


Pathology Residency Program Special Expertise Tracks Meet the Needs of an Evolving Field

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Abstract

Pathologists who enter the workforce must have a diverse skill set beyond that of clinical diagnostics alone. Anticipating this need, the Johns Hopkins Pathology Residency Program developed Special Expertise Tracks to enhance training in relevant subspecialty domains. Using a combination of discussions and surveys, we assessed: (1) our current resident curriculum; (2) perceived curricular strengths and needs; (3) resident career preferences and ultimate career paths; (4) perceived barriers to implementing an advanced elective curriculum; and (5) available departmental/institutional resources. Additionally, we utilized the Accreditation Council for Graduate Medical Education Pathology Milestones as a curricular guide. Six professional residency training Special Expertise Tracks were established: Education, Physician-Scientist Research, Informatics, Quality Improvement/Quality Assurance/Value-Based Care, Health Policy/Hospital Management and Global Health. After implementation in 2017, the Education track has had 4 residents complete the curriculum successfully; the Physician-Scientist Research track has had 2 residents and the Informatics and Global Health tracks have each had one resident successfully complete their respective curricula. Currently, 5 residents are pursuing the Education track, one is pursuing the Physician-Scientist Research track, one is pursuing the Informatics track, and 2 residents are pursuing the Global Health track. Five residents have completed long-term projects including developing several e-learning modules, an online free digital cytopathology atlas, peer-reviewed articles, book chapters, and books. The Johns Hopkins Pathology Resident Special Expertise Track program provides pathology residents an opportunity to gain meaningful experience and additional skills tailored to their individual career interests.

Keywords

pathology residency, special expertise tracks, elective

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Introduction

The expanding scope of pathology practice poses a significant challenge for the next generation of pathologists entering the workforce. The role of a pathologist is rapidly evolving beyond that of diagnostician and scientist; pathologists are expected to be educators, policy advisors, consultants and quality improvement (QI) leaders, as well as stakeholders in informatics and

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global and community health.¹ New pathology residency and fellowship graduates may be expected to share nondiagnostic responsibilities in areas in which they did not receive substantial training during their residency.¹ Thus, graduate medical education in pathology is evolving to include curricula that adequately prepare residents to fulfill a broad spectrum of non-traditional demands.²

These challenges are not unique to pathology training. Other medical specialties, including Emergency Medicine (EM) and radiology, are similarly facing increasing complexities in their respective practices.³⁻⁵ To create a more comprehensive training experience to meet new workplace demands, radiology programs at Johns Hopkins University School of Medicine⁶ and Emory School of Medicine⁵ have implemented longitudinal Special Expertise Tracks (SETs) to extend the traditional core curricula. These special training tracks are standardized, providing residents with long-term professional development.⁶ In addition to the increasing number of published examples of dedicated curricula to enhance training in the aforementioned areas,⁷⁻¹⁰ the Accredited Council for Graduate Medical Education (ACGME) has adjusted the pathology residency training milestones to emphasize some nondiagnostic areas such as patient safety, compliance, quality, and informatics.¹¹

The Johns Hopkins Department of Pathology established one of the first formal pathology residency programs in the United States, welcoming its first trainees in 1899.¹² For more than 120 years, the Department has focused on excellence in 2 primary domains: clinical diagnosis and research.^{12,13} Historically, this has afforded ample experience to meet the demands of new pathology graduates. The Department has also been committed to helping residents meet the ACGME Milestones, which include training in nondiagnostic domains, and has identified additional opportunities for curricular enhancement to ensure that graduates of the program continue to enter the pathology workforce with diverse and relevant skillsets.¹ Herein, we describe the design and successful implementation of a series of formal advanced electives with the overall goal of providing additional opportunities for residents to attain competency in a nondiagnostic skillset relevant to the modern practice of pathology.

Materials and Methods

Modifying the “Six Steps” approach to creating a medical education curriculum pioneered by Kern et al,¹⁴ we assessed our learners’ needs and established our goals, objectives, and educational strategies.

Multiple parameters were evaluated to determine the anticipated needs for pathology residents. Data on long-term career outcomes had previously been published following a longitudinal analysis of the Johns Hopkins Pathology Residency Program.¹² This was supplemented by feedback from residents on current career preferences. The ACGME Pathology Milestones¹¹ and pathology Entrustable Professional Activities (EPAs)² were evaluated against the current resident curriculum. Perceived strengths of the curriculum along with

opportunities for enhancement were then identified through informal resident discussion groups. To assess the perceived barriers to implementing an elective, nondiagnostic skills curriculum, input was obtained from the departmental leadership and key faculty stakeholders, including the Department Director, Residency Program Director, subspecialty Division Directors, Deputy Director of Education, and faculty on the Johns Hopkins Department of Pathology Education Advisory Committee (EAC). Existing departmental and institutional resources were identified, including faculty, personnel, facilities, equipment, and funding.

Results

The Residents

The Johns Hopkins Pathology Residency Program is not only one of the oldest but is one of the largest pathology programs in the nation.^{12,15} Currently, there are 35 residents (5 fourth years, 8 third years, 12 second years, 9 first years), the majority of whom are pursuing Anatomic Pathology/Clinical Pathology (AP/CP) board certification (AP/CP = 24 residents; AP/Neuropathology = 2 resident; AP only = 7 residents; CP only = 2 residents). On average, the program has 35 residents, and residents are allowed to step out of the program for research years. The average class size for the last 5 years has been 9 residents.

From 1899 to 2020, a total of 611 residents have completed pathology residency training at Johns Hopkins, hailing from over 133 different medical schools across 23 countries. At the time of writing, alumni of the Johns Hopkins University School of Medicine have comprised 140 (23%) of the total 611 pathology residents (12, unpublished data). Long-term career paths are diverse. Caturegli et al noted that half of all the residents graduating from Johns Hopkins pursue a career in private practice and a third enter academic practice.¹²

Residents’ Perceived Curricular Strengths and Needs

Resident and faculty discussion groups helped us to assess the perceived strengths and needs of the resident curriculum. Resident discussion groups were held at the beginning of weekly resident CP rounds. Chief residents also met separately with the Department Chair. Combined resident and faculty discussion groups were held during preexisting quarterly Department of Pathology EAC meetings, attended by approximately 6 to 10 residents with a specific interest in the Education SET.

In general, residents expressed satisfaction with the level and rigor of their diagnostic training but emphasized the need for additional opportunities to expand training in nondiagnostic areas. Furthermore, while some residents were already engaged in research or other projects, they were interested in supplemental training and mentorship.

Given the expectations in their future careers, and using the ACGME milestones and EPAs as reference, residents, and faculty developed 6 optional advanced curriculum tracks:

Education, Physician-Scientist Research, Informatics, QI/Quality Assurance (QA)/Value-based Care, and Health Policy/Management and Global Health.

Residents advocated for the creation of standards for each of the tracks, with well-defined objectives and sufficient flexibility to integrate their existing clinical and educational duties with the extracurricular track. Likewise, they requested the ability to individualize curricula, given the diversity of resident skill sets, backgrounds, and interests. Finally, they expressed their desire for faculty mentorship, as well as opportunities to engage and network with top leaders in the field.

Barriers to Curriculum Implementation

The perceived barriers to implementing the curriculum identified by the faculty and residents included limited resident free time within the existing core curriculum and clinical services and challenges surrounding faculty engagement and support. By understanding the concerns of both residents and faculty, the perceived barriers were anticipated and addressed, as discussed below.

Institutional and Departmental Resources

In order to attain our goal, the following resources were deemed necessary:

- 1) *Faculty*: Subspecialty faculty volunteered to participate, including faculty in surgical pathology, hemato-pathology, transfusion medicine, autopsy, clinical lab management, informatics, and clinical chemistry. Faculty in the Department are supported with protected time away from clinical work, which includes time for research, teaching, administrative roles, and mentoring residents.¹⁶ The amount of protected time depends on the faculty member and ranges from 50% to 80%. Institutional funds for faculty working with residents were available through grants from the Johns Hopkins University School of Medicine's Institute for Excellence in Education (IEE). Additional support for faculty, including formal short and longitudinal faculty development courses, were available through the Johns Hopkins School of Medicine Office of Faculty Development (OFD) and IEE, as well as from the Department's EAC.
- 2) *Equipment and Resources*: Residents had the use of departmental equipment, including a dedicated laptop computer with iSpring Suite 9, a computer software program that interfaces with Microsoft PowerPoint to create curriculum and learning modules. These educational resources were secured through an internal trainee grant award. The departmental digital scanning services and Johns Hopkins Department of Pathology Web Team services were also available for trainee use for unfunded educational projects.
- 3) *Funding*: The Department has a number of endowed funds that specifically support resident projects. For

example, the Fred and Janet Sanfilippo Endowment supports resident research projects and the Risa B. Mann and the Mabel Smith Endowments support resident research and education. Travel awards are also available. Trainee awareness of these internal departmental endowments was increased through discussion at EAC meetings.¹⁷

Johns Hopkins Department of Pathology Special Expertise Track Curricula

Together with resident leaders, assigned faculty directors were charged with developing a focused elective curriculum with defined learning goals and objectives, core educational content, and expectations. An overview of the SETs, along with their individual goals, objectives, and educational strategies are presented to residents early in the residency. Residents typically self-select the track(s) during the first or second year. Participation is voluntary, and within each track, residents select, and/or design project(s) under the mentorship of faculty advisors.

All SETs are longitudinal, with formalized expectation for successful completion. Likewise, they are appropriately flexible to accommodate and avoid interference with core residency rotation service-work and learning. After successful completion, graduating residents receive a certificate of completion and special recognition at the program-wide annual graduation ceremony.

Education track. All Johns Hopkins pathology residents are expected to teach fellow trainees and medical students formally and informally throughout their entire training program. The goals for the education curriculum are to provide the next generation of academic pathologists with opportunities to be consumers and producers of education scholarship and to develop the practical skills necessary to become master educators.

Formalized objectives necessary to fulfill these goals require that residents: (1) develop practical teaching skills, (2) create curriculum, (3) display leadership skills, and (4) demonstrate scholarship. The educational strategies to accomplish these goals include:

- 1) To fulfill the practical teaching skill set objective, each resident is asked to create one education-focused presentation per year using one of the resident venues, including grand rounds, resident lectures, or call rounds.
- 2) To fulfill curriculum-creating skills, each resident is asked to participate in one of the numerous offered online or in-person classes on curriculum development and to complete one education initiative, including creation of an educational product, such as an iPad App, a book chapter, an online educational resource, teaching file or e-learning module, or any other residency

curriculum improvement initiative subject to approval by the resident's faculty mentor(s).

- 3) To fulfill the leadership development requirement, the resident is asked to complete one year of service on an educational committee and to participate in advisory meetings with mentors.
- 4) Although not required, all residents are encouraged to submit their work for publication or presentation at national events and meetings.

Physician-Scientist Research Track. The Johns Hopkins Department of Pathology has had a long-standing focus on research, and renowned success recruiting and developing physician-scientists. The department ranks first among all academic pathology departments in annual National Institutes of Health (NIH) grant support.¹³ The Physician-Scientist Track certification, meeting criteria established by the American Board of Pathology for the Physician-Scientist Research Pathway, is highly encouraged in the residency program, in keeping with our tradition of research excellence.

The educational objectives for residents undertaking this curriculum are to gain expertise in a particular research field, identify future directions for their scientific career, and to be prepared for a career as a physician-scientist. The educational strategies to accomplish these goals include asking residents:

- 1) To complete a dedicated year of research as part of the Department's National Cancer Institute T32 training program, "Opportunities for Pathology Trainees in Cancer Research" or a similar program. This T32 can support 1 to 3 years of research training in the field of cancer biology, during which time the resident develops a mentored research project, and presents their work periodically to a mentoring committee.
- 2) To write a grant proposal for one of the endowments available through the Department, a K08 application, or similar career development award application.
- 3) To participate in program activities for the T32 curriculum, including parts of the "Academic Career Development Seminar" series, a bimonthly presentation on topics such as types of research funding mechanisms, peer review, and research laboratory management.
- 4) To complete the Responsible Conduct of Research (RCR) Courses, which includes REWARDS (Research Ethics Workshops about Responsibilities and Duties of Scientists) training. REWARDS is an institution-wide, in-person workshop provided to meet requirements for the RCR, as defined by the NIH.
- 5) To present their research at one national/international conference (either a platform or poster) and participate in the Department's annual Young Investigator's Day.

Informatics track. Recently, Johns Hopkins and other pathology residency programs have branched into the field of informatics.

The Association of Pathology Chairs, the Association for Pathology Informatics, and the College of American Pathologists (CAP) have all recognized the need for a resource guide to help training programs and residents meet ACGME informatics milestone requirements. The Pathology Informatics Essentials for Residents (PIER) was created to fill this need and presents topics and resources for residency programs to provide basic skill sets.^{18,19}

The Johns Hopkins pathology program Informatics track supports the PIER program, and the objectives of the Informatics track are identical to those of PIER.

Quality Assurance/Quality Improvement/value-based track. The goals and objectives for students participating in the QA/QI/Value-Based curricula include (1) providing foundational knowledge of quality concepts, techniques, and tools that may be applied to pathology as a field; (2) empowering residents to observe systemic processes in day-to-day work and to suggest action to improve them, and (3) training residents to become future leaders in QI/control in university and private practice settings. The educational strategies to accomplish these goals include:

- 1) To complete didactic work, namely readings and online learning modules.
- 2) To complete at least one Armstrong Institute for Patient Safety and Quality seminar or attend one quality-related short course at the CAP or United States and Canadian Academy of Pathology national meetings.
- 3) To serve a total of 24 months as a visitor to a committee and to serve as an inspector on at least one internal CAP self-inspection or on at least one external CAP inspection of another institution.
- 4) To initiate or participate in at least 2 QA/QI/value-based care projects with at least one submitted for publication or to develop and deliver one quality or patient safety-related lecture for residents.
- 5) To participate in a root cause analysis: formally document an adverse outcome, detail the origin of the issue, discuss the QI principles used to address it, and review the results of the actions taken.

Health policy track. The objectives for the health policy and management curriculum include (1) providing the next generation of academic pathologists with the knowledge and skills to provide leadership in the area of health care policy; (2) providing opportunities for residents to participate in business activities of a pathology department; and (3) providing residents an understanding of what is needed to operate a pathology department or business unit while laying the groundwork for them to innovate practice as leaders in the field. As part of the curriculum, residents are asked:

- 1) To read and discuss 4 articles per year from the journal *Harvard Business Review*: Health care, as well as one other required reading assignment.
- 2) To participate in the Carey Business School “Leading Health Care Organizations” or “Legal Foundations of Health Care” courses or to participate in the Bloomberg School of Public Health “Introduction to the U.S. Healthcare System” or “Quality of Medical Care” courses.
- 3) To participate in the Department of Pathology Leadership & Management Lecture Series, a management curriculum for residents developed and delivered by the Department of Pathology administrative leadership.
- 4) To attend either the Departmental Finance Committee or departmental leadership meetings (eg, Core Lab meeting with supervisors) regularly for 24 months and to work with the administration on a business improvement project.

Global health track. The Global Health track is intended to provide interested residents and fellows exposure to the challenges pertaining to pathology and laboratory medicine in low-resource settings. Despite being central to surveillance and clinical management, pathology is underresourced in low- and middle-income countries (LMICs).²⁰⁻²² This track offers a myriad of opportunities for global health outreach and combines formal and informal teaching with a capstone project to impart both theoretical knowledge and practical experience in global health. Residents are asked:

- 1) To select a faculty mentor who will facilitate placement in a project that best aligns with the candidate’s expertise, interests, and skill sets.
- 2) To complete a final capstone project or a product intended to transform theory into real-world experience. Early in the track, the resident is expected to submit a project proposal, which will be vetted by a panel of advisors. Although travel is not required, it is strongly encouraged, for any fieldwork component of the project.
- 3) To author a manuscript on a global health topic for peer-reviewed publication. For original research, residents are encouraged to define their own project if embedded in a larger study.

Some of the global health focus areas include communicable and noncommunicable diseases, technology and innovation, policy and/or health economics, as well as pathology and laboratory medicine in the developing world, education, and clinical outreach. Examples of capstone “products” include telepathology program with an LMIC, proficiency testing panels for LMIC, subspecialty pathology course for residents in LMICs, policy papers (eg, disease screening), clinical/diagnostic guidelines for deployment in low-resource setting, and others.

Table 1. Residents Completing Special Expertise Tracks for the Last 2 Years and the Number of Residents Currently Participating in Tracks.

Special Expertise Tracks	2018-2019	2019-2020	2020-2021 (Current)
Education	1	3	5
Research	1	1	1
Informatics	1	0	1
QA/QI/value based	0	0	0
Health policy	0	0	0
Global health	1	0	2

Abbreviation: QA/QI, quality assurance/quality improvement.

Table 2. Number of Completed Resident Projects/Products to Date for Residents in All Special Expertise Tracks.

Resident Projects/Products (2017-Current)	Number (Reference)
Educational case report	1 (24)
Original report	2 (25, 26)
Book chapters	3 (27, 28, 29)
Books	3 (30, 31, 32)
Digital atlas	1 (23)
Online educational modules	4
Other educational media	1

Initial Outcomes

Although formal objective outcome measurement is premature at this initial stage of implementation, there have been early successes. After implementation in 2017, the Education track has had 4 graduating residents successfully complete the curricular objectives; the Physician-Scientist Research track has had 2 graduating residents and Informatics and Global Health tracks have each had one graduating resident successfully complete their respective curricula. Currently, 5 residents ranging from PGY1 to PGY4 are participating in the Education track, 2 residents are pursuing the Global Health track, 1 is pursuing the Physician-Scientist Research track, and 1 is pursuing the Informatics track (Table 1).

Five residents have completed long-term initiatives and capstone projects. Residents in the Education track completed several projects: interactive online educational modules, a free online digital cytopathology atlas,²³ an academic paper aimed at medical students,²⁴ peer-reviewed journal articles,^{25,26} book chapters,²⁷⁻²⁹ and books³⁰⁻³² (Table 2). Currently, 3 alumni of the Education track have accepted a position in academic hospitals.

Discussion

Herein, we describe our experience in designing and implementing 6 dedicated SETs, including Education, Physician-Scientist Research, Informatics, QA/QI/Value-Based, Health Policy, and Global Health. We aim for our experience to serve as a successful example of how a pathology resident’s training experience can be enhanced

Table 3. The Most Common Recommendations for Effective Elective Resident Tracks, as Determined by Review of the Literature.³⁻⁶

Recommendations for effective elective residency tracks

1. Establish clear goals and objectives
2. Refine tracks on a regular basis
3. Match tracks/topics with faculty expertise (bring in outside expertise, if necessary)
4. Protect time for faculty and residents
5. Provide adequate funding
6. Provide adequate mentorship
7. Provide resident recognition

through meaningful exposure to nondiagnostic skill sets that extend beyond current core residency competencies as defined by the ACGME Pathology Milestones and the CAP EPAs.^{2,11} In our experience, pathology residents were already completed projects and/or research in nondiagnostic areas of practice, and we found that the SETs achieved a secondary goal of legitimizing residents' efforts with tangible projects and skills that can be applied in their future careers, without the need for additional postgraduate training.

Although relatively new to pathology, elective training tracks are becoming more widely utilized in other medical specialties.^{3-6,33} Notably, Jordan et al found that 21% of EM residency programs have implemented scholarly tracks or "selectives," which typically broadly mirror available fellowships in EM.³ The Council of Emergency Medicine Residency Directors recently reported on the implementation and early outcomes of EM residency program scholarly tracks or "academic colleges."⁴ The authors note that the most important outcomes of implementing tracks are the benefits to the trainees. Residents are exposed to the process of developing a niche. Although this focus usually occurs during fellowship or as a junior faculty, it can start earlier, if infrastructure and mentorship are provided. Secondly, the residents who participate may develop a diverse skill set and therefore be more competitive for future postgraduate training or faculty appointment. Finally, exposure to tracks may increase the likelihood a resident chooses an academic career path.⁴ These collective studies suggest that residents who participate in tracks ultimately benefit from greater foundational knowledge, as well as deliverable/publishable products giving them a competitive edge for future employment. Likewise, residents can explore additional fields without committing to additional training and can make informed decisions about career choices. Beyond the residents' personal gain, less tangible benefits include an increase in the national reputation of the institution, contribution to faculty development/advancement through mentorship, and the development of a collaborative community.

This training model has also been applied to radiology, which shares many features with pathology. The Emory Radiology Residency Program has developed and described an Integrated Imaging Informatics Track for residents which requires a capstone project and an academic deliverable. Residents accepted

into the track are provided with protected time (one day per month), faculty mentorship, peer support, and accountability.⁵ Similarly, the Johns Hopkins Radiology Residency Program has implemented 5 nondiagnostic longitudinal training tracks, including Clinician Education, QI, Entrepreneurship/Innovation, Health Policy Advocacy, and High-Value Care.⁶ Residents volunteer to participate in their first or second year of residency. Each track has its own requirements and curricula, which incorporates 1 to 2 weeks of professional development fellowship provided by the American College of Radiology.⁶

Barriers to broader widespread use of these training tracks described in the literature include limited resources and/or funding, lack of proof of efficacy of these novel programs, or lack of familiarity with this educational pedagogy.³ Regan et al found that while implementing special tracks in EM was successful in increasing resident scholarly productivity, it did not provide unique insight into the residents' capabilities, nor was there a perception that the additional training provided any specific long-term benefit to the resident.⁴ Concerns about the added time burden were addressed by the use of collective conference time, eliminating dedicated blocks that were formerly used for electives or research, creating a longitudinal experience, and/or reducing a resident's clinical load.⁴ Nonetheless, despite these barriers and possible limitations, specialized tracks allow residents to focus nondiagnostic efforts into a single area of expertise or niche under the expertise of a subspecialty mentor to maximize a resident's interests and/or skills early in their career.

Overall, in review of the literature, we found the most common recommendations for effective selective tracks to be an invaluable framework for our curriculum design and implementation (Table 3). However, despite successes with implementation, we found some of the aforementioned recommended strategies more difficult to implement, such as providing at least one day of protected time per month. Although senior residents in our program have protected elective time, opportunities to identify protected time for junior residents will be considered to encourage more consistent project development. In addition to providing adequate protected time, increasing the recognition of resident efforts and success with SETs is equally as important. Residents who have successfully completed an SET are presented with a certificate of completion at the annual end-of-year Pathology Department awards ceremony. They also have the opportunity to formally present their research to faculty and peers at the annual Pathology Young Investigator's Day, where they are eligible to win awards based on their work. We will continue to look for new ways to recognize and publicize resident achievements, including encouraging residents to present their efforts at national conferences.

The SET program is still in infancy, and we are still assessing long-term data on program interest, as well as any potential impacts on fellowships, future faculty appointments, and career trajectories. Thus far, the interest in the SETs has been variable. Most SETs have gained in popularity, or "perceived value" among residents, with more residents in PGY1 to 3

participating in this current academic year than in the years past. Overall, the Education SET has generated the greatest interest, while the policy track enrolled its first resident in 2020 and the QA/QI SET has had limited resident interest in completing all requirements as of July, 2021. In addition to long-term follow-up on overall interest in and perceived resident needs for SETs, further follow-up discussion is necessary to clarify whether the baseline QA/QI ACGME resident requirements (11) have impacted resident interest in this SET. Additionally, it is unclear at this time how SETs affect overall long-term career choice. Scholarly productivity has had a positive impact on initial faculty appointments, with residents having the benefit of beginning a career in academics with an emerging niche relevant for a specific scholarly focus. Long-term outcomes data will also be assessed for any specific impact on overall career trajectory.

We acknowledge that the successful implementation of our SETs was, in part, due to the availability of faculty, internal education-focused resources, and trainee funding opportunities, and the lack thereof would have presented a significant barrier to implementation. However, funding for GME education initiatives is becoming more broadly available and could support the development of SETs in the absence of significant internal resources. Additionally, the creative utilization of various internal resources (ie, laboratory professionals, hospital administrators, colleagues in other medical specialties, courses through affiliate graduate programs, etc) and external resources (ie, online learning modules, published curricula, national conferences, courses through external graduate programs, etc) can also assist with the development and implementation of similarly robust and individualized SETs.

As we move forward, we look to find ways to improve residents' experiences in the Tracks. In the future, we hope to encourage additional faculty to work with residents on capstone projects. Resident time is a limited commodity, and we will continue to consider innovative and time-efficient ways to offer courses and opportunities to residents, including online courses, such as those offered through the Johns Hopkins OFD. Although most of our data have been compiled through interviews and discussion groups, formal long-term objective data will be obtained through surveys, both at the enrollment of a track and at graduation/completion, to improve our understanding of the efficacy and impact of these curricular enhancements.

Conclusions

The Johns Hopkins Pathology Department Resident SET program provides pathology residents an opportunity to gain meaningful experience in professional skills that are rapidly becoming core elements of the practice of pathology. This program is flexible and allows for various interests, backgrounds, and schedules and provides longitudinal curricula, each with clear objectives and strategies. Successful implementation requires not only resident but also faculty and leadership support, as well as broader resources such as funding and

additional training to ensure a well rounded and robust scholarly nondiagnostic experience.

Regardless of the career paths of our residents, the Johns Hopkins Pathology Residency Program is committed to investing in our residents' futures and is excited to empower the next generation of pathologists with the skills necessary to innovate and lead.

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