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International medical graduates representation in pathology academic workforce, departmental leadership and society leadership

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A B S T R A C T

Compared with the overall physician workforce, pathologist workforce in the United States has significant representation of international medical graduates (IMGs). IMG representation in the academic pathology workforce, as well as in departmental and pathology societal leadership, has not been documented. In this cross-sectional study, we surveyed a sample of 20 North American academic pathology departmental publicly available websites. Each faculty was recorded according to the location of their medical school training as either US or Canadian medical graduateor IMG (country of medical school graduation any other than US or Canada). Past and present presidents of four major North American pathology societies [American Society for Clinical Pathology (ASCP), Association for Academic Pathology (AAPath), College of American Pathologists (CAP), United States and Canadian Academy of Pathology (USCAP)] were also recorded. A total of 1455 pathologists were retrieved in our search: 924 (63.5 %) were USCMGs and 531 (36.5 %) IMGs. Likewise, 65 % of pathology chairs were USCMGs and 35 % IMGs. These data mirror the 2022 Association of American Medical Colleges distribution in the pathology workforce (65.6 % USCMGs and 34.4 % IMGs). In contrast, historic data from 1993 to 2024 show that only 8 (8 %) past or current presidents of the major US pathology societies were IMGs (USCAP = 6, ASCP = 1, AAPath = 1, CAP = none). While the academic pathology community has proportional representation of physicians based on location of their medical school training, there is historical underrepresentation of IMGs in societal leadership. Unveiling the causes of this disparity and identifying any potential obstacles for faculty engagement is paramount.

Keywordss: Canadian medical ggraduate, International medical graduate, Leadership, Pathology, US medical graduate

Introduction

Underrepresentation of several racial, ethnic, cultural and gender groups in medicine has gained recognition in recent years, propelling efforts to understand its drivers and promote recruitment and retention policies that ensure proportional representation, free of implicit and other bias. Compared with the overall composition of physicians in the workforce, disproportional representation occurs often among physicians occupying leadership positions in academic departments, professional societies, and peer-reviewed journal publications,[1–3] as well as among those physicians that succeed in academic promotion to associate professor and full professor.[4,5] The evidence is mostly centered on sex and gender, with much scarcer data related to underrepresented racial and ethnic groups.

A largely unexplored dimension of underrepresentation in medicine is the location of the medical school the US practicing physician graduated from. The Association of American Medical Colleges (AAMC) documents on a yearly basis the proportion of *United States medical graduate (USMG), Canadian medical graduate (CAMG),* and *international medical graduate (IMG)* in the American pathology workforce. In 2023, 64.3 % of pathology physicians working in the US were USMGs, 0.7 % were CAMGs, and 34.8 % were IMG. Importantly, the proportion of IMGs in pathology is higher than in the entire US physician workforce (Table 1).[6] Data pertinent to academic settings, namely pathologists with faculty affiliation to a medical school, are in turn not readily available. Moreover, there is to date no documentation in the peer-reviewed literature of the distribution of pathologists in leadership positions in academic institutions and professional societies according to the type of medical school they graduated from. In this study, we document such distribution among a large sample of academic pathology departments, including breakdown by subspecialty. We also document the distribution of USMGs and CAMGs vs IMGs among presidents of the largest and best recognized professional pathology societies in North America and compare it with the distribution in the US physician workforce.

Materials and methods

This study met the criteria for exempt status per the Mass General Brigham institutional research board. Using publicly available online search engines, we identified the website of 20 academic pathology departments in which the subspecialty or subspecialties of each faculty were clearly identified (full dataset for each department included in Supplementary Table 1). For all faculty members in each subspecialty, as well as the department chair, we documented the country of the medical

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Table 1
Association of American Medical Colleges (AAMC) distribution of US physician workforce, overall and specific to pathology, based on medical school geographic location. Data retrieved from reference 6.[6]

		All US physicians	Pathology
2022	USMG	74.5 %	64.9 %
	CAMG	0.9 %	0.8 %
	IMG	24.7 %	34.4 %
2023	USMG	73.9 %	64.3 %
	CAMG	0.9 %	0.7 %
	IMG	24.7 %	34.8 %
	Unknown	0.5 %	0.1 %

CAMG, Canadian medical graduate, IMG, international medical graduate; USMG, United States medical graduate.

school in which the faculty obtained their medical degree. Departmental websites listing their clinical faculty but without subspecialty designation or biographical information to determine medical school location were excluded.

A similar process involved searching for the list of past and current presidents of the following professional pathology associations, available online as per date of access: the American Society for Clinical Pathology (ASCP),[7] the Association for Academic Pathology (AAPath) [formerly the Association of Pathology Chairs] Council,[8] the American College of Pathologists (CAP),[9] and the United States and Canadian Academy of Pathology (USCAP).[10] The country of the medical school in which the past or current president obtained their medical degree was recorded.

Search and data tabulation occurred between June 1st and July 31st, 2024. For analysis, each faculty, chair, and president identified in our search was tabulated according to the geographic location of their medical school training as: *United States or Canadian medical graduate (USCMG)* or *international medical graduate (IMG*, if the country of the medical school was any other than United States or Canada). As baseline, we retrieved data from the most recent AAMC US physician workforce data dashboard relevant to pathology.[6] We also extracted data specific to pathology from the National Resident Matching Program (NRMP) yearly match results and data reports, which since 1986 have included a table categorizing applicants by subspecialty and applicant status.[11] For the purposes of our analysis, the following categories were considered USCMGs: MD senior, MD graduate, DO senior, DO graduate, and Canadian graduate. In turn, US IMG and non-US IMG were categorized as IMGs.

Statistical comparison involved calculation of the difference between nationwide pathology workforce (AAMC and NRMP data), academic workforce in the 20 academic departments surveyed, and data collected for departmental chairs and society presidents. Comparison included Fisher's exact test (GraphPad, La Jolla, CA).

Results

NRMP data of physicians matched into pathology, categorized by their type of medical school training, are shown in Table 2.[11] Available data show shifts in the proportion of USCMGs and IMGs over time, with a steady increase in the proportion of IMGs between 1986 and 2021 and since then widening increase in the proportion of USCMGs between 2022 and 2024. On average, the percentage of IMGs among those matching into pathology between 1986 and 2024 was 31.5 %, with the lowest number recorded in 1989 (8.5 %) and the highest number recorded in 2021 (51.1 %). Between 1986 and 2004, the annual percentage of IMGs among those matching into pathology was 24.1 % on average (range 8.5–44.7 %). During this period, a total of 1385 IMGs matched in pathology. Between 2005 and 2024, the annual percentage of IMGs among those matching into pathology was 35 % on average (range 17.5–51.1 %). During this period, a total of 3859 IMGs matched in pathology.

Tables 3 and 4 show the USCMG vs IMG distribution at the time of data collection in 2024 of pathologists in the 20 academic departments surveyed, separated by 12 anatomic pathology subspecialties and 6 clinical pathology subspecialties. These 20 departments selected had the required information about faculty subspecialty and biographical information as listed in the methods. Their geographic distribution as per Census Bureau–designated regions, is as follows: two departments in region 1 (New England), four in region 2 (Middle Atlantic), four in region 3 (East North Central), one in region 4 (West North Central), one in region 5 (South Atlantic), two in region 7 (West South Central), four in region 9 (Pacific), and two in Canada. In terms of size, departments surveyed had a mean number of 73 faculty (median 66, range 23–118). Together, a total of 1455 pathologists were recorded. Of these, 924 (63.5 %) were USCMGs and 531 (36.5 %) were IMGs, very similar to the 2022–2023 AAMC physician workforce data[6] and cumulative NRMP pathology match data.[11] The percentage of IMG faculty in each department surveyed ranged from 17 % to 67 % (Supplementary Table 1).

Table 2
Number and corresponding percentage of United States and Canadian medical graduates (USCMGs) and international medical graduates (IMGs) that successfully matched a pathology position in the National Resident Matching Program (NRMP). Public data extracted from reference [11].

Year	USCMG		IMG		Total	Year	USCMG		IMG		Total
	Number	%	Number	%			Number	%	Number	%	
1986	219	79.3	57	20.7	276	**2005**	397	82.5	84	17.5	481
1987	226	81.9	50	18.1	276	**2006**	371	77.3	109	22.7	480
1988	203	80.6	49	19.4	252	**2007**	369	79.2	97	20.8	466
1989	279	91.5	26	8.5	305	**2008**	363	77.7	104	22.3	467
1990	263	90.1	29	9.9	292	**2009**	383	77.8	109	22.2	492
1991	284	89.0	35	11.0	319	**2010**	386	79.8	98	20.2	484
1992	271	85.2	47	14.8	318	**2011**	331	69.5	145	30.5	476
1993	293	84.0	56	16.0	349	**2012**	337	72.3	129	27.7	466
1994	271	79.7	69	20.3	340	**2013**	358	63.7	204	36.3	562
1995	291	79.3	76	20.7	367	**2014**	353	64.7	193	35.3	546
1996	246	74.3	85	25.7	331	**2015**	350	61.6	218	38.4	568
1997	153	61.7	95	38.3	248	**2016**	330	60.1	219	39.9	549
1998	143	57.7	105	42.3	248	**2017**	273	50.1	272	49.9	545
1999	156	55.5	125	44.5	281	**2018**	311	54.8	257	45.2	568
2000	136	55.3	110	44.7	246	**2019**	289	50.8	280	49.2	569
2001	203	65.1	109	34.9	312	**2020**	301	51.3	286	48.7	587
2002	234	70.3	99	29.7	333	**2021**	288	48.9	301	51.1	589
2003	317	79.4	82	20.6	399	**2022**	345	55.7	274	44.3	619
2004	357	81.5	81	18.5	438	**2023**	359	59.1	248	40.9	607
1986–2004	4545	76.6	1385	23.4	5930	**2024**	389	62.6	232	37.4	621
1986–2024	11,428	68.5	5244	31.5	16,672	**2005–2024**	6883	64.1	3859	35.9	10,742

IMG, international medical graduate; USCMG, United States and Canadian medical graduate.

Table 3
Number and corresponding percentage of faculty practicing in anatomic pathology specialties in a sample of 20 academic North American pathology departments.

Subspecialty	USCMG		IMG		Total
	Number	%	Number	%	Number
Bone and soft tissue pathology	33	64	19	36	52
Breast pathology	77	57	58	43	135
Cardiothoracic pathology	60	64	34	36	94
Cytopathology	92	57	69	43	161
Dermatopathology	57	68	27	32	84
Gastrointestinal pathology	120	67	60	33	180
Genitourinary pathology	58	50	58	50	116
Gynecologic and obstetric pathology	77	58	56	42	133
Head, neck, and endocrine Pathology	51	71	21	29	72
Medical autopsy	70	73	26	27	96
Medical kidney and transplant pathology	33	60	22	40	55
Neuropathology	77	72	29	28	106
Total	805	62.7	479	37.3	1284

IMG, international medical graduate; USCMG, United States and Canadian medical graduate.

Table 4
Number and corresponding percentage of faculty with medical (MD, DO) degree practicing in clinical pathology specialties in a sample of 20 academic North American pathology departments.

Subspecialty	USCMG		IMG		Total
	Number	%	Number	%	Number
Blood bank and transfusion medicine	86	75	24	21	110
Clinical chemistry	33	35	6	6	39
Coagulation	43	78	12	22	55
Hematopathology	114	53	101	47	215
Microbiology	34	47	6	8	40
Molecular pathology and cytogenetics	98	46	56	26	154
Total	408	53.5	205	26.9	613

IMG, international medical graduate; USCMG, United States and Canadian medical graduate.

In this study and only for analysis purposes, hematopathology and molecular pathology and cytogenetics were listed as clinical pathology subspecialties. A total of 1908 entries were recorded (larger than the number of pathologists recorded as a pathologist could be listed in more than one subspecialty). A total of 62.7 % entries in anatomic pathology subspecialties were USCMGs, while 37.3 % were IMGs. In clinical pathology specialties, USCMGs and IMGs represented 53.5 % and 26.9 % of the faculty workforce surveyed, respectively. The remaining 19.6 % was represented by non-MD/DO (most often PhD) graduates (see Supplementary Table 1). Not counting non-MD/DO faculty, the proportion of USCMGs (66.6 %) vs IMGs (33.4 %) in clinical pathology specialties was also similar to the 2022 AAMC physician workforce data[6] and cumulative NRMP pathology match data.[11] Among the individuals listed as chairs of the 20 pathology departments surveyed, 13 were USCMGs (65 %), while 7 (35 %) were IMGs.

At the time of data collection, the ASCP, CAP and USCAP websites had past and current presidents listed from 1993 onward, while the AAPath website listed past and current council presidents from 2002-2003 onward. A total of 101 past or current presidents were listed in the ASCP (n = 30), AAPath (n = 23), CAP (n = 16), and USCAP (n = 32) websites at the time of search.[7–10] The distribution of these individuals according to their type of medical school training is depicted in Table 5. Only 8 (8 %) of the 101 past or current presidents were IMGs. This distribution was significantly different than the distribution of IMGs in the 2022 AAMC U.S. Physician workforce data dashboard and the cumulative NRMP pathology match data (both $P < 0.001$). Of the eight IMGs that have served as presidents of a major North American pathology society, six were USCAP presidents. Of note, the distribution of USCAP presidents between USCMGs and IMGs did not reach statistical significance when compared with AAMC and NRMP data. Both ASCP and AAPath have had one president with an IMG status. The CAP does not have past or current presidents with international medical training to date.

Table 5
Number and corresponding percentage of pathologists listed as past or present president in one of four major pathology societies in North America surveyed.

Society	USCMG		IMG		Total
	Number	%	Number	%	Number
American society for clinical pathology	29	97	1	3	30
Association for academic pathology	22	96	1	4	23
College of American pathologists	16	100	0	0	16
United States and Canadian academy of pathology	26	81	6	19	32
Total	93	92	8	8	101

IMG, international medical graduate; USCMG, United States and Canadian medical graduate.

Discussion

In the United States, compared with the overall US pool of working physicians, pathology has a significant proportion of physicians with an international (non-US and non-Canadian) medical degree within its workforce (Table 1).[6] This reality reflects the larger number of residency positions available in the US compared with the number of US medical school graduates choosing pathology residencies each year. It is likely also a reflection of a relatively lower interest in pathology as a specialty among US medical graduates, and in turn a higher interest from the international medical graduate pool. Interestingly, NRMP data show a progressive increase in IMG representation among pathologists until 2021, with relative increase in the proportion of USMGs since then. It can be hypothesized that this apparent trend corresponds to efforts in the recent past to expose US medical students to a more robust pathology curriculum, as well as the increased awareness of the importance of laboratory medicine in healthcare and public health highlighted by the COVID-19 pandemic.

Our study shows that the North American academic pathology workforce has a significant proportion of IMG physicians, similar to the AAMC US workforce data. Distribution of USCMG vs IMG status did not differ significantly among the different anatomic and clinical subspecialties, indicating that engagement in the multiple pathways for clinical practice in pathology occurs in equivalent proportions among USCMGs and IMGs. Our data also show that IMGs have proportional representation in departmental leadership roles compared with the national workforce distribution. These observations are reassuring in the evaluation of diversity, equity, and inclusion in academic pathology as they indicate that pathologists have similar access to subspecialization as well as leadership roles regardless of their medical school training location.

In sharp contrast, leadership in major pathology societies in North America shows a historic overrepresentation of physicians with a US or Canadian medical degree and underrepresentation of international medical graduates. Our study is not designed to unveil the causes of this disparity. However, we venture to hypothesize contributing factors. It is possible that IMG pathologists are not as interested in professional or academic leadership as their USCMG counterparts; arguing against this postulate is the fact that IMGs occupy departmental leadership positions in a proportion similar to their representation in the US workforce. Alternatively, there may be obstacles that impede or limit engagement of IMG pathologists in professional societies to the point of affecting their

nomination and successful appointment as society or council presidents. These potential obstacles can be personal, cultural, and institutional (both at the departmental and societal levels). Identifying, understanding, and addressing these obstacles is very important to pathology as a discipline and to the general population as healthcare recipients.

It could be argued that some obstacles may be inherent to the location of the individual's medical school. The differences among US, Canadian and international medical training are indeed complex and difficult to measure. There are, nonetheless, safeguards in the process of accrediting IMGs that enter the US physician workforce and ascertaining that they have the same level of qualifications and expertise as USCMGs. Successful completion of the United States Medical Licensing Examination step exams and a comprehensive application to the NRMP, with equal requirements as USCMGs, are examples of this. In addition, IMGs matching into pathology train in equal conditions as their USCMG peers during 3–7 years of postgraduate education within the US healthcare system.

We intentionally frame this study, and our exploration of the potential explanations for the underrepresentation of IMGs in societal leadership, under the lens of diversity, equity and inclusion. First, USCMG vs IMG status may by itself be a factor that influences decisions implicitly or explicitly. Despite obtaining equivalent qualifications and going through the same selection process and postgraduate training as USCMGs, international medical degree holders may be perceived as less qualified or competitive for societal leadership. Second, IMGs are more likely to identify as part of a racial, ethnic, and/or cultural minority compared with USCMGs since the location of their medical school is usually their place of origin and/or upbringing as well. To this end, our results can be used as a guide to further explore the status of racial and ethnic minorities in the field of pathology. We note; however, that representation by location where faculty completed medical school training cannot be automatically translated as evidence of racial or ethnic underrepresentation.

Of note, we based our analysis on pathology departments with detailed information on their websites about the subspecialties of each faculty member and their medical degree. We explored many additional departmental websites but excluded those without subspecialty designation or clear biographical information for their clinical faculty. This was done to allow for subspecialty analysis as presented. We; however, acknowledge that this selection criterion may act as bias toward larger, more research-intensive departments. Clinical-intensive departments are still represented in our study cohort (see Supplementary Table 1 for details), but we acknowledge that further documentation of pathologist representation in a larger pool of academic pathology departments, as well as community-based pathology practices, is still warranted.

Another potential bias of our study is the discrepancy between the 2024 “snapshot” distribution of pathologists in pathology departments and the data on past and current presidents of pathology societies which spans a 30-year period. Building a track record deserving of a departmental or societal leadership role takes years, and admittedly not all pathologists represented in our 2024 data have such a record. Ideally, data on departmental faculty should span a time period similar to the one available for pathology societies presidents. Unfortunately, this information is not publicly available. To mitigate this limitation, we also provide residency match data from the NRMP, specifically the number of USCMG and IMG physicians entering pathology in the last 38 years, which shows that IMGs have comprised a significant proportion of US pathologists for decades, never below 15 % of the workforce since 1993 (Table 2).

In summary, our study documents that the distribution of pathologists in the North American academic workforce based on the location of their medical school training is similar to that of the general US physician workforce. Moreover, current departmental leadership in academic departments has a similar composition, with the proportion of US or Canadian medical graduates vs international medical graduates reflecting that of the US workforce. Intriguingly, among past and current leadership of major pathology societies, there is a significant underrepresentation of international medical graduates. This finding should bring awareness to the US pathology community to motivate further scrutiny of our societal spaces, policies, procedures, and practices in order to identify the causes of this disparity. It will be important to consider whether implicit bias in the nomination and selection processes is a contributing factor. This is the first step in promoting engagement in organized medicine and ensuring diverse, equitable and inclusive participation of pathologists in the professional societies that represent them.

Author contributions s

CPH was responsible for the concept and design. AA was responsible for data collection and analysis. Both authors contributed to the writing of the manuscript and approved its final version.

Data

The datasets used and/or analyzed during the current study are included in the manuscript and supplementary materials.

Declaration of Generative AI and AI-assisted technologies in the writing process

This work was entirely prepared by the author without the use of any artificial intelligence or artificial intelligence-assisted technologies.

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Supplementary data

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