



Original Contribution

Current state of Grand Rounds in U.S. pathology training programs

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ABSTRACT

Grand Rounds are held with variable frequency in many academic pathology departments, but their exact goal is uncertain, and the type of subjects covered, and presenters have not been studied. We aimed to gather information about the current state of pathology grand rounds (PGR). We identified all US pathology residency programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) and searched their websites for information regarding PGR, extracting data on their existence, frequency and timing. For a representative subgroup of institutions from all US regions and program sizes, we tabulated the 2017–2018 PGR titles and presenters (gender, degree(s), resident/fellow, faculty academic rank). We found that 71 of 142 (50%) ACGME-accredited programs had PGR, more often in programs with > 12 residents (53/88, 60%). PGR were scheduled most commonly weekly, on Thursdays, and at noon. We analyzed 1019 PGR presentations from 41 institutions located in 26 US states. Among the 1105 presenters, 183 (16.56%) were trainees, 74 (6.7%) were non-academic, and 848 (76.7%) were faculty, 559 male and 289 female (M/F = 1.93). M/F ratio increased with academic rank, from 1.0 (117/115) for assistant, to 2.0 (135/68) for associate, and 2.9 (307/106) for full professors. Topics covered by PGR belonged to anatomic pathology (357), clinical pathology (209), research (184) or other medical or surgical specialties (149). Our study suggests that trainees are a major intended audience of pathology grand round. Unfortunately, there is a gender gap among pathology grand round presenters that widens with increasing academic rank of presenters.

1. Introduction

Grand Rounds (GR) are held with variable frequency in many academic pathology departments and are one of the most important departmental conferences to provide education for their trainees and Continuing Medical Education (CME) for its faculty. Along with tumor boards, and morbidity and mortality (M&M) conferences, GR are considered “regularly scheduled series” [1]. A number of publications have assessed the status of GR in various specialties, such as internal medicine [2,3], surgery [4], dermatology [5,6], neurology [7], radiology [8,9], pediatrics [10,11], orthopedics [12], family medicine [13], ophthalmology [14], psychiatry [15,16] and obstetrics and gynecology [17]. However, to date, very little is known about pathology grand rounds (PGR). In fact, with the exception of a recently published paper suggesting expanding their “subject universe” [18], we couldn't find any publication about PGR. Grand Rounds activities are usually planned by departmental committees that may conduct needs assessments to determine the most effective use of this activity for their

departments [19]. However, discussions among members of our department's PGR planning committee and with our department's faculty and residents made us realize that our notions of PGR differ widely. Such differences in opinion, which were most likely influenced by our previous experiences, were most obvious in discussions concerning issues such as the frequency of PGR, their subject matter, and the proportion of invited guest speakers from other departments and other institutions. These discussions also highlighted the uncertainty of pathologists and pathology trainees about the value, scope, whether the intended audience is the trainees or the faculty, and current role of this time-honored activity. In the absence of published evidence on how this activity is conducted in other pathology departments, PGR committees have to rely on local tradition and anecdotal evidence, or on information provided by studies performed in different specialties, which may not be easily applicable to pathology. The aim of this observational study was to gather information about the current state of GR in academic pathology departments, especially regarding their frequency and timing, presenters, format and subjects. We hope that this information

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could facilitate the planning of PGR and could serve as a baseline for potential future improvements.

2. Materials and methods

The authors identified all ACGME accredited pathology residency programs (PRPs) using the application available at their website [20] and the Fellowship and Residency Electronic Interactive Database (FREIDA™) [21] maintained by the American Medical Association (AMA), in which residency and fellowship programs can be identified by specialty (“Pathology-Anatomic and Clinical”). The names/institutions of the PRPs identified through these searches were entered into a Microsoft Excel spreadsheet file (Microsoft, Redmond, WA). Next to the name of the program, the following information was entered into the spreadsheet: the program’s location (city and state), its categorization as “University Program”, “Community Program”, “Community/University Program”, “Military Program” or “Other”, the number of residents and fellows that it is accredited for. The program’s reputation rank and percentage of board certified graduates were obtained from the Doximity website [22]. The number of residents and fellows that each of these training programs was identified from the above websites, or, if not available, from the program’s website or other online sources like Pathology Resident Wiki [23]. According to the number of residents accepted annually into the residency program or total number of residents we arbitrarily categorized PRPs into small (≤ 3 residents/yea or ≤ 12 total residents), medium-sized (4–5 residents/year, or 13–23 total residents) and large (≥ 6 residents/year, ≥ 24 residents).

Two authors (IK and SEP) accessed each program’s website and checked the availability of information regarding recurring seminar series/regularly scheduled series designated as Grand Rounds or as Pathology (or Laboratory Medicine and Pathology) Seminar Series. The latter were considered equivalent to PGR, if their presentations included a mix of anatomic and clinical pathology, research and other topics. Seminar series dedicated exclusively to research or presented only by residents (e.g. “Resident Grand Rounds”) were excluded. Separate Google searches for “Pathology Grand Rounds”, “Laboratory Medicine Grand Rounds” and “Pathology and Laboratory Medicine Grand Rounds” were also conducted and any additional institutions having such educational activities were included into the spreadsheet, if they occurred in an institution training pathology residents or fellows.

To overcome potential problems related to the lack of consistency of the content presented on PRP websites, for programs that did not have information about PGR and their schedule, we used a short email questionnaire, in which we explained the purpose of the study and asked them to kindly provide additional information about PGR in their programs. Emails sent during September 2018 specifically asked if the program had PGR and if it did, if they could share with us the 2017–2018 PGR schedule, including presenters and titles of the presentations. PGR schedules obtained through responses to this questionnaire were used to extract data regarding individual PGR in a manner similar to that used to for information obtained from websites.

For each PRP identified, data collected included the mention of ongoing PGRs, their frequency, and on what day(s) of the week and hour of the day they occurred.

Additional data about individual PGR presentations held during the 2017–2018 interval were extracted from departmental websites and/or institutional calendars. Depending on its availability, the data extracted for each PGR included the date of the activity, presenter(s), including their academic degree(s), nonacademic or academic status, academic rank, sex, departmental and institutional affiliation, medical specialty (other than pathology), pathology specialty (AP or CP) and subspecialty, and title of the presentation. The subject domain, type of presentation, i.e. case report, update, review, perspective, overview, historical overview, new classification, etc. was inferred from the title, or when unclear, from the actual archived presentation, if available. The presenter’s specialty/subspecialty, academic degree(s) and academic

rank were obtained from the presenter’s institution’s website; the presenter’s gender was inferred from their name, or, if unclear, from their picture on their departmental webpage. The data were extracted by two of the authors (IK and SEP) independently, with resolution of any potential discrepancies through discussion and review.

To determine if the gender and academic rank distribution of PGR speakers mirrors that of the U.S. academic pathology faculty we compared it with used the data from the Association of American Medical Colleges 2018 U.S. Medical School Faculty [24].

After entering and coding all data, we created contingency tables and made statistical comparisons using the freely available GraphPad online calculators. Continuous data were compared with the *t*-test, while categorical data were compared with the Fisher exact test. Two-sided *p* values were calculated and *p* values < 0.05 were considered significant.

3. Results

a. Grand Rounds in pathology residency programs

To determine the frequency, timing, and correlates of PGR occurring in PRP, we used only the data obtained for the 142 ACGME-accredited pathology residency programs. For this analysis we disregarded the data obtained for institutions training only pathology fellows, but not residents, like large cancer centers. Data from two such institutions (City of Hope Comprehensive Cancer Center, Duarte, CA, and M. D. Anderson Cancer Center, Houston, TX) were used, in addition to data from PGR held at PRP, for the analysis of individual PGR speakers and topics.

Of the 142 ACGME-accredited anatomic and clinical pathology PRPs, 67 mentioned ongoing PGR on their websites. From the remaining 75 institutions that we had contacted by email soliciting additional information, we received 24 answers, representing a response rate of 32%. Four additional institutions informed us of ongoing PGR and shared the latest schedule/calendar of such events. Another 20 institutions confirmed through email that their institutions do not have PGR, and some commented in their emails that the pathology residents regularly attend medical or surgical GR and M&M conferences, as well as institution-wide GR on ethics and other professional issues of general interest, like wellness, resilience and burnout. For the purpose of this study, we have assumed that the remaining 51 institutions that did not respond our email did not have PGR, while 71/142 (50%) PRPs had ongoing PGR.

For 52 of these 71 institutions having PGR scheduling information was available and showed that these conferences were most commonly scheduled weekly, most frequently on Thursdays and at noon (Table 1). We found no PGR scheduled during weekends. PGR had a 3-months summer gap in almost all institutions.

Table 1
Frequency and timing of pathology grand rounds.

Frequency	Weekly	Bi-weekly	Monthly	Quarterly
n	22	14	15	1
%	42.3%	26.9%	28.9%	1.9%

Day of the week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
n	10	5	13	15	9	0
%	19.2%	9.6%	25.0%	28.8%	17.3%	0.0%

Start time	Morning, starting at 8–9 AM	Noon, starting at 12–1 PM	Afternoon, starting at 2–5 PM
n	14	32	6
%	26.9%	61.5%	11.5%

Table 2
Pathology grand round (PGR)s by region, residency program type, and total residents number.

	Institutions	PGR	% PGR
Region			
Northeast	45	26	57.78%
Midwest	32	17	53.13%
Southeast	34	16	47.06%
Southwest	12	5	41.67%
West	17	7	41.18%
SUM	140 ^a	71	
Program type			
University	102	60	58.82%
Community/university	28	8	28.57%
Community	7	3	42.86%
Military and other	5	0	0.00%
SUM	142	71	
Number of residents (total)			
≤ 12	54	18	33.33%
13–23	55	30	54.55%
≥ 24	33	23	69.70%
SUM	142	71	

^a Excluding the PRP at the University of Hawaii and University of Puerto Rico.

With a single exception, in which PGR were scheduled for 1 h 30 min, all PGR were scheduled for an hour. By region, PGR were more common in the U. S. Northeast and Midwest (43/77, 55.8%), than in the Southeast, Southwest and West (28/64, 43.8%), but the difference was not statistically significant ($p = 0.18$). PGR were significantly more common in “University Programs” than in all other type of programs (60/102, 57.78% vs. 11/40, 27.5%, $p = 0.001$) (Table 2).

The 142 PRP included in the study had 8–42 (mean 18.3 ± 8.2) residents. The number of residents was higher in programs that had PGR (8–41, mean 20.8 ± 8.5) than in those that did not have PGR (8–42, mean 15.8 ± 7.2), which was statistically significant ($p < 0.001$). Smaller programs, i.e. programs with 12 or fewer residents, had PGR significantly less commonly than medium sized programs (18/54, 33.33% vs. 30/55, 54.55%, $p = 0.03$) and large programs (18/54, 33.33% vs. 23/33, 69.7%, $p = 0.001$), but the difference between medium-sized programs and large programs was not significant (30/55, 54.55% vs. 23/33, 69.7%, $p = 0.18$).

PRP with Doximity reputation ranks in the upper half of all programs had PGR significantly more frequently than those ranked in the lower half of all programs (48/71, 67.61% vs. 23/71, 32.39%, $p < 0.0001$). According to Doximity, the board certification rates of residents graduating from the 142 PRP included in the study varied from 69% to 100%, with the mean and median value of 93%. We found no significant difference in resident graduation rates between residency programs that had PGR and those that did not (74–94%, mean $92.4 \pm 6.0\%$ vs. 69–100%, mean $91.2 \pm 6.6\%$, $p = 0.21$).

b. Speakers and Topics in pathology Grand Rounds

For the analysis of the presenters and contents of individual PGR presentations, we have analyzed, in addition to the PGR held at 39 ACGME-accredited pathology residency programs, the PGRs held at two major cancer centers that do not have residency programs but train pathology fellows.

Data regarding the presenter(s) were available for 1019 PGR presentations from 41 institutions located in 26 U.S. states, that were geographically representative of the country as a whole (Table 3).

3.1. Grand Rounds presenters

In 933/1019 (91.6%) there was one presenter, while in the

Table 3
Number of pathology grand rounds (PGR) presentations analyzed in detail, by region and institution.

Region	Number of PGR
Northeast	300
1. Yale-New Haven Medical Center, New Haven, CT	22
2. Massachusetts General Hospital, Boston, MA	15
3. Johns Hopkins University, Baltimore, MD	69
4. Dartmouth-Hitchcock, Lebanon, NH	9
5. Rutgers Robert Wood Johnson Medical School, New Brunswick, NJ	5
6. New York University School of Medicine, New York, NY	10
7. Stony Brook Medicine/University Hospital, Stony Brook, NY	29
8. University of Rochester, Rochester, NY	39
9. New York Presbyterian Hospital (Cornell Campus), New York, NY	31
10. University of Pennsylvania Health System, Philadelphia, PA	10
11. UPMC Medical Education, Pittsburgh, PA	53
12. University of Vermont Medical Center, Burlington, VT	8
Midwest	274
1. University of Iowa Hospitals and Clinics, Iowa City, IA	13
2. Loyola University Medical Center, Maywood, IL	19
3. McGaw Medical Center of Northwestern University, Chicago, IL	6
4. University of Illinois College of Medicine at Chicago, Chicago, IL	9
5. University of Kansas School of Medicine, Kansas City, KS	8
6. Mayo Clinic College of Medicine and Science, Rochester, MN	18
7. University of Minnesota, Minneapolis, MN	83
8. St Louis University School of Medicine, St Louis, MO	35
9. University of Nebraska Medical Center College of Medicine, Omaha, NE	19
10. Medical College of Wisconsin Affiliated Hospitals, Milwaukee, WI	60
11. University of Wisconsin Hospitals and Clinics, Madison, WI	4
Southeast	173
1. University of Alabama Medical Center, Birmingham, AL	31
2. University of Florida College of Medicine, Jacksonville, FL	39
3. Medical College of Georgia, Augusta, GA	3
4. Tulane University, New Orleans, LA	34
5. Duke University Hospital, Durham, NC	9
6. University of North Carolina Hospitals, Chapel Hill, NC	17
7. Virginia Commonwealth University Health System, Richmond, VA	40
Southwest	113
1. University of New Mexico School of Medicine, Albuquerque, NM	9
2. University of Texas M D Anderson Cancer Center Program, Houston, TX	53
3. Methodist Hospital, Houston, TX	10
4. University of Texas Southwestern Medical Center, Dallas, TX	41
West	159
1. City of Hope Comprehensive Cancer Center, Duarte, CA	21
2. Los Angeles County-Harbor-UCLA Medical Center, Torrance, CA	33
3. Stanford Health Care, Stanford CA	10
4. University of California Davis Health, Sacramento, CA	37
5. UCLA David Geffen School of Medicine, Los Angeles, CA	7
6. University of Colorado, Aurora, CO	25
7. University of Washington, Seattle, WA	26

remaining 8.4% there were 2 presenters, for a total of 1105 presenters. 74 presenters were not from academic institutions, including presenters working in commercial laboratories, community hospitals or private pathology practices, pharmaceutical firms, law firms, or governmental agencies.

Among the presenters there were 183 trainees (16.56%), 100 pathology residents and 83 fellows from various subspecialties. Of the 41 institutions analyzed in detail, 19 (46.3%) had at least 1 PGR presented by trainees, while 22 (53.7%) did not. Residents and fellows were the

Table 4
Distribution by gender and academic rank of pathology grand round (PGR) speakers compared to US pathology faculty.

	Pathology grand rounds speakers					U.S. academic pathologists ^a					PGR speaker vs all US academic pathologists
	Total	F	M	M/F	F%	Total	F	M	M/F	F%	
Resident	100	49	51	1.04	49.00%						
Fellow	83	41	42	1.02	49.40%						
Assistant Professor	232	115	117	1.02	49.57%	1704	872	832	0.95	51.17%	p = 0.67
Associate Professor	203	68	135	1.99	33.50%	1067	468	599	1.28	43.86%	p = 0.007
Professor	413	106	307	2.9	25.67%	1420	415	1005	2.42	29.23%	p = 0.17
Total academic faculty	848	289	559	1.93	34.08%	4191	1755	2436	1.43	41.14%	p < 0.0001
Nonacademic	74	26	48	1.85	35.14%						
Total speakers	1105	405	700	1.73	36.65%						
Intramural speakers	625	262	363	1.39	41.92%						
Extramural speakers (academic and nonacademic)	480	143	337	2.36	29.79%						
Total speakers	1105	405	700	1.73	36.65%						

^a Data from the Association of American Medical Colleges 2018 U. S. medical school faculty survey.

presenters of 183/1105 (16.5%) PGR presentations, but this varied widely among institutions (range 0–75%).

The highest degrees of PGR presenters were MD, DO or equivalent (538), MD/PhD (228) or PhD (219). The remaining presenters had other degrees (JD, MBA, etc.). There were also 74 presenters not affiliated with academic institutions. The remaining 922 presenters were faculty members in various departments and academic institutions. Among these, there were 559 male and 289 female faculty members, resulting in a male to female (M/F) presenter ratio of 1.93. According to their academic rank, 413/848 (48.70%) were full professors, 203/848(23.94%) associate professors, and 232/848(27.36%) assistant professors. When analyzed by trainee versus faculty status and academic rank, the male to female (M/F) presenter ratio increased from 1/1 for residents, fellows, and assistant professors, to 2/1 for associate professors and 2.9/1 for full professors. The data regarding the gender and rank of the PGR speakers was compared to data regarding the gender and rank of all U.S. academic pathologists, provided by the American Association of Medical Colleges U.S. Medical School Faculty 2018 survey (Table 4). These data show that in academic pathology, like in most academic medical specialties, women are increasingly underrepresented with increasing academic rank. However, female PGR speakers are underrepresented even in comparison to these national data on the gender and rank of academic pathologists (289/848, 34.1%, [95% CI 31.0–37.3%] vs. 1659/4033, 41.4% [95% CI 39.6–42.7%], p < 0.0001). This underrepresentation in relation to the proportion of women in academic pathology faculty ranks appears to be mostly due to the marked underrepresentation of women at the associate professor rank (68/203, 33.50% vs. 468/1067, 43.86%, p = 0.007).

Extramural (visiting) speakers were also more likely to be men (M/F ratio of 2.36) and the gender difference was statistically significantly greater than that found for intramural speakers (143/480, 29.79% vs. 262/625, 41.92%, p < 0.0001) (see Table 5).

The majority of PGR speakers were from pathology departments or were pathologists practicing in nonacademic institutions, governmental or private practice settings (n = 686); another large category of PGR presenters were members of basic sciences departments (Anatomy, Biochemistry, Microbiology, Molecular/Cell Biology, Pharmacology, Physiology and other basic sciences) or were researchers in basic science laboratories (Table 5). The proportion of extramural (visiting) PGR speakers was similar for pathologists (323/686, 47.1%) and basic scientists (137/299, 45.8%), but was slightly lower for speakers from clinical departments (323/686, 47.1% vs. 47/125, 37.6%, p = 0.05) A total of 421 PGR were delivered by invited academic speakers from 108 academic institutions, each contributing 1–30 invited PGR speakers (mean 9, median 4). Table 6 shows the institutions that contributed most invited PGR speakers.

Table 5
Pathology grand rounds (PGR) speakers by specialty.

	Intramural	Extramural (visiting)	Total
Pathology ^a	363	323	686
Basic Sciences ^b	162	137	299
Clinical Departments (total)	78	47	125
Medicine	30	21	51
Surgery	7	4	11
Pediatrics	8	7	15
Ob-Gyn	5	4	9
Dermatology	4	2	6
Neurosurgery	2	3	5
Radiology	5	0	5
Psychiatry	5	0	5
Anesthesiology	4	1	5
Radiation Oncology	1	3	4
Ophthalmology	3	0	3
Otolaryngology, Head & Neck Surgery	2	1	3
Urology	2	1	3
Total PGR speakers	603	507	1110

^a Including pathologists not affiliated with an academic institution.

^b Including presenters not affiliated with an academic institution.

Table 6
Pathology grand rounds (PGR) invited speakers' institutions: the institutions with most invited PGR presenters.

	Number
Academic institutions	
Brigham & Women's Hospital, Boston, MA	30
John Hopkins Hospital, Baltimore, MD	17
Mayo Clinic, Rochester, MN	17
Massachusetts General Hospital, Boston, MA	14
University of Pennsylvania Perelman School of Medicine, Philadelphia, PA	13
University of Wisconsin, Madison WI	13
Washington University School of Medicine, St. Louis, MO	13
Yale School of Medicine, New Haven, CT	12
Ohio State University, Columbus, OH	11
University of Michigan, Ann Arbor, MI	10
Cancer centers	
MD Anderson Cancer Center, Houston, TX	13
Memorial Sloan Kettering Cancer Center, New York, NY	10
Dana-Farber Cancer Institute, Boston, MA	4
Moffitt Cancer Center, Tampa, FL	3
Roswell Park Cancer Institute, Buffalo, NY	3

Table 7
Pathology grand rounds topics by specialty and subspecialty.

AP		CP	
Subspecialty	PGR number	Subspecialty	PGR number
Gastrointestinal Pathology	39	Hematopathology	68
Genitourinary Pathology	39	Molecular Pathology	36
Cytopathology	35	Transfusion Medicine	30
Neuropathology	34	Microbiology	30
Head, Neck and Endocrine Pathology	28	Clinical Chemistry	24
Bone and Soft Tissue Pathology	27	Coagulation	14
Thoracic Pathology	25	HLA	3
Gynecologic Pathology	23		
Breast Pathology	20		
Dermatopathology	20		
General Surgical Pathology	19		
Pediatric Pathology	13		
Renal Pathology	10		

3.2. Grand Rounds topics

PGR covered topics from anatomic pathology (357), clinical pathology (209), research (184) or other medical or surgical specialties (149). By subspecialty, most presentations covered hematopathology topics (68), followed by GI and GU pathology topics (39 each) (Table 7).

Among more general subjects that were covered by PGR were education-related topics (34), technology, informatics, artificial intelligence and digital imaging (27), professional issues, including clinician burnout, overall wellness, ethics/professionalism, patient safety, medicolegal and risk management (26), and healthcare system-related topics (18). There were also 12 PGR focusing on the interface between pathology and humanities (music, literature, mass-media, history, etc.). Other, less common subjects were decision-making, team-based care and quality improvement.

4. Discussion

The aim of our study was to determine the current state of PGR and try to better understand their current role in the academic pathology department. In order to better understand the function of this time-honored activity, it is helpful to try to understand the history of PGR. Although Grand Rounds are a “staple” of American medical education and have a long and rich tradition in medical and surgical departments, we found that the history of PGR difficult to trace. From the inception of the GR tradition in the last decade of the 19th century, pathology was presented at medical and surgical GR by clinicians with strong pathology backgrounds, like the Sir William Osler (1849–1919), who started this tradition [25,26]. While pathologists were frequently present at these clinical GR conferences, and were even hosting clinicopathologic conferences (CPCs) [27,28], we found no mention of PGR before the middle of the 20th century. No PGR or other similar formal conferences taking place pathology departments of large academic centers, were mentioned in an overview of the United States pathology education, seen through the eyes of a British pathologist published in 1949 [29]. This was most likely due to the fact that pathology departments, which at that time typically had a very small faculty and resident body, had little use for their own Grand Rounds. The number of faculty, staff and trainees increased dramatically in pathology departments in the 1960s, due to the growth of their research divisions, and the formation of Laboratory Medicine divisions, which incorporated faculty from medicine, pediatrics, biochemistry and microbiology [30,31]. Concomitantly, there was a major increase in the number of residency positions offered, as exemplified by the Johns Hopkins

pathology residency program, in which, from its inception under William H. Welch (1850–1934) in 1889, there were 1–2 residency positions per year, starting in 1958 their number increased to 8–9 per year [32]. The increase in the number of faculty and trainees and the integration of faculty previously belonging to clinical departments have most likely contributed to the initiation of GR seminars in pathology departments in the 1960s or 1970s. At about the same time, Grand Rounds, which were initially conceived as a student and resident educational patient-centered case-based teaching conference, that was engaging the audience by the Socratic method of cooperative argumentative dialogue, to decipher the diagnosis step by step, underwent dramatic changes. The presence of a real or simulated patient, who was initially the center of GR conferences, became unusual in most specialties, both due to concerns about patient privacy and dignity, and to the change of emphasis from clinical findings (patient-centered, “high touch” medicine) to laboratory tests (laboratory-centered, “high tech” medicine) [33]. At the same time, due to concerns that the Socratic Method had the potential to be abused, resulting in “pimping” [34], and therefore act as a deterrent to effective medical education, the Socratic dialogue was also abandoned. The resulting modern Grand Rounds morphed into formal presentations on a variety of subjects [35], frequently including research, sometimes only remotely related to the care of the individual patient. Around the same time that the above-mentioned changes in GR occurred, there was another important change that occurred in academic departments: the trend for increasing subspecialization [36] and of splintering of academic medical and surgical departments. As departments became more and more subspecialized and geographically splintered, they also became larger, with more faculty and trainees, and their departmental Grand Rounds became one of the few opportunities for the department to interact across subspecialties and get acquainted with each other's clinical and research interests and achievements. This social function was most likely responsible for the continuation of the GR tradition, even after GR lost their original meaning, and were criticized for being an anachronism, and just another lecture with “mind-numbing” PowerPoint presentations that may be used as an opportunity for “grandstanding” by influential members of the department [37,38].

The social function of GR is as important in pathology as it is in specialties like medicine and surgery. Pathology departments' faculty and trainees have a wide diversity of interests, including research, anatomic pathology (AP) and clinical pathology (CP), various training backgrounds and degrees, and are practicing various specialties and subspecialties. These include, in addition to 11 subspecialties for which the American Board of Pathology (ABP) gives diplomas or certificates, 18 sub-subspecialties for which ACGME-accredited “selective pathology” fellowships are available [39,40]. This wide diversity of interests makes the social function of PGR very important, but it also makes it more difficult to design a PGR series with topics that are of interest to more than a handful of people in the audience. The importance of this social function is highlighted in a recent publication from a large pathology department, which lists Grand Rounds as one of the activities meant to enhance faculty and staff engagement [32].

Our study found that PGR are taking place at various intervals in academic pathology departments of all sizes. They often took place towards the end of the week (Thursdays and Fridays), but not on weekends, as they may have been historically held [26]. The proportion of pathology training programs having GR (50%) appears smaller than the proportion of training programs of other specialties that hold GR. Recent studies using methodology similar to ours have found that GR took place in 66.7% of radiology [9], 73% of orthopedic surgery [41], 76.5% of dermatology [42], and 81% of general surgery [43] residency programs. Similar to studies performed in other specialties, our study also found that PGR are more commonly occurring in university programs, and programs that have larger numbers of trainees, residents and fellows. In fact, the proportion of programs with > 30 trainees that are having GR was comparable to that of GR held in other specialties' training programs.

Our study also found that almost all that PGR analyzed have a 60 min lecture format, but differed widely in frequency, timing, and type of subjects covered and type of presenters, and especially in the proportion of intra- and extramural presenters, the inclusion of trainees as presenters, and the proportion of presenters who are pathologists or from other specialties or professions. We found that PGR covered a diverse array of subjects, including anatomic and clinical pathology and their subspecialties, other medical specialties with which the pathologist comes into contact, medical education, technology, the healthcare system, professional issues, ethics, and humanities. We found that, in aggregate, there was a balance between clinical and research presentations and that the relative frequency of AP and CP topics covered by PGR was balanced. Moreover, in aggregate, the subspecialty and “sub-subspecialties” domains covered by PGRs mirror the pathologists' interests in these specialties and subspecialties as reflected by the fellowship programs currently offered. We therefore believe that, taken as an aggregate the subjects of the PGR presentations, give us an accurate cross-sectional view of the existing interests and current preoccupations of academic pathologists and their trainees. However, individual institution's mix of research, clinical and anatomic pathology topics, and topics falling outside the strict pathology domain was highly variable, as was the frequency of GR, and the participation of residents and fellows as presenters. Such high interinstitutional variation has also been found in radiology residency programs, in which the frequency of GR and the inclusion of residents as presenters were also highly variable [9].

Since this is an observational study, we can only speculate about the reason(s) underlying this variation between institutions regarding PGR. This variation is, at least in part, rooted in each institution's academic culture and tradition, but other factors including logistics and financial considerations, and most likely also differences in opinion as to what exactly is achieved by PGR, whether their main function is educational, social, for faculty development, or to showcase the department's achievements.

We believe that PGR can have an important educational role, especially if their subject matter and speakers were suggested by the faculty and trainees, or where identified through a formal needs assessment. Well-planned and well-delivered GR can offer very valuable learning opportunities even to such a diverse audience as the faculty, staff and trainees of a pathology department. Despite the fact that we found no or very limited evidence of a “curriculum”, covering specialties and topics in a systematic fashion, it is likely that the topics covered by these presentations integrate into the existing resident teaching curriculum, complementing other educational activities, including less formal lectures, case presentations and didactic sessions. Invited extramural speakers to PGR or visiting professors may fill educational gaps for both residents and faculty, conveying knowledge and skills that are not available within the department [44]. In addition to their educational value for trainees and junior faculty members, PGR may give them the opportunity to identify a potential mentor, or role model. PGR can also offer the department's faculty and trainees a setting to present their research results or clinical interests, allowing them to gain experience in giving formal talks, establish connections and potential collaborations. Grand Rounds presentations, which are regarded as a “scholarly activity” by the ACGME, may also help speakers establish or increase their reputation within the department, the institution, and beyond. This can give the faculty a sense of accomplishment, decreasing their potential for burnout and increasing their retention in academia and their chances for promotion. Since both burnout [45] and academic promotion (or lack thereof) are issues that disproportionately impact women [46-48], it is important to insure a gender balance among speakers at PGR. Similar to prior studies that found significant gender disparities in GR speakers in other specialties [49-51], we also found that there was a gender gap in the presenters of PGR. This gender gap widened with increasing academic rank and was even higher for invited extramural guest speakers. The gender gap was

essentially nonexistent for trainees (residents and fellows) and faculty at the assistant professor rank, where women represent almost half of PGR speakers, but widened at the associate professor and became very wide at the full professor level, where women represent only a third and respectively a quarter of all PGR speakers. The underrepresentation of women as PGR speakers found in this study is only partially explained by the gender gap currently existing in the US academic pathology faculty at higher academic ranks. The underrepresentation at the mid-level academic rank is particularly worrisome, as it may be responsible, at least in part, for the low proportion of women achieving the highest academic rank. Narrowing and closing the gender gap is not only important to maintain the role of PGR as a platform to showcase the achievements of all faculty members, and allowing the academic promotion, but also because of the role of PGR presenters as potential role models for trainees and junior faculty members, which insures the future interest of women in academic pathology. The gender imbalance in Grand Rounds speakers is clearly noticed by residents, as a recent survey showed high dissatisfaction rates of both male and female Internal Medicine residents with the gender balance of faculty presenting educational conferences and Grand Rounds [52].

In general, PGRs take place less frequently than Grand Rounds in departments of medicine or surgery, and even under ideal conditions, not accounting for cancellations due to holidays or other reasons, the annual number of PGR held at an individual institution varies from 9 to 40 (mean 25). This relatively small number of PGRs delivered annually makes it more difficult to notice a gender discrepancy in PGR speakers in any given institution. Therefore, it is very likely that a gender gap in PGR presenters, especially regarding visiting presenters and higher academic rank presenters, remains unnoticed by the PGR organizers. However, the awareness of the existence of a gender gap in PGR presenters at the national level that is even greater than the gender gap in academic pathology faculty, could help departmental PGR planning committees focus their attention on this issue, and evaluate the multi-year distribution by PGR speakers' gender and academic rank. The identification of a similar gender gap in PGR speakers at their institution is important, as it may reflect an unconscious gender bias. Such a bias consists of a series of mental associations that are, by definition, not overtly perceived, but can control or influence the individuals' interactions with others and their decision-making. A recent study involving residents found that this implicit (unconscious) bias to favor men over women can be found in both male and female residents, although it is greater in male residents, and may vary according to the residents' specialty [53]. Because they affect behavior on an unconscious level such biases are difficult to change and their impact on decision-making resulting in gender imbalance is unlikely to passively self-correct [54]. Once the existence of such gender gap is noted, PGR organizers can take measures to actively reduce and ultimately eliminate it. There is encouraging evidence that the simple act of directing the attention of planning committees to the issue can lead to an immediate improvement in the gender distribution of Grand Round presenters [55]. A possible way to achieve gender balance in PGR speakers is have a well-functioning formal departmental mentorship program and involve the mentors in PGR planning. Committed mentors can help female faculty members recognize Grand Round presentations as opportunities to increase their chances for promotion, gain insight into the process of selecting PGR speakers, and overcome any potential obstacles, including the so-called “impostor syndrome”, which is disproportionately more common and more severe in female faculty members [56]. Purposefully inviting women, especially those at associate professor academic rank, as extramural Grand Round speakers and visiting professors, can also help correct the underrepresentation of women as PGR speakers.

A recent study addressing the gender gap in medicine GR, found that, while the gender gap persists, it appears to be decreasing in more recent years [51]. Our study did not analyze the representation of women as PGR speakers over time and was therefore unable to

determine such a trend. Another limitation of this study is that we did not attempt to analyze the representation of racial and other minority groups among PGR presenters.

We believe that the most important limitation of this study was its observational nature, which did not allow us to determine the cause(s) of the prominent gender gap in PGR speakers, which was even greater than the gender gap among academic pathologists. We also had to rely on the accuracy and completeness of information on departmental and other websites (FREIDA, Pathology Wiki and Doximity) regarding pathology residency programs and their PGR. Due to the limited response rate to our email questions, we could only partially overcome the limitation imposed by the incomplete information on departmental websites.

Another limitation was that there was a significant variation in the number of PGR per institution that we could analyze in detail, which may have led to underrepresentation of some institutions and regions and overrepresentation of others. This occurred due to the large variation in the frequency of PGR at different institutions, despite the fact that we have analyzed PGR from a geographically representative sample of small, medium-sized and large pathology residency programs and university-affiliated cancer centers.

5. Conclusion

Our study gives a first glimpse into a previously unexplored academic activity, the time-honored PGR. We found that PGRs are occurring at academic pathology departments with residency and fellowship training programs of all sizes but were more frequent in institutions with larger numbers of pathology residents and fellows, suggesting that trainees are a major intended audience of PGR. Our study also provides a cross-sectional view of the interests of academic pathology departments, which span a very wide spectrum of research, anatomic and clinical pathology topics. The topics covered by PGR are not restricted to pathology, but include subjects bridging pathology with clinical specialties, professionalism, ethics and the humanities. Our study unfortunately also documents the existence of a gender gap in PGR presenters. We believe that the results of this study give an overview of the variety of approaches to PGR among different academic pathology departments and could help departmental committees better plan this activity.

References

- ACCME. How is a regularly scheduled series defined? 2019 [cited 2019 8/20/2019]; Available from: <http://www.accme.org/faq/how-regularly-scheduled-series-defined>.
- Parrino TA, White AT. Grand rounds revisited: results of a survey of U.S. Departments of Medicine. *Am J Med* 1990;89(4):491–5. [https://doi.org/10.1016/0002-9343\(90\)90381-m](https://doi.org/10.1016/0002-9343(90)90381-m).
- Mueller PS, et al. Current status of medical grand rounds in departments of medicine at US medical schools. *Mayo Clin Proc* 2006;81(3):313–21. <https://doi.org/10.4065/81.3.313>.
- Birch DW, Mavis B. A needs assessment study of undergraduate surgical education. *Can J Surg* 2006;49(5):335–40.
- Mehrabi D, Cruz Jr. PD. Educational conferences in dermatology residency programs. *J Am Acad Dermatol* 2006;55(3):523–4. <https://doi.org/10.1016/j.jaad.2006.04.024>.
- Cohen JM, et al. Perspectives on dermatology grand rounds: a survey of United States residency program directors. *Int J Dermatol* 2016;55(5):e310–1. <https://doi.org/10.1111/ijd.13093>.
- Choi RK, et al. Current status of neurology grand rounds. *Neurologist* 2010;16(5):308–12. <https://doi.org/10.1097/NRL.0b013e3181c29f38>.
- Tridandapani S, Mullins ME, Meltzer CC. Grand rounds and a visiting professorship program in a department of radiology: how we do it. *Acad Radiol* 2012;19(11):1415–20. <https://doi.org/10.1016/j.acra.2012.08.003>.
- Yablon CM, et al. A report on the current status of grand rounds in radiology residency programs in the United States. *Acad Radiol* 2011;18(12):1593–7. <https://doi.org/10.1016/j.acra.2011.08.015>.
- Dolcourt JL, Zuckerman G, Warner K. Learners' decisions for attending Pediatric Grand Rounds: a qualitative and quantitative study. *BMC Med Educ* 2006;6:26. <https://doi.org/10.1186/1472-6920-6-26>.
- Lewis DW. Are pediatric grand rounds dead? *J Pediatr* 2012;160(5):711–2. <https://doi.org/10.1016/j.jpeds.2012.01.034>.
- Cantu RV, et al. Orthopedic grand rounds can change resident practice. *Am J Orthop (Belle Mead NJ)* 2013;42(5):215–9.
- Lewkonja R. M. Sosnowski, and F. Murray, Hospital grand rounds in family medicine. Content and educational structure. *Can Fam Physician* 1996;42:301–6.
- Zeng D, et al. Scope, focus, and relevance of ophthalmology grand rounds. *Journal of Academic Ophthalmology* 2014;07(01):e013–6. <https://doi.org/10.1055/s-0034-1396087>.
- Kunik ME, et al. Correlates of psychiatry grand rounds attendance. *Acad Psychiatry* 1993;17(2):77–83. <https://doi.org/10.1007/BF03341858>.
- Ramchandani D. Usefulness of psychiatric grand rounds for medical student education. *Acad Psychiatry* 2009;33(2):149–51. <https://doi.org/10.1176/appi.ap.33.2.149>.
- Martin M. Grand rounds: what is the point? *J Obstet Gynaecol Can* 2005;27(5):511–4. [https://doi.org/10.1016/s1701-2163\(16\)30537-0](https://doi.org/10.1016/s1701-2163(16)30537-0).
- Gutmann EJ. GRAND(ER) ROUNDS: expanding the universe of topics and speakers in a pathology department seminar series. *Ann Diagn Pathol* 2018;35:94–6. <https://doi.org/10.1016/j.anndiagpath.2018.05.006>.
- Lockyer J. Needs assessment and grand rounds: how to do it Available from: <http://www.royalcollege.ca/rcsite/documents/continuing-professional-development/needs-assessment-grand-rounds-how-to-e>; 2012.
- ACGME. Accreditation Council for Graduate Medical Education (ACGME) - Public advanced program search by specialty: pathology-anatomic and clinical. 2019 8/20/2019; Available from: [https://apps.acgme.org/ads/Public/Programs/Search?stateId=&specialtyId=54&specialtyCategoryTypeId=&numCode=&city=&stateId=](https://apps.acgme.org/ads/Public/Programs/Search?stateId=&specialtyId=54&specialtyCategoryTypeId=&numCode=&city=&stateId=&specialtyId=54&specialtyCategoryTypeId=&numCode=&city=&stateId=)
- AMA. The AMA Residency & Fellowship Database. 2019 8/20/2019; Available from: <https://freida.ama-assn.org/Freida/#/>.
- Doximity. Residency navigator. Pathology (anatomic & clinical) residency programs. Sort by reputation. 2019 [cited 2019 August 19]; Available from: https://residency.doximity.com/programs?residency_specialty_id=53&sort_by=reputation&location_type=region.
- Gardner, J.M., M.P. Sedrak, and L.N. Stuart. Pathology Resident Wiki. Residency and fellowship programs. 2019 8/25/2019; Available from: https://pathinfo.fandom.com/wiki/Residency_and_Fellowship_Programs.
- AAMC. Association, of American Medical Colleges 2018 U. S. Medical school faculty. Distribution of full-time U. S. Medical school faculty by sex, rank, and department (Table 13). 2018; Available from: <https://www.aamc.org/data-reports/faculty-institutions/interactive-data/data-reports/faculty-institutions/interactive-data/2018-us-medical-school-faculty>.
- Walsh, K., Medical education. A history in 100 images. 2016, Boca Raton, FL: CRC Press Taylor & Francis Group.
- Sugg, D.K., Show-and-tell for doctors. Making the rounds. In a tradition that began at Hopkins Hospital, doctors learn from patients and each other. *The Baltimore Sun*, 1995(September 23, 1995).
- Harris, N.L. and R.E. Scully, The clinicopathological conferences (CPCs), in Keen minds to explore the dark continents of disease: a history of the pathology services at Massachusetts General Hospital, D.N. Louis and R.H. Young, Editors. 2011, Massachusetts General Hospital: Boston. p. 349–362.
- Louis DNY, Era Robert Henry The Mallory, in Keen minds to explore the dark continents of disease: a history of the pathology services at Massachusetts General Hospital, D.N. Louis and R.H. Young, Editors. 2011, Massachusetts General Hospital: Boston p 1926–1951;48–72.
- Hill KR. Some observations on the teaching of pathology in the U.S.A. *Br Med J* 1949;1(4606):674–6. <https://doi.org/10.1136/bmj.1.4606.674>.
- Benson ES. Ward Burdick Award Lecture: Laboratory Medicine in the United States—the dream and the reality. *Am J Clin Pathol* 1981;76(1):1–7. <https://doi.org/10.1093/ajcp/76.1.1>.
- Burke MD. Laboratory medicine in the 21st century. *Am J Clin Pathol* 2000;114(6):841–6. <https://doi.org/10.1309/th8p-1cal-9k3g-vftm>.
- Sanfilippo F, et al. The Johns Hopkins Department of Pathology novel organizational model: a 25-year-old ongoing experiment. *Acad Pathol* 2018;5. <https://doi.org/10.1177/2374289518811145>. (p. 2374289518811145).
- Fred HL. Medical education on the brink. 62 years of front-line observations and opinions. *Tex Heart Inst J* 2012;39(3):322–9.
- Brancati FL. The art of pimping. *JAMA* 1989;262(1):89–90.
- Altman LK. Socratic dialogue gives way to PowerPoint, in *New York Times*. 2006.
- Cassel CK, Reuben DB. Specialization, subspecialization, and subspecialization in internal medicine. *N Engl J Med* 2011;364(12):1169–73. <https://doi.org/10.1056/NEJMs1012647>.
- Ingelfinger, F.J., Sounding boards. The graying of grand rounds. *N Engl J Med*, 1978. 299(14): p. 772. <https://doi.org/10.1056/nejm197810052991409>.
- Gilbert JAL. Against the grand medical round. *Med Teach* 1979;1(6):314–5. <https://doi.org/10.3109/01421597909014345>.
- lezzoni JC, et al. Selective pathology fellowships: diverse, innovative, and valuable subspecialty training. *Arch Pathol Lab Med* 2014;138(4):518–25. <https://doi.org/10.5858/arpa.2013.0454-SA>.
- Petrickeas AH, Salmi D. Trends in pathology graduate medical education programs and positions, 2001 to 2017. *Acad Pathol* 2018;5. <https://doi.org/10.1177/2374289518765457>. (p. 2374289518765457).
- Oladeji LO, et al. How useful are orthopedic surgery residency web pages? *J Surg Educ* 2015;72(6):1185–9. <https://doi.org/10.1016/j.jsurg.2015.05.012>.
- Ashack, K.A., et al., Evaluating dermatology residency program websites. *Dermatol Online J*, 2016. 22(3).
- Stoeger SM, et al. Evaluation of general surgery residency program websites. *Am J Surg* 2019;217(4):794–9. <https://doi.org/10.1016/j.amjsurg.2018.12.060>.
- Sayyid SK, Mullins ME, Singer AD. Current trends among us diagnostic radiology

- visiting professor programs. *J Am Coll Radiol* 2019;16(5):757–61. <https://doi.org/10.1016/j.jacr.2018.10.027>.
- [45] Titus K. *Addressing the gender gap: women and burnout—like men, but not, in CAP Today*. 2018.
- [46] Paulus JK, et al. Where is the leak in the pipeline? Investigating gender differences in academic promotion at an academic medical centre. *Perspect Med Educ* 2016;5(2):125–8. <https://doi.org/10.1007/s40037-016-0263-7>.
- [47] Awad MA, et al. Gender differences in promotions and scholarly productivity in academic urology. *Can J Urol* 2017;24(5):9011–6.
- [48] Gawad N, et al. Gender and academic promotion of Canadian general surgeons: a cross-sectional study. *CMAJ Open* 2020;8(1):E34–40. <https://doi.org/10.9778/cmajo.20190090>.
- [49] Boiko JR, Anderson AJM, Gordon RA. Representation of women among academic grand rounds speakers. *JAMA Intern Med* 2017;177(5):722–4. <https://doi.org/10.1001/jamainternmed.2016.9646>.
- [50] Buell D, Hemmelgarn BR, Straus SE. Proportion of women presenters at medical grand rounds at major academic centres in Canada: a retrospective observational study. *BMJ Open* 2018;8(1):e019796 <https://doi.org/10.1136/bmjopen-2017-019796>.
- [51] Mortaji, P. and E. Barrett Gender differences in internal medicine grand rounds speakers at a local academic hospital. University of New Mexico Health Sciences Center Education Day 2018.
- [52] Lukela JR, et al. When perception is reality: resident perception of faculty gender parity in a university-based internal medicine residency program. *Perspect Med Educ* 2019;8(6):346–52. <https://doi.org/10.1007/s40037-019-00532-9>.
- [53] Hansen M, et al. Implicit gender bias among US resident physicians. *BMC Med Educ* 2019;19(1):396. <https://doi.org/10.1186/s12909-019-1818-1>.
- [54] Grimm LJ, et al. Men (and women) in academic radiology: how can we reduce the gender discrepancy? *AJR Am J Roentgenol* 2016;206(4):678–80. <https://doi.org/10.2214/AJR.15.15277>.
- [55] Lieberman JA, et al. Eliminating the glass ceiling in academic psychiatry. *Acad Psychiatry* 2018;42(4):523–8. <https://doi.org/10.1007/s40596-017-0810-5>.
- [56] Gottlieb M, et al. Impostor syndrome among physicians and physicians in training: a scoping review. *Med Educ* 2020;54(2):116–24. <https://doi.org/10.1111/medu.13956>.