross and microscopic findings (Table 3).^{1,10} Histologic review of tissue in forensic pathology is variable from office to office and often depends upon the available resources and case circumstances.²⁰ The ability of residents to prepare pathology reports in forensic cases is also highly variable, with some offices only allowing the resident to observe. Furthermore, a significant portion of cases take many weeks to receive all of the ancillary testing results necessary to make a determination on cause and manner of death.²¹ Lack of follow-up and short rotations help to create situations in which residents may be unable to complete all necessary aspects of a complete autopsy for many of their cases.

This variability in forensic autopsy experience, taken with the general laxity in reporting guidelines for board examinations, illustrates the fact that programs should adopt a policy for limiting the number of forensic autopsies allowed for board examination qualification. Unfortunately, more data are necessary before such a determination can be made. Until this complex issue can be further investigated, each residency program would benefit from implementing their own protocols based on their specific autopsy and forensic service opportunities, as well as good communication with the forensic pathologist in charge of the forensic pathology rotation.

In response to some of these issues, an Autopsy Working Group (AWG) of the APC was formed in 2014. This group has recently released its final recommendations to assist programs in maintaining the academic and technical standards necessary for adequate resident training in autopsy pathology. These recommendations stress the importance of communication between the program director and the autopsy director and introduces the idea of "entrustable professional activities" that will help to ensure standardization in both teaching and performing autopsies by employing autopsy-specific competencies defined in the ACGME milestones. Furthermore, the AWG suggested methods of documentation to ensure a complete record of resident participation in all aspects of the autopsy and only upon completion can the case be used for the 50 autopsies needed for the board examinations.²² These concepts easily lend themselves for use in forensic pathology training. Standardization of resident expectations, skill sets, and knowledge base with thorough documentation would confirm universal resident competency and qualification.

Additionally, there is a necessity to fulfill the needs of society. Currently, there are too few board-certified forensic pathologists in the United States.¹¹ With an average of only 3.7 forensic pathologists per 1 million people in NAME-accredited offices and an estimated 500 full-time practicing forensic pathologists nationwide, these numbers would have to more than double in order to meet current population needs.^{11,23} Unfortunately, these numbers are unlikely to change with only 48 fellows passing their forensic pathology boards in 2016 entering the workforce and as many as 49% of the available fellowship positions vacant in 2013.^{20,24} To make matters worse, a study published in 2015 has projected that over the next 2 decades, the general pathologist workforce is going to decline from 5.7 to 3.7 per 100 000 people.²⁵ This can only mean that the current numbers of forensic pathologists will also decline, further exacerbating an already dire situation. Introducing residents to forensic pathology where programs emphasize its importance and foster their understanding of the specialty will not only produce more prepared and well-rounded residents but also encourage more residents to specialize in the field.

Our Program

When considering the efficacy of the forensic pathology curriculum changes in our program, the results of the pre- and post-lecture quiz associated with the didactic lecture showed an increase in overall average score, supported by a P value $< .05$, indicating general knowledge improvement in the forensic topics discussed. Furthermore, when comparing the more senior residents RISE scores in forensic pathology from 2015 to 2016, there was an increase in the mean raw score. Although this increase supports an improvement in forensic pathology knowledge, the P value shows that this is not statistically significant. This finding may be due to the small sample size of

this study and thus limited statistical power. Additionally, the first-year residents scored above the national average in the forensic section of their RISE, despite the fact that they have not yet had their forensic pathology rotation. These data further indicate the value of a structured forensic pathology curriculum in resident education.

Conclusions

Forensic pathology is a crucial part of training in pathology residency; however, this importance has only recently begun to be appreciated. Our survey confirmed the variable nature of forensic pathology training in graduate medical education. Additionally, despite its relatively small sample size, our survey was able to reveal the common trends and areas of concern in current practices. Furthermore, our data illustrated the need for further investigation to determine specific limitations for supplementing forensic autopsies when applying for national pathology board examinations. Using this knowledge, along with changes made in our own curriculum, we summarized a list of recommendations for improving forensic pathology in graduate medical education in Table 4.

Table 4. Recommendations for Forensic Pathology Training in Pathology Residency.

The Forensic Pathology Rotation	
<ul style="list-style-type: none">• Ensure forensic pathology is a required rotation• The rotation should be a minimum of 4 weeks• Ensure the rotation is at a NAME-accredited facility with a board-certified forensic pathologist• Emphasize the importance of a defined and documented rotation curriculum prepared or approved by a board-certified forensic pathologist• Encourage residents to take the rotation in the second or early third postgraduate training year after having completed at least 4 weeks of autopsy pathology• Emphasize the importance of documented evaluations completed by the supervising forensic pathologist• Ensure residents claim only appropriately completed cases when applying for the board examinations	
The Forensic Pathology Core Curriculum	
<ul style="list-style-type: none">• Ensure a defined forensic pathology curriculum or lecture series is part of the core curriculum of the program, independent of the rotation• Emphasize the importance of lectures given or approved by a board-certified forensic pathologist as part of that curriculum• Ensure the curriculum is aimed at teaching a variety of high-yield forensic pathology topics	

Abbreviation: NAME, National Association of Medical Examiners.

Appendix A

Forensic Pathology Education in Pathology Residency Training

1. Are your residents required to do a Forensic pathology rotation?

- ☐ Yes
- ☐ No

If Yes please explain and/or Additional Comments.

2. Where do your residents complete their Forensic Pathology rotation/training?

- ☐ Medical Examiner's office
- ☐ On campus/Main Residency Training site
- ☐ A combination of sites (please explain)
- ☐ Other (please explain)

Explanation and/or Additional Comments

3. Is a Forensic pathologist part of your on-site hospital faculty?

- ☐ Yes
- ☐ No
- ☐ Other

Explanation and/or Additional Comments

4. Are there any pre-requisite requirements before a resident is permitted to do a Forensic pathology rotation?

- ☐ Yes (please explain)
- ☐ No (please explain)

Explanations and/or Additional Comments

5. Do you currently have a defined curriculum for your Forensic pathology rotation?

- ☐ Yes (Would you be willing to share it?
Please email to aspencer3@hmc.psu.edu)
- ☐ No

Explanations and/or Additional Comments

6. Do you have defined Forensic pathology lectures as part of your curriculum?

- ☐ Yes (Who gives the lectures?)
- ☐ No
- ☐ Other

Explanations and/or Additional Comments

7. How many autopsies (out of the required 50) do you permit you residents to claim for American Board of Pathology purposes?

8. How are the residents evaluated for their Forensic Pathology rotation?

9. Average total number (per year) of AP/CP or AP only residents in your residency program?

10. In the past 5 years, how many of your residents have gone into a Forensic pathology fellowship?

11. Do you have a Forensic pathology fellowship in your program/department, within our city/county, or in the immediate geographic area?

- ☐ Yes (Please explain location in detail)
- ☐ No

Explanations and/or Additional Comments

12. In general, outside of those who go into Forensic pathology fellowship, do your residents express interest in doing Forensic pathology research, quality improvement projects, other scholarly activity, and/or attending national forensic conferences?

- ☐ Yes
- ☐ No

13. May we contact you if we have additional questions or need clarifications?

- ☐ Yes
- ☐ No

Best way to contact you:

14. Thank you for completing this survey. All individual responses will remain confidential. If you would like a summary of the survey data please provide your email address.

Declaration of Conflicting Interests

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